Construction of a Secondary Boundary Fence and New Sections of Primary Boundary Fence and Boundary Patrol Road

Environmental Impact Assessment (Final)

(Volume 1 of 2)

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1 INTRODUCTION

1.1 Background

1.1.1 The Frontier Closed Area (FCA) is an integral part of the package of measures for maintaining the integrity of the Hong Kong SAR's boundary with the Mainland and for combating illegal immigration and other cross-boundary criminal activities. Following a recent review, the Government has concluded that with the erection of a secondary boundary fence (SBF) along the boundary patrol road (BPR) and construction of new sections of the BPR and primary boundary fence (PBF) at certain sections along the boundary, the FCA coverage can be substantially reduced without affecting the objective of maintaining the integrity of the boundary. The PBF and SBF will be erected along the northern and southern curbs of the realigned BPR respectively to facilitate the Police in combating cross-boundary criminal activities. The reduced FCA will comprise a narrow strip of land covering the realigned BPR and areas to its north, together with the points of crossing the boundary (i.e. the Boundary Control Points and Sha Tau Kok town). Areas south of the SBF will generally be excised from the FCA.

1.2 The Project

1.2.1 The Project mainly comprises the construction of an SBF along the southern edge of the existing BPR (approximately 21.7km) from west (Pak Hok Chau) to east (Sha Tau Kok). For sections where the existing PBF runs along the southern edge of the BPR, a new fence with sensor alarm system will be constructed on the northern edge of the BPR as part of the PBF whereas the existing PBF will become the SBF. The project also includes the conversion of the existing maintenance services road along the Shenzhen River bank to the north of the Lok Ma Chau Loop and Hoo Hok Wai into a new section of the BPR with a PBF and an SBF; and construction of two new sections of the BPR with a PBF and an SBF along the Shenzhen River side to the north of Pak Fu Shan and northwest of Lin Ma Hang Village. In addition, the Project includes the construction of a checkpoint at the entrance to the Sha Tau Kok town (i.e. location of "Gate One") and replacement of the existing checkpoint at Pak Hok Chau, removal of the existing checkpoints at Lok Ma Chau, Sha Ling, Ping Che and Shek Chung Au, and removal of the existing PBF along those sections of the existing BPR which will be replaced by new sections of the BPR.

1.3 EIAO and Designated Projects

1.3.1 The Project is a designated project (DP) under item Q.1, Part I, Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) (Cap. 499) which reads *"All projects including new access roads, railways, sewers, sewage treatment facilities, earthworks, dredging works and other building works partly or wholly in an existing or gazetted proposed country park or special area, a conservation area, an existing or gazetted proposed marine park or marine reserve, a site of cultural heritage, and a site of special scientific interest."*

1.4 Scope

1.4.1 The entire length of the Project is about 21.7km from west of Pak Hok Chau to east of Sha Tau Kok and is divided into four sections as shown in **Figure 1.1**. The project scope of each

section is described below.

Section 1 – Mai Po to Lok Ma Chau Control Point

(i) To erect an SBF along the existing BPR (approximately 4.1km); and

(ii) To replace the existing checkpoint at Pak Hok Chau.

Section 2 – Lok Ma Chau Control Point to Ng Tung River

(i) To convert the maintenance services road of Drainage Services Department along the Shenzhen River bank to the north of the Lok Ma Chau Loop and Hoo Hok Wai into a new section of the BPR (approximately 5.6km);

(ii) To erect a new PBF with the sensor alarm system and an SBF respectively along the northern and southern side of the converted road;

(iii) To remove the original PBF and the sensor alarm system thereon along the existing BPR south of the Lok Ma Chau Loop and Hoo Hok Wai; and

(iv) To remove the existing checkpoint at Lok Ma Chau Road.

Section 3 – Ng Tung River to Lin Ma Hang Village

(i) To erect an SBF along the existing BPR except the sections to the north of Pak Fu Shan and northwest of Lin Ma Hang Village (approximately 7.5km);

(ii) To construct new sections of the BPR along the Shenzhen River side to the north of Pak Fu Shan and northwest of Lin Ma Hang Village without necessitating river training (approximately 4.0km);

(iii) To erect a new PBF with the sensor alarm system and an SBF along the northern and southern sides of the new sections of BPR respectively;

(iv) To remove the original PBF and the sensor alarm system thereon along the existing BPR near Pak Fu Shan and Lin Ma Hang Village; and

(v) To remove the existing checkpoints at Sha Ling and Ping Che.

Section 4 – Lin Ma Hang Village to Sha Tau Kok

(i) To erect an SBF from the entrance of the Sha Tau Kok town (i.e. the location of "Gate One") to the Sha Tau Kok Control Point (approximately 0.5km);

(ii) To provide a new checkpoint at "Gate One"; and

(iii) To remove the existing checkpoint at Shek Chung Au.

1.4.2 Typical cross sections of the proposed PBF, SBF, BPR and checkpoint are presented in **Appendix B**.

1.4.3 Apart from normal boundary patrol operation conducted by the Police, no significant operational or decommissioning activities would be involved in association with the proposed SBF, PBF and BPR.

1.4.4 Security Bureau is the project proponent, Police is the end-user of the boundary fences and the realigned BPR and Architectural Services Department is the works agent responsible for the management, planning, design and implementation of the Project.

1.5 Need for the Project and Consequences of not Proceeding with the Project

1.5.1 While the coverage of the Frontier Closed Area (FCA) will be substantially reduced, it would still be necessary to maintain the integrity and security of the boundary area. The construction of new sections of PBF and SBF is considered to be essential to ensure effective law enforcement to safeguard boundary integrity and security and to prevent and combat illegal immigration and other cross-boundary crimes.

1.5.2 Without the implementation, the above purpose cannot be achieved.

1.6 Consideration of Alternative Alignment

1.6.1 The alignment generally runs along the southern boundary of the reduced FCA, the coverage of which has taken account of the comments received during the consultation exercise conducted in September to November 2006.

1.6.2 For mitigating impacts on important habitats and wildlife in the order of priority of 'Avoidance, Minimizing, Compensation', the alignments are proposed along the existing boundary patrol road avoiding the environmentally sensitive areas as far as possible. Other alternatives are considered not feasible as they could only be established by creating new pathways in the adjacent natural habitats. The impacts would be minimized if the alignments stay along the existing boundary patrol road. In addition, mitigation measures have also been considered to minimize the environmental impacts. For example, special type of footing would be adopted to retain the existing trees if necessary.

1.6.3 For Section 2, it was originally proposed in the FCA review to retain all the land north of the existing BPR in the FCA. This covered about 100 hectares in the Lok Ma Chau Loop and about 300 hectares in the adjacent Hoo Hok Wai. During the consultation, the local community suggested that these areas should be excluded from the FCA. After consideration, Government decided to accept the suggestion and reduce the FCA coverage accordingly. To this end, the existing maintenance road of the Drainage Services Department to the north of the Lok Ma Chau Loop and Hoo Hok Wai will be used as the boundary patrol road, with a primary boundary fence to be constructed along the northern edge of the road and a secondary boundary fence along the southern edge of the road. To mitigate the environmental impacts, the proposed works would avoid the environmentally sensitive areas, e.g. fish ponds and marshes along Hoo Hok Wai, as far as possible.

1.6.4 The alignments to the north of Pak Fu Shan and northwest of Lin Ma Hang Village are

originally proposed along the existing boundary patrol road in Section 3. The relevant Rural Committee requested that two patches of land northwest of Lin Ma Hang and north of Pak Fu Shan be excised from the FCA to release their development potential. After consideration, the alignment is amended to run along the Shenzhen River bank to the north of the two areas in accordance with the views of the local community.

1.6.5 The latest alignment is shown in **Figure 1.1**. The alignment along the existing boundary patrol road and new sections of boundary patrol road is denoted in blue and red in **Figure 1.1** respectively.

1.7 Alternative / Preferred Construction Methods and Sequence of Works

1.7.1 The major construction works of the Project is provision of the secondary and primary boundary fences. The fences mainly comprise the reinforced concrete footing and the steel fence. For the reinforced concrete footing, precast footing had been considered to minimize the concreting works on site. However, it was found that the precast option is not feasible due to the limited road width which hinders the transportation of the precast units. In addition, the longitudinal and horizontal alignment of the boundary patrol road varies significantly. Thus, standard precast concrete units cannot be applied and cast-in-situ option is necessary to match the site condition.

1.7.2 Apart from the boundary fences, the Project also involves provision of two checkpoints. Since the size of the proposed Pak Hok Chau Checkpoint is comparatively small, it is proposed to adopt prefabricated house instead of traditional reinforced concrete structure to minimize the environmental impact.

1.8 Interface with Concurrent Projects

1.8.1 There are three potential interface projects identified.

Liantang/Heung Yuen Wai Boundary Control Point in Section 3

1.8.2 A new Boundary Control Point (BCP) is proposed to be constructed at Heung Yuen Wai. Civil Engineering and Development Department, the works agent of the new BCP, has been informed that the construction of the BPR, the PBF and the SBF in Section 3 not affected by the new BCP will be completed by end 2012.

Advance Works for River Training in Section 3

1.8.3 In association with the proposed BCP at Heung Yuen Wai, Drainage Service Department (DSD) will carry out advance works for the river training from Ping Yuen River to Pak Fu Shan. As advised by DSD, the works will commence in mid-2012 and its exact extent could only be confirmed after a study at the end of 2009. Since the advance works would involve realignment of certain sections of the Shenzhen River, the existing BPR and the existing PBF, it would result in abortive works if the SBF were to be provided along the originally proposed alignment in the affected section. ArchSD is liaising with DSD on the inclusion of the construction of the affected section of the SBF under DSD's advance works. The proposed works from Ping Yuen River to Pak Fu Shan would hence be excised from this Project. Given that DSD's advance works are still at a preliminary stage and the

realignment of the affected sections of the Shenzhen River, the existing BPR and the existing PBF is subject to DSD's further study, this EIA Report is done based on the originally proposed alignment of the BPR, PBF and SBF in Section 3 set out in **Figure 1.1**.

Proposed New Wave Wall / Modification to Existing Wave Wall in Section 2

1.8.4 The works in Section 2 will have interface with DSD's proposed modification of the existing wave wall and construction of a new wave wall alongside the Shenzhen River in Section 2. Liaison with DSD is on-going to resolve the interface issue and the entrustment approach may be adopted. This EIA Report has already taken into account the potential entrustment of works of the existing wave wall from DSD.

1.9 Objectives of the EIA Study

1.9.1 The objectives of the EIA study are as follows:

(i) to describe the Project and associated works together with the requirements for carrying out the Project;

(ii) to identify and describe elements of community and environment likely to be affected by the Project and/or likely to cause adverse impacts to the Project, including natural and man-made environment, and the associated environmental constraints;

(iii) to provide information on the consideration of alternatives to avoid and minimize potential environmental impacts to environmentally sensitive areas and other sensitive uses; to compare the environmental benefits and dis-benefits of each of different options; to provide reasons for selecting the preferred option(s) and to describe the part environmental factors played in the selection of preferred option(s);

(iv) to identify and quantify all environmental sensitive receivers, emission sources and determine the significance of impacts on sensitive receivers and potential affected uses;

(v) to identify and quantify any potential losses or damage to flora, fauna and natural habitats;

(vi) to identify and quantify any potential landscape and visual impacts and to propose measures to mitigate these impacts;

(vii) to identify and quantify any potential archaeological and cultural heritage and propose measures to mitigate these impacts;

(viii) to propose provision of mitigation measures so as to minimize pollution, environmental disturbance and nuisance during construction and operation of Project;

(ix) to investigate the feasibility, practicability, effectiveness and implications of the proposed mitigation measures;

(x) to identify, within the study area, any individual project(s) that fall under Schedule 2 and/or Schedule 3 of the EIAO; to ascertain whether the findings of this EIA study

have adequately addressed the environmental impacts of those projects; and where necessary, to identify the outstanding issues that need to be addressed in any further detailed EIA study;

(xi) to identify, predict and evaluate the residual environmental impacts (i.e. after practicable mitigation) and the cumulative effects expected to arise during the construction and operation phases of the Project in relation to sensitive receivers and potential affected uses;

(xii) to identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operation of the Project which are necessary to mitigate these environmental impacts and cumulative effects and reduce them to acceptable level;

(xiii) to investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures and to identify constraints associated with the mitigation measures recommended in the EIA study, as well as the provision of any necessary modification; and

(xiv) to design and specify environmental monitoring and audit requirements to ensure the effective implementation of the recommended environmental protection and pollution control measures.

1.10 The Assessment Area

1.10.1 The works are mainly located along the existing BPR from west of Pak Hok Chau to east of Sha Tau Kok, the Shenzhen River side at Lok Ma Chau Loop, Hoo Hok Wai, north of Pak Fu Shan and northwest of Lin Ma Hang Village within the FCA. Access to these areas is controlled by Closed Area Permits issued under Section 37(2) of the Public Order Ordinance. The location of the fence alignment, the new sections of BPR, the new checkpoint, the four existing checkpoints to be removed and the replacement checkpoint to be constructed are shown in **Figure 1.1**.

1.11 Programme

1.11.1 The Project is being planned and designed by the Consultant appointed by ArchSD. The works will be implemented by the Contractors appointed by ArchSD and the first Construction Contract is expected to be awarded in late 2009. The construction works are expected to commence in late 2009 for completion in late 2012 subject to the potential adjustment due to the project of Liantang/Heung Yuen Wai Boundary Control point and its advance river training works as described in Sections 1.8.2, 1.8.3 and 1.8.4. The tentative construction programme is shown in **Appendix A**.

1.12 Structure of the EIA Report

1.12.1 The EIA has been prepared to contain all the findings of the Study as follows:

- Section 2 presents the Air Quality Impact Assessment;

- Section 3 presents the Noise Impact Assessment;
- Section 4 presents the Water Quality Impact Assessment;
- Section 5 presents the Waste Management Implications;
- Section 6 presents the Ecological Impact Assessment;
- Section 7 presents the Landscape and Visual Impact Assessment;
- Section 8 presents the Impact on Cultural Heritage;
- Section 9 provides a summary of the Environmental Outcomes;
- Section 10 presents the Environmental Monitoring and Audit (EM&A) Requirements;
- Section 11 presents an Implementation Schedule; and
- Section 12 presents a summary of the Conclusions of the EIA.

2 AIR QUALITY

2.1 Introduction

2.1.1 This section describes the potential air quality impacts associated with the construction and operation of the proposed secondary boundary fences, new sections of primary and secondary boundary fences and boundary patrol roads as discussed in Section 1.4. The major air emission will be the dust generation from the construction of the boundary fences and patrol roads. During the operation phase, the patrol police cars on the new boundary patrol roads will be subject to the vehicular emission.

2.1.2 Representative Air Sensitive Receivers (ASRs) within 500m of the study area have been identified and extended to include off-site air quality impact along the boundary patrol roads. Suitable mitigation measures, where necessary, are recommended to protect the ASRs and to ensure that the legislative criteria are complied with. The study area for the air quality impact assessment is shown in **Figure 2-1**.

2.2 Legislation, Standards, Guidelines and Criteria

2.2.1 Legislation, Standards, Guidelines and Criteria relevant to the consideration of air quality impacts under this study include the following:

- Hong Kong Air Pollution Control Ordinance;
- Air Pollution Control (Construction Dust) Regulation; and
- Environmental Impact Assessment Ordinance and Technical Memorandum on Environmental Impact Assessment Process.

Hong Kong Air Pollution Control Ordinance

2.2.2 Hong Kong's air quality is regulated through the Air Pollution Control Ordinance (Cap. 311) ("APCO"). The APCO specifies Air Quality Objectives ("AQOs"), which are the statutory limits for a number of pollutants and the maximum allowable number of times that these may be exceeded over specified periods – these pollutants are defined as Criteria Pollutants ("CP"). The Air Quality Objectives (AQOs) that have been defined for these pollutants (CP) are given in the following table.

Table 2-1 Hong Kong Air Quality Objectives (μg/m^3)[(i)]

Pollutant	1 Hour (ii)	8 Hours (iii)	24 Hours (iii)	3 Months (iv)	1 Year (iv)
Sulphur Dioxide	800	N.A.	350	N.A.	80
Total Suspended Particulates	500[(vii)]	N.A.	260	N.A.	80
Respirable Suspended Particulates [(v)]	N.A.	N.A.	180	N.A.	55
Carbon Monoxide	30,000	10,000	N.A.	N.A.	N.A.
Nitrogen Dioxide	300	N.A.	150	N.A.	80
Photochemical Oxidants (as ozone) [(vi)]	240	N.A.	N.A.	N.A.	N.A.
Lead	N.A.	N.A.	N.A.	1.5	N.A.

Notes:
(i) Measured at 298K(25 ^{o}C) and 101.325 kPa (one atmosphere).
(ii) Not to be exceeded more than three times per year.
(iii) Not to be exceeded more than once per year.
(iv) Yearly and three monthly figures calculated as arithmetic means.
(v) Respirable suspended particulates means suspended particles in air with nominal aerodynamic diameter of 10 micrometres and smaller.
(vi) Photochemical oxidants are determined by measurement of ozone only.
(vii) This is not an AQO but a criterion for construction dust impact assessment under Annex 4 of the Technical Memorandum on Environmental Impact Assessment Process.

Air Pollution Control (Construction Dust) Regulation

2.2.3 Air Pollution Control (Construction Dust) Regulation stipulates the construction dust control requirements for both notifiable (e.g. site formation) and regulatory (e.g. road opening) works to be carried out by the Contractor. The requirements for various notifiable and regulatory works are given in Parts 1 and 2 of the Regulation respectively. Part 3 of the Regulation stipulates the general control requirements (e.g. site boundary and entrance) for construction dust. The control requirements for individual activities (e.g. stockpiling of dusty material) are given in Part 4 of the Regulation.

Environmental Impact Assessment Ordinance and Technical Memorandum on Environmental Impact Assessment Process

2.2.4 The criteria for evaluating air quality impacts are stated in Annexes 4 and 12 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). The EIAO-TM states that the hourly Total Suspended Particulates (TSP) level should not exceed 500μg/m^3 (measured at 25^{o}C and one atmosphere) for construction dust impact assessment

2.3 Baseline Conditions and Air Sensitive Receivers

Baseline Conditions

2.3.1 The project mainly comprises the construction of a secondary boundary fence along the southern edge of the existing boundary patrol road from west (Pak Hok Chau) to east (Sha Tau Kok).

2.3.2 The nearest EPD air quality monitoring station (AQMS) is located at Yuen Long and Tap Mun. Taking into account data for 2003 – 2007, the annual average air quality data collected at the monitoring station is presented in **Table 2-2**.

Table 2-2 Annual Average Background Air Quality (2003 – 2007)

Air Pollutants	Annual Average Background Concentration at Yuen Long Monitoring Station (ug/m^3)	Annual Average Background Concentration at Tap Mun Monitoring Station (ug/m^3)	HKAQO (ug/m^3)
Total Suspended Particulates (TSP)	103	-	80
Respirable Suspended Particulates (RSP)	64	50	55
Nitrogen Dioxide (NO_2)	60	14	80
Sulphur Dioxide (SO_2)	26	15	80

Representative Air Sensitive Receivers

2.3.3 The selected ASRs, represent the closest distance from the proposed project site boundary or patrol road alignment, have been identified within the study area of 500m of the proposed alignment of the secondary boundary fence in accordance with the criteria as set out in Annex 12 of the EIAO-TM by means of site inspections and reviews of land use plans.

2.3.4 Identified ASRs with horizontal distances from the proposed alignment of the boundary fences are summarized in **Table 2-3**. The locations of the ASRs for each section (Sections 1 – 4) are shown in **Figures 2-2** to **2-5**.

Table 2-3 Representative Air Sensitive Receivers

ASR ID	Description	Type of Use	Separation Distance between the ASRs and the Project Site Boundary
Section 1			
ASR 1	Mai Po Village House	Residential	101.4
ASR 2	Mai Po Village House	Residential	63.6
ASR 3	Mai Po San Tsuen	Residential	346.7
ASR 4	Lin Barn Tsuen	Residential	441.1
Section 2			
ASR 5	Ha Wan Tsuen	Residential	13
ASR 6	Lok Ma Chau San Tsuen	Residential	21.7
ASR 7	Lok Ma Chau Village House	Residential	77.9
ASR 8	Ping Hang Village House	Residential	23.1
ASR 9	Ma Tso Lung Village House	Residential	15.6
ASR 10	Liu Pok	Residential	117.9
ASR 11	Temple	Worship	188.5
ASR 12	Tak Yuet Lau, House No. 4	Residential	18.7
Section 3			
ASR 13	Lo Wu, House No. 3	Residential	100.4

ASR ID	Description	Type of Use	Separation Distance between the ASRs and the Project Site Boundary
ASR 14	Lo Wu Public School, House No. 39	Educational	58.5
ASR 15	Temple	Worship	111.8
ASR 16	Muk Wu, House No. 125	Residential	155
ASR 17	Sam Wo Public School	Educational	341.8
ASR 18	Muk Wu Chuen Yiu, House No. 11	Residential	75.8
ASR 19	Ta Kwu Ling, House No. 10	Residential	56.3
ASR 20	Kiu Liu Village	Residential	67.7
ASR 21	Chuk Yuen, House No. 19	Residential	110
ASR 22	Tsz Tong	Worship	198.1
ASR 23	Wang Lek Village House	Residential	55.8
ASR 24	Wang Lek Village House	Residential	6.5
ASR 25	Lin Ma Hang, House No. 1A	Residential	199.5
Section 4			
ASR 26	Cannan English & Chinese Kindergarten	Educational	88
ASR 27	Ha Tam Shui Hang, House No. 221	Residential	67
ASR 28	Sha Tau Kok Estate, Block 1	Residential	88.2
ASR 29	Ha Tam Shui Hang, House No. 128	Residential	121
ASR 30	Kong Ha Village	Residential	126.7
ASR 31	Shan Tsui Village	Residential	88.2

2.4 Identification and Evaluation of Air Quality Impact

Construction Phase

2.4.1 The construction and demolition of the boundary fences and patrol road will be divided into four sections, from which the major construction activities include the excavation, footing construction, fence installation, road construction, the demolition of existing boundary fence and the check points at Pak Hok Chau and Sha Tau Kok. There is no consolidated demolition programme, but it is expected the demolition will be commenced after the completion of the construction of secondary boundary fence.

2.4.2 Refer to the tentative construction programme in **Appendix A**, some construction activities will be carried out at the same period of time. However, in real situation, each construction activity will be carried out separately at different road sections.

2.4.3 The soil materials will be mainly generated from the construction activities including site clearance, construction and demolition, excavation and the waste generated from the construction works. The total amount of soil materials generated each day from the project site will be in the range of 88m^3/day to 248m^3/day, which depends on the sections and the construction activities which will be carried out. As such, an average number of trucks hauling on the site will be in the range of 11-30 trucks/day so as to remove the soil materials generated from the construction activities. Given the Border Patrol Road is narrow (~4m to 8m), the number of trucks hauling around the road would be limited and hence the air

quality impact is predicted minimal.

2.4.4 The likely air quality impacts arising from the construction of the secondary boundary fences include dust nuisances and gaseous emissions from Powered Mechanical Equipment (PMEs) and construction vehicles. It is anticipated that fugitive dust would also be generated from construction of concrete footing and fences, material handling and wind erosion from the site.

2.4.5 As the PMEs used for each section will not be operating concurrently as the construction works for the four sections are anticipated to be carried out in phases, fugitive dust impacts and gaseous emissions will be minimal. In addition, fugitive dust impacts from the construction vehicles will be further minimised with the implementation of the appropriate dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation. As such, air quality impacts resulting from the proposed construction works are considered to be insignificant.

Operational Phase

2.4.6 Based on site observation during October 07 to August 08 and the confirmation from the Border District Police Headquarter, the traffic flow along the Border Patrol Road (BPR) observed is less than 50 veh/hr. The main function of BPR is for boundary patrol, the Border District Police (BDP) is the main user of the BPR, the BPR would not be opened to the public except permit holders and there is no plan to revise this policy. Based on such assumption, it is anticipated that the traffic flow of the BPR would not exceed 50 veh/hr in 15 years after its commissioning. Hence, there will be limited gaseous emissions from the cars on the patrol roads, the potential air quality impacts are considered to be insignificant during operation.

2.5 Mitigation Measures

Construction Phase

2.5.1 Construction dust impacts should be controlled within the 1-hour TSP criterion of 500 $\mu g/m^3$ and 24-hour TSP AQO of 260 $\mu g/m^3$. Therefore, effective control measures and good site practices should be implemented to meet the requirements of the *Air Pollution Control (Construction Dust) Regulation* and to minimize construction dust impact.

2.5.2 During construction phase, the Contractor shall make reference, but not limited, to the following measures:

- any excavated dusty materials or stockpile of dusty materials should be covered entirely by impervious sheeting or sprayed with water so as to maintain the entire surface wet, and recovered or backfilled or reinstated within 24 hours of the excavation or unloading;
- the working area of excavation should be sprayed with water immediately before, during and immediately after the operations so as to maintain the entire surface wet;
- dusty materials carried by vehicle leaving a construction site should be covered entirely by clean impervious sheeting;
- the area where vehicle washing takes place and the section of the road between the washing facilities and the exit point should paved with concrete, bituminous materials or

hardcores;

- the portion of road leading only to a construction site that is within 30m of designated vehicle entrance or exit should be kept clear of dusty materials;
- all dusty materials should be sprayed with water prior to any loading, unloading or transfer operation;
- vehicle speed should be limited to 10kph except on completed access roads; and
- every vehicle should be washed to remove any dusty materials from its body and wheels before leaving the construction sites.

Operational Phase

2.5.3 As the gaseous emission from the operation of the secondary boundary fences and new boundary patrol roads are considered to be insignificant, air quality mitigation measures during the operational phase are not required.

2.6 Potential Concurrent Projects

2.6.1 As mentioned in Section 1.8, there are three potential concurrent projects within the assessment area. The proposed works at Section 3 will be completed at the end of 2012, prior to the construction of the new Boundary Control Point (BCP) at Heung Yuen Wai, and hence no interface will be occurred.

2.6.2 The advance works from River Trainings in Section 3 and proposed new wave wall or modification to existing wave wall in Section 2 will be carried out concurrently with the project work. However, it is recommended that the proposed works from the two projects would be exercised from this project to avoid any duplications. At such, an entrustment approach for the concurrent projects would be adopted, and the cumulative impacts from the concurrent project are considered to be minimal.

2.7 Environmental Monitoring and Audit

2.7.1 Full compliance with the air quality criteria will be achieved at all ASRs with the implementation of dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation. Dust monitoring is considered not necessary during the construction phase but weekly site audits are required to ensure that the dust control measures are properly implemented. No operational monitoring is considered to be necessary for this project.

2.8 Conclusion

2.8.1 The construction works for the four sections will be carried out in phases, the potential air quality impacts will not be anticipated. Air quality impacts resulting from the construction works of the Project are considered to be insignificant to air sensitive receivers.

2.8.2 Gaseous emissions from the operation of the secondary boundary fence and the new boundary patrol roads are considered to be insignificant, no air quality impact will be anticipated during the operational phase.

3 NOISE IMPACT

3.1 Introduction

3.1.1 The noise impact assessment evaluated the impact quantitatively using standard acoustic principles and making reference to the approach and methodology documented in Annexes 5 and 13 of Environmental Impact Assessment Ordinance – Technical Memorandum and EIAO Guidance Note No. 9/2004 – Preparation of Construction Noise Impact Assessment under EIAO for construction phase and EIAO Guidance Note No. 12/2005 – Road Traffic Noise Impact Assessment under the EIAO for operational phase.

3.2 Relevant Legislations, Standards & Guidelines

General Construction Activities during Non-Restricted Hours

3.2.1 Noise impacts arising from general construction activities other than percussive piling during the daytime period (07:00-19:00 hours of any day not being a Sunday or general holiday) shall be assessed against the noise standards tabulated in **Table 3-1** below.

Table 3-1 Noise Standards for Daytime Construction Activities

Noise Sensitive Uses	0700 to 1900 hours on any day not being a Sunday or general holiday, Leq (30 min), dB(A)
All domestic premises including temporary housing accommodation	75
Hotels and Hostels	
Educational institutions including kindergarten, nurseries and all others where unaided voice communication is required	70 65 during examination

Source: EIAO-TM, Annex 5, Table 1B - Noise Standards for Daytime Construction Activities.
Note:

- The above standards apply to uses, which rely on opened windows for ventilation.
- The above standards shall be viewed as the maximum permissible noise levels assessed at 1m from the external facades.

General Construction Activities during Restricted Hours

3.2.2 Noise impacts arising from general construction activities (excluding percussive piling) conducted during the restricted hours (19:00-07:00 hours on any day and anytime on Sunday or general holiday) and percussive piling during anytime are governed by the Noise Control Ordinance (NCO).

3.2.3 For carrying out general construction activities involving the use of Powered Mechanical Equipment (PME) within restricted hours, a Construction Noise Permit (CNP) is required from the Authority under the NCO. The noise criteria and the assessment procedures for issuing a CNP are specified in Technical Memorandum on Noise from Construction Work Other Than Percussive Piling (GW-TM) under the NCO.

3.2.4 The use of Specified PME (SPME) and/or the carrying out of Prescribed Construction Work (PCW) within a Designated Area (DA) under the NCO during the restricted hours are also

prohibited without a CNP. The relevant technical details can be referred to Technical Memorandum on Noise from Construction Work in Designated Areas (DA-TM) under NCO.

3.2.5 Designated areas, in which the control of SPME and PCW shall apply, are established through the Noise Control (Construction Work Designated Areas) Notice made under Section 8A(1) of the NCO.

3.2.6 All sections of the construction works except the Sha Tau Kok section have been checked to fall outside the Designated Areas defined under the NCO (with effective from 1 January 2009). Moreover, no percussive pilling will be involved in this Project.

3.2.7 As such, the application for CNP for any general construction activities involving the use of any PME shall refer to the GW-TM and DA-TM. However, the Contractor has the responsibility to check the latest status and coverage of the Designated Areas at the time of construction of the project.

3.2.8 Regardless of the description or assessment made in this chapter, the assessment of a filed application for a CNP by the Authority will be guided by the relevant Technical Memoranda. The Authority will consider all the factors affecting their decision taking contemporary situations/ conditions into account. Nothing in this Report shall pre-empt the Authority in making their decisions, and there is no guarantee that a CNP will be issued. If a CNP is to be issued, the Authority may include any conditions they consider appropriate and such conditions are to be followed while the works covered by the CNP are being carried out. Failing to do so may lead to the cancellation of the permit and prosecution action under the NCO.

Road Traffic Noise

3.2.9 Relevant criteria for road traffic noise levels at the affected sensitive façade are given in **Table 3-2** below.

Table 3-2 EIAO-TM Road Traffic Noise Criteria

Noise Sensitive Uses	Road Traffic Noise, Peak Hour Traffic, $L_{10\ (1\text{-}hr)}$ dB(A)
All domestic premises including temporary housing accommodation	70
Hotel and Hostels	
Educational institutions including kindergarten, nurseries and all others where unaided voice communication is required	65

Source: EIAO-TM, Annex 5, Table 1 - Noise Standards for Planning Purposes
Note:

- The above standards apply to uses, which rely on opened windows for ventilation.
- The above standards shall be viewed as the maximum permissible noise levels assessed at 1m from the external facades.

3.3 Study Area and Construction Programme

3.3.1 As stated in Clause 3.4.2.2(i) of the EIA Study Brief, the Study Area shall include all areas within 300m (the 300m envelope) from the Project Boundary. Although the study area can reach 300m from the work sites, the first-tier NSRs are usually selected as representative NSRs in the noise impact assessment. Other NSRs further away from these first-tier NSRs are expected to be less affected by comparison. The assessment area of noise impact assessment is shown in **Figure 3-1**.

3.3.2 A tentative construction programme is shown in **Appendix A**. The construction programme shows that the construction activities including the excavation, footing construction, fence installation, road construction and the check point superstructure at Sha Tau Kok of all sections are in phases. However, in real situation, each construction activities will be carried out in segment by segment, the length of each segment is estimated to be 50m, which is a normal practice of construction.

3.3.3 Given that the narrow and long construction works area of Section 1 to Section 3 (~4m to 8m in width), the construction activities would be constructed sequentially along each Section. The construction works would start from the west end of each Section and cumulative impact from the concurrent works could be avoided as the length of each Section is more than 2km. Hence, the construction noise impact would be dominated by the construction activity of any one Section for each NSR.

3.3.4 Moreover, there is currently no firmed demolition programme of existing boundary fence and the check points at Lok Ma Chau, Sha Ling, Ping Che and Shek Chung Au. It is expected the demolition activities will be commenced after the secondary boundary fence is constructed. Hence, the noise impact of construction and demolition activities could be assessed separately.

3.4 Noise Sensitive Uses

3.4.1 Representative Noise Sensitive Receivers (NSRs) have been identified in accordance with Annex 13 of the EIAO-TM. The NSRs include existing, planned/ committed noise sensitive developments and relevant uses earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by Lands Department, where applicable.

3.4.2 There are numerous villages situated along the proposed alignment which are identified as NSRs. For the purpose of this construction noise assessment, representative NSRs of each village close to the site have been selected within the Study Area for prediction of the levels of construction noise impact. Descriptions of selected representative existing NSRs are tabulated in **Table 3-3** to **Table 3-6** below and the respective locations are shown in **Figure 3-2** to **Figure 3-8**. The shortest distance between the noise source, construction of boundary fence/ road construction, demolition of existing boundary wall and check points, which are the footing foundation of the fence and the receivers are measured and listed in **Table 3-3** to **Table 3-6** below. Photos of existing noise sensitive receivers are shown in **Figure 3-9** and **Figure 3-10**.

Table 3-3 Locations of the Existing Representative NSRs for Construction of Boundary Fence/ Road Construction/ Check Point Superstructure

NSR ID	Description	Usage	Shortest Distance (m)
Section 1			
Mai Po			
VH01	Village House	Residential	44
VH02	Village House	Residential	59
VH03	Village House	Residential	147
Section 2			
Ha Wan Tsuen			
HAT01	Village House	Residential	206
Lok Ma Chau San Tsuen			
LMC01	Village House	Residential	>300
LMC02	Village House	Residential	>300
LMC03	Village House	Residential	>300
Ping Hang			
PH01	Village House	Residential	>300
Ma Tso Lung			
MTL01	Village House	Residential	>300
Liu Pok			
LP01	House No. 1B, Liu Pok	Residential	>300
Tak Yuet Lau			
TYL01	House No. 4, Tak Yuet Lau	Residential	204
Section 3			
Lo Wu			
LW01	House No. 3, Lo Wu	Residential	103
LW02	House No. 39, Lo Wu	Residential	60
Muk Wu			
MW01	House No. 125, Muk Wu	Residential	130
MW02	House No. 11, Muk Wu Chuen Yiu	Residential	78
Ta Kwu Ling			
TKL01	House No. 10, Tak Kwu Ling	Residential	43
Kaw Liu Village			
KL01	Village House	Residential	18
Chuk Yuen			
CY01	House No. 19, Chuk Yuen	Residential	106
Wang Lek			
WL01	Village House	Residential	101
WL02	Village House	Residential	85
WL03	House No. 1A, Lin Ma Hang	Residential	155
Section 4			
Sha Tau Kok			
STK01	House No. 221, Ha Tam Shui Hang	Residential	42 (Boundary Fence) 132 (Checkpoint superstructure)
STK02	House No. 128, Ha Tam Shui	Residential	100 (Boundary Fence)

NSR ID	Description	Usage	Shortest Distance (m)
	Hang		235 (Checkpoint superstructure)
STK03	Block 1, Sha Tau Kok Estate	Residential	16 (Boundary Fence) 73 (Checkpoint superstructure)
STK04	Block 28, Sha Tau Kok Estate	Residential	91 (Boundary Fence) 169 (Checkpoint superstructure)

Table 3-4 Locations of the Existing Representative NSRs for Demolition of Exsiting Boundary Fence

NSR ID	Description	Usage	Shortest Distance (m)
Section 2 – Demolition of Existing Boundary Fence			
HAT01	Village House	Residential	9
LMC01	Village House	Residential	21
LMC02	Village House	Residential	74
LMC03	Village House No. 201	Residential	55
PH01	Village House	Residential	7
MTL01	Village House	Residential	15
LP01	House No. 1B, Liu Pok	Residential	118
TYL01	House No. 4, Tak Yuet Lau	Residential	4
Section 3 – Demolition of Existing Boundary Fence			
WL01	Village House	Residential	48
WL02	Village House	Residential	6

Table 3-5 Location of Existing Representative NSRs for Demolition of Check Points

NSR ID	Description	Usage	Shortest Distance (m)
Demolition of Check Points			
Pak Hok Chau			
VH01	Village House	Residential	75
Lok Ma Chau			
LMC03	Village House No. 201	Residential	53
Sha Ling			
SL01	Village House No. 190	Residential	149
Ping Che			
PC01	House No. 5A, Tong Fong	Residential	59
Shek Chung Au			
STK05	Village House	Residential	110

3.4.3 The potential planned/ committed noise sensitive uses within the assessment area have been checked with Planning Department and Lands Department. Relevant correspondances have been attached in **Appendix C1**. Planning Department stated that there is neither rezoning application approved nor any planned/ committed development including residential/ school/ hotel within the assessment area. However, there is a planning application no. A/YL-ST/313 for temporary open storage of new left-hand-drive vehicles prior to sale was approved by the Rural and New Town Planning Committee on 21/7/2006 up to 21/7/2009. Also, the Town Planning Board deferred a review application no. A/DPA/YL-MP/31 for a residential development on 17/5/1996, hence these two developments are not identified as noise sensitive uses. Lands Department stated that they are not in position to disclosure these kinds of

relevant information to third party.

3.4.4 Nevertheless, according to the Outline Zoning Plans along the works area from Mai Po to Sha Tau Kok, there is a Village Type Development ("V" zone) zoned near Lok Ma Chau. As the construction of New Territories Exempted House is always permitted, an assessment point located at the V zone boundary is selected as a planned NSR for worst-case scenario assessment. Description of the planned NSR and location is shown in **Table 3-6** below and **Figure 3.3** respectively.

Table 3-6 Location of Planned NSR for Demolition of Existing Boundary Fence

NSR ID	Description	Usage	Shortest Distance (m)
Section 2 – Demolition of Existing Boundary Fence			
V01	Planned Village House	Planned Residential	11

3.5 Assessment Approach & Methodology

3.5.1 Assessment approach to the noise impact is in line with the Guidance Note titled "Preparation of Construction Noise Impact Assessment under the Environmental Impact Assessment Ordinance" (GN 9/2004).

3.5.2 In addition, the assessment of construction noise impact is based on standard acoustic principles, and the guidelines given in GW-TM issued under the NCO where appropriate. Where no sound power level (SWL) can be found in the relevant TM, reference has been made to BS 5228 Part I or noise emission levels measured for PME used in previous projects in Hong Kong. The approach used is as follows: -

1. Assume a typical construction schedule and project-specific equipment inventory for each work stage in **Table 3-8** to **Table 3-9** together with the number and type of PME that are considered likely for completing the works during the non-restricted hours;
2. Obtain from the GW-TM, Sound Power Levels (SWL) for each PME assumed in the equipment inventory;
3. Assume that likely noise source to be located near the boundary fence;
4. For each of the representative NSRs in **Table 3-3** to **Table 3-6**, with the use of the shortest distance to the noise source as worst-case scenario, calculate the maximum unmitigated Predicted Noise Level (PNL) amongst all construction work sites, corrected for facade reflection to obtain the Corrected Noise Level (CNL);
5. If necessary, replace some of the PME with silenced equipment and/ or consider to use temporary noise barriers to calculate the mitigated noise impact;
6. Consider any potential impact from the concurrent impact as mentioned in Section 1.8; and
7. Compare the mitigated CNL with the noise standards given in **Table 3-1** to determine acceptability and the need for further mitigation/ EM&A.

3.5.3 The calculation methodology is estimated with the following standard formula (1):

$$SPL = SWL - DC + FC \quad (1)$$

where
Sound Pressure Levels, SPL in dB(A)
Sound Power Levels, SWL in dB(A)

Distance Attenuation, DC in dB(A) = 20*Log(D)+8 (where D is the distance between NSRs and noise source in meters)
Façade Correction, FC in dB(A) = 3dB(A)

3.6 Analysis of Construction Activities and Sources of Noise Impact

3.6.1 As mentioned in the Section 1.4, the entire boundary fence is divided into four sections namely Section 1 to Section 4 as shown in **Figure 1.1**.

3.6.2 It is expected that works for the construction/ demolition of the boundary fence can roughly be divided into several work stages as given in **Table 3-7**. There is no confirmed programme for the demolition of existing boundary fence and the check points as yet, however, it is expected that this demolition activity would be commenced after the completion of construction of secondary boundary fence and hence no cumulative impact is expected.

3.6.3 It is also expected that the construction/ demolition activities will be conducted during non-restricted hours, construction/ demolition works during restricted hours will not be anticipated.

3.6.4 To facilitate an estimate of the likely level of construction noise impact during non-restricted hours, an inventory of project-specific PME needed has been assumed with the typical construction works are shown in **Table 3-8** to **Table 3-9** below. The number of PME used for the construction/ demolition activities is also included. The checkpoint replacement in Section 1 would be in pre-fabrication method which does not involve any construction activities and no PME would be involved.

3.6.5 As the Boundary Patrol Road is narrow and this Road is the main route for patrolling and emergency, the frequency and the size of PME employed on site would be limited. The Contractor would prefer the use of smaller machines, for example, the use of mini-robot mounted breakers and excavators instead of the regular PME listed in the GW-TM to avoid obstruction the patrolling and emergency access. Also, the duration of the use of lorry for loading and uploading of construction material and/or excavated material should be limited such that the progress of construction works would not be hindered.

3.6.6 Moreover, in general construction situtation, the loading and uploading activities would not be carried out at the footing location/ checkpoints location to hinder the general excavation or footing construction activities. As such, the distance from the lorry to noise sensitive uses would be longer, a 20m further away from the footing location is assumed for calculation. The construction noise impact assessment would then be assessed for general construction activities (excavation, road construction, footing construction and checkpoint superstructure) and loading and uploading activities seperately.

3.6.7 Each construction/ demolition activity would be carried out in sequence, for example, during the excavation activities and the demolition of existing boundary fence, the PME such as mini-robot mounted breakers and excavators will not be operated concurrently as the works are usually carried out using the same equipment in sequence. During the footing construction of the boundary fence, excavation and the concreting works will not be operated concurrently as the works are also carried out in sequence. **Table 3-8** below shows the grouping of each construction sequence.

3.6.8 The number and the percentage of time used of PMEs assumed for worst-case scenario for each construction/ demolition activities is shown in **Appendix C2**. The Project Proponent

confirmed that the plant inventories adopted in this assessment are technically feasible for undertaking the construction/ demolition works.

3.6.9 According to Section 1.8 of this EIA Report, there is one potential concurrent project, the Proposed New Wave Wall/ Modification of Existing Wave Wall in Section 2. Based on the latest information obtained, the construction works would be in entrustment approach and the construction programme and the PME list in Section 2 has been incoporated (excavation and footing construction work for both wave wall and the boundary patrol road and boundary fence).

Table 3-7 Tentative Construction/ Demolition Activities for All Sections

Section	Activity ID	Construction/ Demolition Activities
Section 1	1A	Excavation
	1B	Footing Construction
	1C	Fence Installation
Section 2	2A	Excavation
	2B	Footing Construction
	2C	Road Construction
	2D	Fence Installation
Section 3	3A	Excavation
	3B	Footing Construction
	3C	Road Construction
	3D	Fence Installation
Section 4	4A	Excavation
	4B	Footing Construction
	4C	Fence Installation
	4D	Check Point Superstructure
Section 1 – Section 4	-	Loading and Uploading activities with the use of Lorry
Section 2 and Section 3	-	Demolition of Existing Boundary Fence
Section 1 – Section 4	-	Check Points Demolition

Table 3-8 Tentative Construction Plant List for Construction of Boundary Fence/ Road Construction/ Check Point Superstructure

Construction Activities/ PME		TM Ref.	SWL dB(A)/ Unit	Quantity	Percentage on time
Excavation					
	Group 1				
	Breaker, mini- robot mounted	[1]	115	1	100%
				Total SWL, dB(A)	**115**
	Group 2				
	Excavator, mini robot mounted	[1]	94	1	100%
	Generator, Standard	CNP 101	108	1	100%
	Water Pump (electric)	CNP 281	88	1	100%
				Total SWL, dB(A)	**108**
	Group 3				
	Lorry	CNP 141	112	1	50%
				Total SWL, dB(A)	**109**

Construction Activities/ PME		TM Ref.	SWL dB(A)/ Unit	Quantity	Percentage on time
				Maximum SWL, dB(A)	**115**
Footing Construction					
	Group 1				
	Lorry	CNP 141	112	1	50%
				Total SWL, dB(A)	**109**
	Group 2				
	Generator, Standard	CNP 101	108	1	100%
	Bar bender and cutter (electric)	CNP 021	90	1	100%
	Water pump (electric)	CNP 281	88	1	100%
				Total SWL, dB(A)	**108**
	Group 3				
	Compactor, vibratory	CNP 050	105	1	100%
	Concrete lorry mixer	CNP 044	109	1	100%
				Total SWL, dB(A)	**110**
				Maximum SWL, dB(A)	**110**
Fence Installation					
	Group 1				
	Lorry	CNP 141	112	1	50%
				Total SWL, dB(A)	**109**
	Group2				
	Generator, Standard	CNP 101	108	1	100%
	Drill/grinder, hand-held (electric)	CNP 065	98	1	100%
				Total SWL, dB(A)	**108**
				Maximum SWL, dB(A)	**109**
Road Construction					
	Group 1				
	Lorry	CNP 141	112	1	50%
				Total SWL, dB(A)	**109**
	Group 2				
	Excavator, mini-robot mounted	[1]	94	1	100%
				Total SWL, dB(A)	**94**
	Group 3				
	Road Roller	CNP 185	108	1	100%
				Total SWL, dB(A)	**108**
				Maximum SWL, dB(A)	**109**
Check Point Superstructure					
	Group 1				
	Excavator, mini-robot mounted	[1]	94	1	100%

Construction Activities/ PME		TM Ref.	SWL dB(A)/ Unit	Quantity	Percentage on time
				Total SWL, dB(A)	**94**
	Group 2				
	Lorry	CNP 141	112	1	50%
				Total SWL, dB(A)	**109**
	Group 3				
	Generator, standard	CNP 101	108	1	100%
	Bar bender and cutter (electric)	CNP 021	90	1	100%
				Total SWL, dB(A)	**108**
	Group 4				
	Compactor, vibratory	CNP 050	105	1	100%
	Concrete lorry mixer	CNP 044	109	1	100%
	Concrete pump, stationary/ lorry mounted	CNP 047	109	1	100%
				Total SWL, dB(A)	**113**
				Maximum SWL, dB(A)	**113**

Note:

[1] Details extracted from EPD website:

http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

Table 3-9 Tentative Construction Plant Lists for Demolition of Existing Boundary Fence and Check Points

Demolities Activities/ PME		TM Ref.	SWL dB(A)/ Unit	Quantity	Percentage on time
Demolition of Existing Boundary Fence and Check Points					
	Group 1				
	Generator, standard	CNP 101	108	1	100%
	Drill/ grinder, hand-held (electric)	CNP 065	98	1	100%
				Total SWL, dB(A)	**108**
	Group 2				
	Breaker, mini robot mounted	[1]	115	1	100%
				Total SWL, dB(A)	**115**
	Group 3				
	Excavator, mini robot mounted	[1]	94	1	100%
				Total SWL, dB(A)	**94**
	Group 4				
	Lorry	CNP 141	112	1	50%
				Total SWL, dB(A)	**109**
				Maximum SWL, dB(A)	**115**

Note:

[1] Details extracted from EPD website:

http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

3.6.10 Given the similar construction method for each section and the construction activities would be carried out in sequence, the maximum SWL of each activity is summarised in **Table 3-10** below for carrying construction noise impact assessment for worst-case scenario.

Table 3-10 Maximum SWL of Each Activity for Construction Noise Impact Assessment

Section	Construction/ Demolition Activities	Total SWL, dB(A)
Section 1 – Section 4	Excavation	115
	Footing Construction	110
	Fence Installation	108
Section 2 and Section 3	Road Construction	108
Section 4	Check Point Superstructure	113
Section 1 – Section 4	Loading and Uploading Activities with the use of Lorry	109
Section 2 and Section 3	Demolition of Existing Boundary Fence	115
Section 1 – Section 4	Check Points Demolition	115

3.6.11 The construction noise impacts due to construction activities (excavation, footing construction, road construction and check point superstructure) to the NSRs within 300m assessment area are identified in **Table 3-11**.

Table 3-11 Construction Noise Impacts apart from Demolition of Existing Boundary Fence and Check Point to the NSRs

NSR ID	Description	Construction Activities													
		Section 1			Section 2				Section 3				Section 4			
		1A	1B	1C	2A	2B	2C	2D	3A	3B	3C	3D	4A	4B	4C	4D
VH01	Village House	■	■	■												
VH02	Village House	■	■	■												
VH03	Village House	■	■	■												
HAT01	Village House				■	■	■	■								
LMC01	Village House				■	■	■	■								
LMC02	Village House				■	■	■	■								
LMC03	Village House				■	■	■	■								
V01	Planned Residential				■	■	■	■								
PH01	Village House				■	■	■	■								
MTL01	Village House				■	■	■	■								
LP01	House No. 1B, Liu Pok				■	■	■	■								
TYL01	House No. 4, Tak Yuet Lau				■	■	■	■								
LW01	House No. 3, Lo Wu								■	■	■	■				
LW02	House No. 39, Lo Wu								■	■	■	■				
MW01	House No. 125, Muk Wu								■	■	■	■				
MW02	House No. 11, Muk Wu Chuen Yiu								■	■	■	■				
TKL	House No. 10, Tak Kwu Ling								■	■	■	■				
KL01	Village House								■	■	■	■				
CY01	House No. 19, Chuk Yuen								■	■	■	■				
WL01	Village House								■	■	■	■				
WL02	Village House								■	■	■	■				
WL03	House No. 1A, Lin Ma Hang								■	■	■	■				
STK01	House No. 221, Ha Tam Shui Hang												■	■	■	■
STK02	House No. 128, Ha Tam Shui Hang												■	■	■	■
STK03	Block 1, Sha Tau Kok Estate												■	■	■	■
STK04	Block 28, Sha Tau Kok Estate												■	■	■	■

Note:
As there is no confirmed programme for demolition of existing fence and check points, it is expected that this demolition activity would be commenced after the completion of construction of secondary boundary fence

3.7 Unmitigated Construction Noise Impacts

3.7.1 Based on the staged construction activities and PME inventory, the predicted highest construction noise impacts amongst all construction stages for the unmitigated scenario have been summarised in **Table 3-12** to **Table 3-14** below together with calculation summary sheet shown in **Appendix C2**.

Table 3-12 Unmitigated Noise Impact due to the Construction of Boundary Fence/ Road Construction/ Check Point Superstructure

NSR ID	Usage	Unmitigated Noise Level, dB(A)	Noise Criteria, dB(A)	Mitigation Measures Required?
Section 1				
VH01	Residential	**77**	75	Yes
VH02	Residential	75	75	No
VH03	Residential	67	75	No
Section 2				
HAT01	Residential	64	75	No
TYL01	Residential	64	75	No
Section 3				
LW01	Residential	70	75	No
LW02	Residential	74	75	No
MW01	Residential	68	75	No
MW02	Residential	72	75	No
TKL01	Residential	**77**	75	Yes
KL01	Residential	**85**	75	Yes
CY01	Residential	69	75	No
WL01	Residential	70	75	No
WL02	Residential	71	75	No
WL03	Residential	66	75	No
Section 4				
STK01	Residential	**78**	75	Yes
STK02	Residential	70	75	No
STK03	Residential	**86**	75	Yes
STK04	Residential	71	75	No

Note: **Bold** figure denotes exceedance of relevant noise criteria

Table 3-13 Unmitigated Noise Impact due to the Demolition of Existing Boundary Fence

NSR ID	Usage	Unmitigated Noise Level, dB(A)	Noise Criteria, dB(A)	Mitigation Measures required?
Section 2 – Demolition of Existing Boundary Fence				
HAT01	Residential	**91**	75	Yes
LMC01	Residential	**84**	75	Yes
LMC02	Residential	73	75	No
LMC03	Residential	75	75	No
V01	Planned Residential	**89**	75	Yes
PH01	Residential	**93**	75	Yes

NSR ID	Usage	Unmitigated Noise Level, dB(A)	Noise Criteria, dB(A)	Mitigation Measures required?
MTL01	Residential	**86**	75	Yes
LP01	Residential	69	75	No
TYL01	Residential	**98**	75	Yes
Section 3 – Demolition of Existing Boundary Fence				
WL01	Residential	**76**	75	Yes
WL02	Residential	**94**	75	Yes

Note: **Bold** figure denotes exceedance of relevant noise criteria

Table 3-14 Unmitigated Noise Impact due to the Demolition of Check Points

NSR ID	Usage	Unmitigated Noise Level, dB(A)	Noise Criteria, dB(A)	Mitigation Measures required?
Demolition of Check Points				
VH01	Residential	72	75	No
LMC03	Residential	**76**	75	Yes
SL01	Residential	67	75	No
PC01	Residential	75	75	No
STK05	Residential	69	75	No

Note: **Bold** figure denotes exceedance of relevant noise criteria

3.7.2 As shown in the tables above, exceedances of noise criteria were predicted, mitigation measures should be implemented to ameliorate the impacts. It is noted that with a separation distance of 60m between the noise sensitive uses and the construction/ demolition activities, similar as VH02, full compliance of noise criteria could be achieved. Hence, for those NSRs with the distance over 300m as shown in **Table 3-3**, the unmitigated noise impact should also be complied with relevant noise criteria.

3.8 Possible Noise Mitigation Measures and Mitigated Impacts

Level 1 – Use of Quiet Plant and Movable Noise Barrier

3.8.1 With construction/ demolition work undertaken at a distance of 60m or less to the NSRs, mitigation measures should be considered. Quiet plant is defined as a PME which has a SWL lower than that given in the Technical Memorandum for Noise from Construction Work Other Than Percussive Piling for the same type of equipment. Examples of known SWLs of various types of quiet plant available in Hong Kong are shown in **Table 3-15** and have been successfully applied in other EIA/ works and contributed to achieve noticeable noise reduction.

Table 3-15 Recommended Quiet PME and the SWL

Quiet Plant	SWL, dB(A)	Reference
Breaker, excavator mounted (hydraulic), 52kW	106	BS5228 C8-12
Generator, super silenced	95	CNP 103
Lorry	105	BS5228 C3-59
Concrete lorry mixer ($6m^3$)	100	BS5228 C6-23
Road roller	101	BS5228 C8-30

Quiet Plant	SWL, dB(A)	Reference
Concrete Pump (100kW)	106	BS5228 C6-36

3.8.2 Also, purpose-built movable noise barriers should be used to mitigate construction noise directly at sources that are not usually mobile. As the village houses along the boundary fence is typical 1-2 storeys, the movable noise barrier is effective to block the direct line of sight from the receiver to the noise source. According to the EIAO Guidance Note No. 9/2004, a 5 dB(A) and 10 dB(A) reduction is assumed for movable plant and stationary plant respectively. The noise screening effect for each item of plant considered in this assessment is listed as follows:

- Mobile plant – assume 5 dB(A) reduction: Breaker, Excavator, Vibratory Compactor, Hand-held Driller, Road Roller; and
- Stationary plant – assume 10 dB(A) reduction: Generator, Concrete Pump and Water Pump

3.8.3 The movable noise barriers should be free of gaps and made of materials having a surface mass density in excess of 7 kg/m^2. To improve the effectiveness of noise reduction, non-flammable absorptive lining can be adhered on the inner surface of the barrier. The barrier can be in the form of vertical or bend top barrier and the width of the barrier should have with an effective height/ width to block the line of sight to from the NSRs to the noise source. A typical section of movable noise barrier is shown in **Figure 3.11**.

3.8.4 However, it should be noted that the noise mitigation measures including the phasing of works and the use of movable noise barriers adopted in this EIA report are specified to this project only. With the consideration of specify work type and the low-rise village houses in this project, these specific designs of movable noise barrier with the screening effect provided that the direct line of sight between the noise sensitive uses and the noise source is blocked. This mitigation measure of noise screening should not be lightly applied to the other projects without careful consideration of the specify works, design of noise barriers and the noise sensitive receivers' situation.

3.8.5 By replacing the regular PMEs with the quieter ones and with the use of movable noise barrier, the maximum SWLs for the worst-case scenario of the revised plant inventory is listed in **Table 3-16** below and in **Appendix C3**.

Table 3-16 Maximum SWLs of Plant Inventory with Mitigation Measures Implemented

Section	Construction/ Demolition Activities	Total SWL, dB(A)
Section 1 – Section 4	Excavation	101
	Footing Construction	103
	Fence Installation	94
Section 2 and Section 3	Road Construction	96
Section 4	Check Point Superstructure	104
Section 1 – Section 4	Loading and Uploading Activities with the use of Lorry	102
Section 2 and Section 3	Demolition of Existing Boundary Fence	101
Section 1 – Section 4	Check Points Demolition	101

3.8.6 The noise impact has been re-assessed and summarised in **Table 3-17** to **Table 3-19** with calculation summary sheet was shown in **Appendix C3**.

Table 3-17 Mitigated Noise Impact due to the Construction of Boundary Fence/ Road Construction/ Check Point Superstructure (Level 1)

NSR ID	Usage	Mitigated Noise Level, dB(A)	Noise Criteria, dB(A)	Mitigation Measures Required?
Section 1				
VH01	Residential	65	75	No
Section 3				
TKL01	Residential	65	75	No
KL01	Residential	73	75	No
Section 4				
STK01	Residential	66	75	No
STK03	Residential	74	75	No

Table 3-18 Mitigated Noise Impact due to the Demolition of Existing Boundary Fence (Level 1)

NSR ID	Usage	Mitigated Noise Level, dB(A)	Noise Criteria, dB(A)	Mitigation Measures required?
Section 2 – Demolition of Existing Boundary Fence				
HAT01	Residential	**77**	75	Yes
LMC01	Residential	70	75	No
V01	Planned Residential	75	75	No
PH01	Residential	**79**	75	Yes
MTL01	Residential	72	75	No
TYL01	Residential	**84**	75	Yes
Section 3 – Demolition of Existing Boundary Fence				
WL01	Residential	62	75	No
WL02	Residential	**80**	75	Yes

Note: **Bold** figure denotes exceedance of relevant noise criteria

Table 3-19 Mitigated Noise Impact due to the Demolition of Check Points (Level 1)

NSR ID	Usage	Mitigated Noise Level, dB(A)	Noise Criteria, dB(A)	Mitigation Measures Required?
Demolition of Check Points				
LMC03	Residential	62	75	No

3.8.7 With all these measures in place, the mitigated construction noise impacts have been predicted with noise exceedance still exist. Therefore, further mitigation measures should be considered.

Level 2 – Alternative Demolition Method of Existing Boundary Fence

3.8.8 Based on **Table 3-18** above, noise exceedance was found during the demolition of existing

boundary fence. A sensitivity test below showing that the maximum of SWL for the demolition of existing boundary fence which is 102 dB(A) as shown in **Table 3-16**. With a minimum separation distance of 12m would comply with the noise criteria of 75 dB(A).

Table 3-20 Sensitivity Test for Minimum Separation Distance

Maximum SWL, dB(A)	Distance, (m)	Distance Attenuation, dB(A)	Façade Correction, dB(A)	Maximum SPL, dB(A)
102	12	-30	+3	75

3.8.9 Given the existing boundary fence and the works area are close promixity to the noise sensitive receivers, particular migitaion measures should be applied to those NSRs having a distance of less than 12m between the sensitive receivers and the footing location of the existing boundary fence. In addition to the use of quiet plant and movable noise barrier, alternative demolition method of existing boundary fence at Section 2-3 shall be used where demolition works would be undertaken at a distance of 12m or less to the NSRs and the Project Proponent comfirmed this alternative demolition method is feasible. These particular mitigation measures include:

Demolition of Existing Fence

- the use of welder is recommened to replace the use of hand-held driller;
- the use of hand-held breaker with movable noise barrier is recommended to replace the use of mini-robot mounted breaker; a 10 dB(A) noise reduction was assumed for the hand-held breaker with the movable noise barrier; and the duration for the use of hand-held breaker is minimal as only the surface level of the footing to be broken; and
- the removal of the footing of the existing boundary fence should be carried by concrete crusher mini-robot mounted after the surface level broken by hand-held breaker.

3.8.10 With these mitigation measures in place, the mitigated construction noise impacts have been predicted and the summary of assessment results of mitigated scenario is shown in **Table 3-21**. The revised plant inventory for demolition of existing boundary fence and the calculation summary sheet is shown in **Appendix C4**.

Table 3-21 Mitigated Noise Impact due to the Demolition of Existing Boundary Fence (Level 2)

NSR ID	Usage	Mitigated Noise Level, dB(A)	Noise Criteria, dB(A)	Mitigation Measures Required?
Section 2 – Demolition of Existing Boundary Fence				
HAT01	Residential	69	75	No
PH01	Residential	70	75	No
TYL01	Residential	75	75	No
Section 3 – Demolition of Existing Boundary Fence				
WL02	Residential	72	75	No

3.8.11 With these further mitigation measures in place, the mitigated construction noise impacts have been predicted and full compliance of noise criteria has achieved.

3.8.12 There is an office area managed by World Wide Fund (WWF) near the existing checkpoint of Section 1 (which has a longer distance to the works area compared with VH01), there may

have potential educational usages (with no examination period assumed) and hostel uses within the office area. The maximum SWL of construction activities of Section 1 is 103 dB(A) as shown in **Table 3-16**. A sample calculation for the potential construction noise impact to WWF is summarised below in **Table 3-22** which showed the compliance of relevant 70 dB(A) noise criteria.

Table 3-22 Construction Noise Impact Assessment for WWF

Maximum SWL, dB(A)	Distance, (m)	Distance Attenuation, dB(A)	Façade Correction, dB(A)	Maximum SPL, dB(A)
103	140	-51	+3	55

3.8.13 By combining with the implementation of mitigation measures proposed and the designed EM&A requirements, construction noise impact should be controlled to within acceptable levels.

3.8.14 However, it is recommended that the Contractor should also adopt good working practices in order to minimise construction noise as far as possible, e.g.:

- The Contractor shall adopt the Code of Practice on Good Management Practice to Prevent Violation of the Noise Control Ordinance (Chapter 400) (for Construction Industry) published by EPD;
- The Contractor shall observe and comply with the statutory and non-statutory requirements and guidelines;
- Before commencing any work, the Contractor shall submit to the Engineer Representative for approval the method of working, equipment and noise mitigation measures intended to be used at the site;
- The Contractor shall devise and execute working methods to minimise the noise impact on the surrounding sensitive uses, and provide experienced personnel with suitable training to ensure that those methods are implemented;
- Noisy equipment and noisy activities should be located as far away from the NSRs as practical;
- Unused equipment should be turned off. Number of operating PME should be kept to a minimum and the parallel use of noisy equipment / machinery should be avoided;
- Regular maintenance of all plant and equipment; and
- Material stockpiles and other structures should be effectively utilised as noise barriers, where practicable.

3.9 Operation Phase Noise Impact Assessment

Road Traffic Noise

3.9.1 The operation of the new sections of the boundary patrol road may have road traffic noise impact to noise sensitive receivers nearby, the impact on the identified NSRs is assessed following the criteria and guidelines set out in Annexes 5 and 13 of the TM.

3.9.2 It is anticipated that the road traffic generated would be minimal as there are mainly police patrol cars and maintenance cars (e.g. WSD, DSD etc.) travelling along the boundary patrol

road.

3.9.3 Based on site observation during October 2007 to August 2008, the traffic flow observed on the Boundary Patrol Road was less than 50 veh/hr, it is anticipated that the function of future Boundary Patrol Road would be the same as the existing Boundary Patrol Road and the traffic flow 15 years after the commissioning of the Project is hence assumed to be less than 50 veh/hr.

3.9.4 Predicted road traffic noise is calculated in accordance to the UK methodology for the Calculation of Road Traffic Noise (CRTN) published by Department of Transport, UK. In order to satisfy the minimum traffic flow requirement for CRTN, the traffic flow of the BPR is assumed to be 50veh/hr. Moreover, the traffic speed and the percentage of heavy vehicles of the BPR are assumed as 50 km/hr and 100% respectively as worst case scenario. The correction of low traffic flow to the calculated noise level has also been considered. The Project Proponent confirmed these assumptions are capable for calculation of road traffic noise.

3.9.5 The village house at Wang Lek (WL02) is the nearest noise sensitive receiver to the new section of the boundary patrol road (85m). The predicted road traffic noise level is 60 dB(A) which is 10 dB(A) less than the criteria 70 dB(A). Moreover, for those noise sensitive receivers exposed to the existing boundary patrol road, it is anticipated the impact would be similar to the existing scenario as the traffic flow 15 years after the commissioning of the Project is expected to be still less than 50 veh/hr. Nevertheless, potential traffic impact has also been assessed. The village house at Kaw Liu Village (KL01) is the nearest noise sensitive receiver to the existing boundary patrol road (18m). The predicted road traffic noise level is 66 dB(A) which is 4 dB(A) less than the criteria 70 dB(A).

3.9.6 A worst-case assumption of road traffic flow and the percentage of heavy vehicle has been adopted in the prediction, it is concluded that potential road traffic noise impact would comply with the noise criteria stipulated in the EIAO-TM.

3.10 Environmental Monitoring and Audit (EM&A) Requirements

3.10.1 Given the results from the noise impact predicted during the construction phase could be mitigated to acceptable noise level, to ensure that the nearby NSRs will not be subjected to unacceptable construction noise impact, an Environmental Monitoring and Audit (EM&A) programme is recommended. Details on the noise monitoring requirements, methodology and action plans have been described in the accompanying EM&A Manual.

3.11 Conclusion

3.11.1 The construction noise impact assessment has been based on a best estimate of the construction sequence and machines inventory.

3.11.2 The potential noise impact that could arise from daytime construction activities of the Project has been evaluated. With the use of quiet plant, the movable noise barriers and the alternative demolition method, all the construction noise impact can be mitigated to acceptable levels. The Contractor shall, from time to time, be aware of the noise impacts on the surrounding NSRs through adequate noise monitoring during the works so that adjustments could be made

to control the construction noise levels. These requirements should be triggered by an Event and Action Plan as part of the EM&A which should be incorporated into the works contract in order to make it enforceable.

3.11.3 During the operation phase, the road traffic noise generated from the newly constructed Border Road is predicted remaining unchanged to the existing scenario as there are mainly police patrol cars and maintenance cars (e.g. WSD, DSD etc.) travelling along the boundary patrol road. A worst-case assumption of road traffic flow and the percentage of heavy vehicle has been adopted in the prediction, it is concluded that potential road traffic noise impact would comply with the noise criteria stipulated in the EIAO-TM.

4 WATER QUALITY IMPACT

4.1 Introduction

4.1.1 A water quality impact assessment has been undertaken to define the nature and scale of potential environmental impacts associated with the Project specifically in terms of the effects in the vicinity of water sensitive receivers. The assessment has been carried out in accordance with section 3.4.3 of the Study Brief and *Annexes 6 and 14* of the *Technical Memorandum to the EIAO*.

4.1.2 This chapter presents the assessment of potential water quality impacts which may arise during both the construction and operation of the Project. Mitigation measures have been proposed to alleviate the potential water quality impact, and the residual impacts after implementation of these measures are evaluated.

4.2 Environmental Legislation, Standards, Guidelines and Criteria

4.2.1 Water quality impacts have been assessed with reference to the relevant environmental legislation and standards. The following relevant pieces of legislation and associated guidelines are applicable to the evaluation of water quality impacts associated with the Project.

- Water Pollution Control Ordinance (WPCO) (Cap. 358);
- Technical Memorandum for Effluents Standards for Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (WPCO, Cap. 358, S.21);
- Environmental Impact Assessment Ordinance (Cap. 499., S.16), Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), Annexes 6 and 14;
- Hong Kong Planning Standard and Guidelines (Chapter 9); and
- Practice Note for Professional Persons, Construction Site Drainage (ProPECC PN 1/94).

Water Pollution Control Ordinance

4.2.2 Under the *Water Pollution Control Ordinance* (WPCO) (Chapter 358), Hong Kong waters are divided into 10 Water Control Zones (WCZs) and 4 supplementary water control zones. Each of which has a designated set of statutory Water Quality Objectives (WQOs) designed to protect the inland and/or marine environment and its users. The proposed project is located in the Deep Bay and Mirs Bay Water Control Zones. The WQOs are applicable as evaluation criteria for assessing compliance of any effects from the construction and operation of the Project.

Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters

4.2.3 This technical memorandum (TM-DSS) was issued under section 21 of the WPCO. It sets the limits to control the physical, chemical and microbial quality of effluent discharges into foul sewers, stormwater drains, inland and coastal waters. Specific limits apply for different areas and are different between surface waters and sewers. The limits vary with the rate of

effluent flow. Sewage from the proposed construction activities should comply with the standards for effluent discharged into foul sewers, inshore waters or marine waters of Deep Bay and Mirs Bay WCZs, as shown in Tables 4, 5, 8, 10a and 10b of the TM-DSS.

No Net Increase Requirement

4.2.4 Effluent treatment is required prior to discharge into the water courses in the Deep Bay Area, in order to meet the criteria of "no net gain" in pollution load as specified in the Town Planning Board Guidelines No. 12B. The underlying principle is to protect the important habitats and wildlife of the Deep Bay region.

Environmental Impact Assessment Ordinance (Cap. 499) Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)

4.2.5 Under Section 16 of the EIAO, EPD issued the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) which specifies the assessment methods and criteria for environmental impact assessment. This Study follows Annex 6 – Criteria for Evaluating Water Pollution and Annex 14 – Guidelines for Assessment of Water Pollution under the EIAO-TM to assess the potential water quality impacts that may arise during construction and operation phases of the Project.

Hong Kong Planning Standards and Guidelines (HKPSG)

4.2.6 Chapter 9 of these guidelines provide guidance for potentially polluting uses including environmental considerations in the planning of civil engineering infrastructure and operation. The guidelines recommend that unspoilt areas designated for conservation, Sites of Special Scientific Interest, areas used for commercial fisheries including fish culture and shellfish cultivation should be taken care in planning and implementation of works to avoid, minimize or ameliorate pollution caused by silt, oil and floating refuse.

Practice Note for Professional Persons, Construction Site Drainage (ProPECC PN 1/94)

4.2.7 This Practice Note issued by ProPECC in 1994 also provides useful guidelines on the management of construction site drainage and prevention of water pollution associated with construction activities.

4.3 Assessment Methodology

4.3.1 The Study Area for the water quality impact assessment is defined as 500m from the Project site boundary according to the Study Brief. Construction phase of the Project will include the construction of primary and secondary boundary fence, new boundary patrol road, two new checkpoints and the removal of existing boundary fence and checkpoints at various places. These works will be commenced near existing water systems including rivers, streams and fish ponds.

4.3.2 In order to assess the impacts on water systems during construction and operations, it is first necessary to define what activities will take place which could potentially affect water quality.

4.3.3 During the construction phase, facilities such as dust suppression sprays and temporarily stockpile will be used on site. Wash water runoff and erosion of excavated materials by rainfall may contain suspended solids and contaminants. Domestic sewage will be generated from site workers. During the operational phase, as the proposed checkpoint at Shek Chung Au will be provided with sanitary facilities, sewage will be generated. All these runoff and sewage may cause chemical and biological disruptions of marine water, freshwater systems, stormwater channels and fish ponds.

4.3.4 No reclamation or dredging works is required. There will not be any physical disruptions of marine water, freshwater systems, stormwater channels or fish ponds. No impact on ground water, hydrology or flow regime is anticipated. Potential biological and chemical disruptions mentioned can be avoided and mitigated by good site practices.

4.4 Baseline Conditions

4.4.1 The water environmental aspects of the Study Area include marine water, river water, drainage, freshwater stream and fishponds. Within the Study Area, water quality is dominated by effluents from agricultural activities, disposal of domestic sewage from nearby villages and industrial discharges.

Marine Water Quality

4.4.2 The Study Area of the Project lies within the Deep Bay and Mirs Bay Water Control Zones. Marine water bodies in the Study Area include Inner Deep Bay and Starling Inlet.

4.4.3 Marine water quality at Inner Deep Bay remained poor in 2006 with low dissolved oxygen level, high amount of suspended solids and *E. coli*, failing to compile with WQOs. The EPD monitoring station of most relevance is DM1. A summary of the recently published EPD marine water monitoring data collected at DM1 are presented in **Table 4-1**.

Table 4-1 Summary of EPD Marine Water Quality Monitoring Data at Inner Deep Bay Monitoring Station DM1 between 2004 and 2006

Parameter	WQO	2004	2005	2006
Dissolved Oxygen (mg/L)	≥ 4.0	3.3 (1.6 – 7.0)	2.9 (1.3 – 6.3)	3.8 (1.4 – 6.7)
pH	6.5 – 8.5	7.7 (7.2 – 8.3)	7.5 (7.0 – 8.0)	7.3 (6.8 – 7.9)
Total Inorganic Nitrogen (mg/L)	≤ 0.7	6.26 (2.98 – 8.97)	5.48 (3.68 – 7.01)	3.86 (1.16 – 6.47)
Unionised Ammonia (mg/L)	≤ 0.021	0.162 (0.022 – 0.521)	0.096 (0.023 – 0.460)	0.041 (0.002 – 0.110)
***E. coli* (cfu/100mL)**	≤ 610	3,600 (70 – 37,000)	9,800 (2,100 – 360,000)	2,000 (140 – 14,000)

Note: 1. Unless otherwise specified, data presented are depth-averaged values.
2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* which is annual geometric means.
3. Data in brackets indicate the ranges.
4. cfu – colony forming unit.

4.4.4 Starling Inlet coastal waters and mudflat are habitats of ecological importance. They are the main feeding sites for Great Egrets and Little Egrets nesting on A Chau. Marine water

quality at Starling Inlet fully complied with WQOs in recent years. The EPD monitoring station of most relevance is MM1. A summary of the recently published EPD marine water monitoring data collected at MM1 are presented in **Table 4-2**.

Table 4-2 Summary of EPD Marine Water Quality Monitoring Data at Starling Inlet Monitoring Station MM1 between 2004 and 2006

Parameter	WQO	2004	2005	2006
Dissolved Oxygen (mg/L)	≥ 4.0	8.0 (5.3 – 10.6)	7.2 (4.8 – 12.6)	7.9 (6.0 – 11.0)
pH	6.5 – 8.5	8.3 (8.1 – 8.5)	8.3 (8.0 – 8.7)	8.2 (7.9 – 8.4)
Total Inorganic Nitrogen (mg/L)	≤ 0.3	0.10 (0.03 – 0.28)	0.17 (0.04 – 0.43)	0.13 (0.03 – 0.31)
Unionised Ammonia (mg/L)	≤ 0.021	0.006 (0.003 – 0.020)	0.007 (0.003 – 0.019)	0.004 (0.001 – 0.007)
***E. coli* (cfu/100mL)**	≤ 610	44 (2 – 360)	96 (20 – 930)	39 (3 – 4,300)

Note: 1. Unless otherwise specified, data presented are depth-averaged values.
2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* which is annual geometric means.
3. Data in brackets indicate the ranges.
4. cfu – colony forming unit.

River Water Quality

4.4.5 The Study Area includes Shenzhen River, the lower reaches of River Indus and River Ganges, and Lin Ma Hang Stream.

4.4.6 Shenzhen River is the boundary river between Hong Kong and Shenzhen, and drainage outlets of various rivers in the two places. Its tributaries include River Indus, River Beas and River Ganges. It is highly polluted by industrial and domestic discharges due to the fast development of industry and residential buildings in Shenzhen. In recent years, Hong Kong and Shenzhen governments jointly completed the three-stage Shenzhen River Regulation Project. However, by field observations, the river water quality of Shenzhen River remained poor. Shenzhen River flows into Inner Deep Bay estuary, so its water quality has significant effect on the water quality of Mai Po Ramsar Site. A summary of the water qualities of various sections of Shenzhen River from 2006 to 2007 is presented in **Table 4-3**.

Table 4-3 Summary of River Water Quality Monitoring Data at Various sections of Shenzhen River between 2006 and 2007

Parameters	WQO	Shenzhen River Sections					
		Shenzhen River Mouth		Ta Sha Lok		Man Kam To	Ganges River Mouth
		2006	2007*	2006	2007*	2006	2006
pH	6.0 – 9.0	6.86	7.25	6.81	6.90	6.71	6.93
DO (mg/L)	≥ 4	4.32	6.99	1.58	3.72	2.71	3.87
BOD_5 (mg/L)	≤ 5	9.73	7.32	28.95	25.49	14.26	18.82
SS (mg/L)	≤ 20	43.73	51.87	66.02	41.86	62.30	69.19

Note: 1.Data source: EM&A monitoring data of Shenzhen River Regulation Project Stage III Contract C (長江水資源保護科學研究所, 2007).
2. The 2007 data indicate Jan to May 2007 only.
3. Data for Chemical Oxygen Demand (COD) were not available.

4.4.7 River Indus and River Ganges flow into Shenzhen River. Downstream of Rivers Indus and Ganges are included in the Study Area. In field observations during wet season, the river bank of River Ganges turned into a marsh supporting various residential waterbirds. At present, the river water quality monitoring conducted by EPD provides spatial and temporal river water quality data, and these data may be used to represent the baseline water quality conditions of Rivers Indus and Ganges. The EPD river quality monitoring stations of most relevance for downstream of River Indus and River Ganges are IN1 and GR1 respectively. The recently published EPD river water monitoring data collected at IN1 and GR1 are summarized in **Table 4-4** and **Table 4-5**.

Table 4-4 Summary of EPD River Water Quality Monitoring Data at downstream of River Indus in the Deep Bay Water Control Zones between 2003 and 2006

Parameters	WQO	2003	2004	2005	2006
pH	6.5 – 8.5	7.2 (6.9 – 7.9)	7.1 (6.7 – 7.3)	7.1 (6.8 – 7.6)	7.2 (6.6 – 7.3)
BOD_5 (mg/L)	≤ 3	5 (4 – 20)	15 (5 – 32)	11 (4 – 37)	7 (1 – 29)
COD (mg/L)	≤ 15	24 (12 – 44)	30 (17 – 78)	31 (15 – 58)	26 (10 – 60)
SS (mg/L)	≤ 20	34 (9 – 77)	37 (7.6 – 440)	34 (12 – 63)	25 (7 – 88)
DO (mg/L)	≥ 4	5.2 (2.5 – 11.8)	3.9 (1.4 – 7.2)	3.6 (1.6 – 9.8)	3.8 (1.6 – 7.4)
***E. coli* (cfu/100mL)**	≤1000	78,000 (11,000 – 3,000,000)	190,000 (25,000 – 2,900,000)	320,000 (18,000 – 4,200,000)	140,000 (6,400 – 2,600,000)

Parameters	WQO	2003	2004	2005	2006
Ammonia-nitrogen (mg/L)	Annual average ≤0.021	2.45 (0.41 – 11.00)	5.85 (0.98 – 18.00)	5.80 (1.10 – 17.00)	5.35 (0.31 – 21.00)
Nitrate-nitrogen (mg/L)	--	1.65 (0.01 – 3.90)	1.05 (0.01 – 3.60)	1.00 (0.01 – 2.40)	1.20 (0.01 – 4.20)
Aluminium (µg/L)	(a) Waste discharges shall not cause the toxins in water to attain such levels as to produce significant toxic carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms, with due regard to biologically cumulative effects in food chains and to toxicant interactions with each other. (b) Waste discharges shall not cause a risk to any beneficial uses of the aquatic environment.	225 (80 – 610)	270 (90 – 2,400)	290 (70 – 640)	140 (50 – 370)
Cadmium (µg/L)		0.1 (0.1 – 0.9)	0.1 (0.1 – 1.0)	0.1 (0.1 – 0.2)	0.1 (0.1 – 0.2)
Chromium (µg/L)		1 (1 – 5)	5 (1 – 21)	4 (1 – 19)	3 (1 – 15)
Copper (µg/L)		6 (2 – 7)	8 (3 – 50)	8 (3 – 16)	6 (2 – 13)
Lead (µg/L)		3 (1 – 6)	3 (1 – 40)	3 (1 – 10)	3 (1 – 7)
Zinc (µg/L)		90 (40 – 250)	75 (30 – 750)	100 (50 – 1,400)	80 (40 – 190)

Note: 1. WQO follows WPCO Cap.358R.
2. Data presented are in annual medians of monthly samples, except those for *E. coli* which are in annual geometric means.
3. Figures in brackets are annual ranges.
4. cfu – colony forming unit

Table 4-5 Summary of EPD River Water Quality Monitoring Data at downstream of River Ganges in the Deep Bay Water Control Zone between 2003 and 2006

Parameters	WQO	2003	2004	2005	2006
pH	6.5 – 8.5	7.4 (7.0 – 7.7)	7.4 (6.9 – 7.7)	7.4 (7.3 – 8.0)	7.6 (6.8 – 8.1)
BOD_5 (mg/L)	≤ 3	26 (3 – 320)	16 (8 – 95)	32 (8 – 74)	38 (4 – 170)
COD (mg/L)	≤ 15	60 (17 – 400)	49 (37 – 150)	78 (16 – 170)	60 (7 – 1,100)
SS (mg/L)	≤ 20	195 (33 – 520)	79 (11 – 340)	29 (17 – 720)	50 (23 – 660)
DO (mg/L)	≥ 4	5.1 (1.8 – 9.6)	3.9 (1.6 – 6.4)	4.8 (2.2 – 8.0)	6.2 (1.8 – 8.0)
***E. coli* (cfu/100mL)**	≤1000	59,000 (3,700 – 830,000)	130,000 (27,000 – 700,000)	120,000 (9,000 – 1,600,000)	230,000 (34,000 – 1,700,000)

Parameters	WQO	2003	2004	2005	2006
Ammonia-nitrogen (mg/L)	Annual average ≤0.021	22.00 (3.50 – 110.00)	17.50 (3.80 – 83.00)	20.50 (4.20 – 61.00)	36.00 (3.10 – 210.00)
Nitrate-nitrogen (mg/L)	--	0.14 (0.01 – 0.93)	0.21 (0.01 – 1.60)	0.25 (0.01 – 1.60)	0.28 (0.01 – 1.30)
Aluminium (µg/L)	(a) Waste discharges shall not cause the toxins in water to attain such levels as to produce significant toxic carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms, with due regard to biologically cumulative effects in food chains and to toxicant interactions with each other. (b) Waste discharges shall not cause a risk to any beneficial uses of the aquatic environment.	290 (160 – 960)	210 (50 – 540)	165 (70 – 1,300)	155 (70 – 900)
Cadmium (µg/L)		0.2 (0.1 – 0.4)	0.1 (0.1 – 0.2)	0.1 (0.1 – 0.5)	0.1 (0.1 – 0.2)
Chromium (µg/L)		2 (1 – 4)	1 (1 – 2)	1 (1 – 4)	1 (1 – 6)
Copper (µg/L)		14 (6 – 120)	12 (2 – 38)	8 (4 – 73)	13 (4 – 23)
Lead (µg/L)		5 (2 – 13)	3 (1 – 11)	3 (1 – 31)	2 (1 – 6)
Zinc (µg/L)		125 (30 – 440)	40 (20 – 130)	50 (30 – 900)	40 (20 – 350)

Note: 1. WQO follows WPCO Cap.358R.
2. Data presented are in annual medians of monthly samples, except those for *E. coli* which are in annual geometric means.
3. Figures in brackets are annual ranges.
4. cfu – colony forming unit

4.4.8 From **Table 4–4** and **Table 4–5** it may be observed that compliance with river water quality objectives in the downstream of Rivers Indus and Ganges is low. The recorded levels of biochemical oxygen demand, suspended solids and Ammonia-nitrogen all exceed the WQOs, and high chemical oxygen demand and *E. coli* counts further indicate poor water quality in the downstream of Rivers Indus and Ganges. This is considered to be the result of the direct discharge of sewage from domestic premises.

4.4.9 Lin Ma Hang Stream is a natural stream with riparian vegetation. The stream water is clean, slow flowing and relative undisturbed. This stream is listed as a Site of Special Scientific Interest (SSSI), since it is one of the lowland streams recognized as having high ecological value. It supports a very high diversity of primary freshwater fish. A total of 16 species has been recorded and 14 of them are native species which represent nearly 50 percent of the native primary freshwater fish in Hong Kong. This stream also supports a number of rare freshwater fish species, including *Rasbora steineri*, *Rasborinus lineatus* and *Mastacembelus armatus*. Current water quality data of Lin Ma Stream was obtained and summarized in **Table 4–6**.

Table 4-6 Summary of Water Quality of Lin Ma Hang Stream in 2006

Parameters	Lin Ma Hang Stream	
	Downstream	Upstream
DO (mg/L)	7.85	8.15
pH	6.75	6.5
SS (mg/L)	2.75	7
BOD_5 (mg/L)	3	3
COD (mg/L)	6	3.5
Ammonia-nitrogen (µg/L)	<10	15
Nitrite-nitrogen (µg/L)	<10	<10
Nitrate-nitrogen (µg/L)	<10	19.5
Zinc (ug/L)	<10	<10
Iron (µg/L)	310	270
Magnesium (µg/L)	605	400

Note: 1. Data source: Stream water quality survey conducted by Ove Arup (2007).
2. The "<" sign denotes that the actual value was below reporting limit.

Drainage Channel

4.4.10 The drainage channel besides Ha Tam Shui Hang is included in the Study Area. From field observation, it is a clear and medium-flowing channel covered with vegetation. No data for the water quality of this drainage channel is available. It is at least 250 m away from the proposed construction of boundary fence along the existing boundary road, therefore the proposed works will not affect its water quality.

Active Fishponds

4.4.11 The Study Area included a large number of active fishponds. They were located at Mai Po, Sam Po Shue, Lok Ma Chau, Hoo Hok Wai, Ta Sha Lok, Nam Hang and Yuen Leng Chai. Except the fishpond at Yuen Leng Chai, other fishponds are actively managed for rearing freshwater fish. The fishpond at Yuen Leng Chai was a restored fishpond, being as one mitigation measure for ecological impact in the Shenzhen River Regulation Project Stage III. According to the EM&A Report, the fishpond habitat was completely restored in September 2006.

4.4.12 Since most of the fishponds within the Study Area were proprietary, data for water quality of these fishponds was not available. Water quality monitoring data for three fishponds located near the boundary fence in Lok Ma Chau area was available and summarized in **Table 4-7**.

Table 4-7 Summary of Water Quality of Fishpond in Lok Ma Chau area

Parameter	Fishpond
Dissolved Oxygen (mg/L)	4.1 (1.8 – 7.1)
Turbidity (NTU)	54.6 (6.6 – 206)
Suspended Solid (mg/L)	88 (11 – 1700)

Note: 1. Data source: Water Quality Monitoring Results for KCR Lok Ma Chau Spurline conducted by Hyder (2003).
2. Samples were taken at water surface, time period from Dec 2002 to Aug 2003.

4.4.13 From the monitoring results of the fishponds shown in **Table 4-7**, it may be observed that the high turbidity and level of suspended solid indicate poor water quality in the fishponds. Level of dissolved oxygen may be maintained by active air pumping.

4.5 Water Sensitive Receivers

4.5.1 The identified water sensitive receivers within the Study Area include Lin Ma Hang Stream SSSI, wetlands and active fishponds adjacent to the proposed boundary fence and patrol road. The Shenzhen River, River Indus, River Ganges, Inner Deep Bay and Starling Inlet are the indirect water sensitive receivers.

4.6 Impact Assessment

Identification and Evaluation of Impacts during Construction Phase

4.6.1 Potential sources of impacts on water quality during the construction phase include site preparation, formation of patrol roads, concreting work, demolition of fence, stockpiling and site depots.

4.6.2 Preparation of land for construction of fence and roads will involve excavations and the removal of surface vegetation. These may lead to soil erosion releasing high level of organic matters into adjacent watercourses and fishponds during the wet season. Increased surface runoff with high suspended solids loadings may also be resulted.

4.6.3 Asphalt laying and concreting work are required in the formation of patrol roads and fence footing respectively. In case of asphalt/concrete spillage or washdown, water quality of adjacent fishponds and watercourses will be threatened due to the present of contaminants and changes in pH. Level of suspended solids and turbidity will also be increased. These may create toxic conditions for aquatic life.

4.6.4 Demolition of existing boundary fence and checkpoints may cause water pollution due to accidental drop of waste materials into adjacent watercourses. Moreover, demolition may require spraying of water for dust suppression. This may generate surface runoff consisting suspended solids and greases.

4.6.5 Temporarily stockpile required during construction may generate site surface runoff as a result of daily activities. This might be exacerbated during rainstorms, generating high levels of sediments discharged into fishponds and streams.

4.6.6 Site depots are required for maintenance and repair services for equipments on site. These will include storage and use of engines, hydraulic oil, chemicals and lubricants. Spillage and stormwater runoff from site depots, if directly discharged into nearby watercourses, will cause contamination of water. Provision of chemical toilets is also required on site. Domestic sewage generate at the outfall will affect water quality by the increase in *E. coli* and BOD.

4.6.7 The various construction activities and their associated impact on water quality described in the above sections are summarized in **Table 4-8**.

Table 4-8 Summary for Identification and Evaluation of Potential Impacts on Water Quality during Construction

Activity	Effect
Site preparation	Soil erosion and surface runoff. Increase in suspended solids and organic matters.
Formation of patrol roads & concreting work	Spillage or washdown of asphalt and concrete. Change in pH and increase in suspended solids.
Demolition of fence and checkpoints	Accidental drop of waste materials into water causing contamination; Spraying of water for dust suppression causing runoff of suspended solids.
Temporarily stockpile	Site surface runoff causing discharge of high levels of sediment
Site depots & Chemical toilets	Spillage and runoff of chemicals, oil and grease; Domestic sewage discharge.

Identification and Evaluation of Impacts during Operational Phase

4.6.8 In the operational phase of boundary fence and patrol roads, discharges or water polluting activities is not anticipated and therefore there will be no impact on water quality by the Project.

4.6.9 During operation, sanitary facilities provided only in the proposed checkpoint at Shek Chung Au will generate domestic sewage. If directly discharged into Mirs Bay, rivers or streams, such domestic sewage will affect water quality by the increase in *E. coli* and BOD.

4.6.10 With appropriate mitigation measures, there will be no impact on water quality by domestic sewage from sanitary facilities.

4.7 Mitigation of Impacts

Construction Phase

4.7.1 Potential water quality impacts primarily relate to the uncontrolled surface runoff and discharge of silts during construction. Good site practices in addition to the implementation of mitigation measures would minimize the impact to the surrounding water environment.

General Prevention and Precaution Measures

- The site should be confined to avoid silt runoff from the site;
- No discharge of silty water into the river, stream or drainage channel within and in the vicinity of the site;
- Any soil contaminated with chemicals/oils shall be removed from site and the void created shall be filled with suitable materials;
- Stockpiles to be covered by tarpaulin to avoid spreading of materials during rainstorms;
- Suitable containers shall be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport;
- Chemical waste containers shall be labelled with appropriate warning signs in English and Chinese to avoid accidents. There shall also be clear instructions showing what

action to take in the event of an accidental;

- Storage areas shall be selected at safe locations on site and adequate space shall be allocated to the storage area;
- Any construction plant which causes pollution to the water system due to leakage of oil or fuel shall be removed off-site immediately;
- Spillage or leakage of chemical waste to be controlled using suitable absorbent materials;
- Chemicals will always be stored on drip trays or in bunded areas where the volume is 110% of the stored volume;
- Regular clearance of domestic waste generated in the temporary sanitary facilities to avoid waste water spillage; and
- Temporary sanitary facilities to be provided for on-site workers during construction.

Concreting Work

4.7.2 A temporary drainage channel and associated facilities should be provided to collect the runoff generated and prevent concrete-contaminated water from entering watercourses. Adjustment of pH can be achieved by adding a suitable neutralising reagent to wastewater prior to discharge.

4.7.3 For the fence footing works site in the proximity of Lin Ma Hang Stream SSSI, the concreting works should be temporarily isolated with proper methods, such as by placing of sandbags or silt curtains with lead edge at bottom and properly supported props, to prevent adverse impacts on the water quality of the natural stream.

Soil Excavation and Stockpiling

4.7.4 Excavated soil which needs to be temporarily stockpiled should be stored in a specially designated area and provided with a tarpaulin cover to avoid runoff into the drainage channels.

Site Depot

4.7.5 All compounds in works areas should be located on areas of hard standing with provision of drainage channels and settlement ponds where necessary to allow interception and controlled release of settled/treated water. Hard standing compounds should drain via an oil interceptor. The oil interceptor should be regularly inspected and cleaned to avoid wash-out of oil during storm conditions. A bypass should be provided to avoid overload of the interceptor's capacity. Any contractor generating waste oil or other chemicals as a result of his activities should register as a chemical waste producer. Disposal of the waste oil should be done by a licensed collector.

4.7.6 Good housekeeping practices should be implemented to minimise careless spillage and to keep the storage and the work space in a tidy and clean condition. Appropriate training including safety codes and relevant manuals should be given to the personnel who regularly handle the chemicals on site.

Construction of Checkpoints

4.7.7 Sewage system should be constructed to divert domestic sewage, which will be generated from the sanitary facilities provided in the new checkpoint at Shek Chung Au, to public sewer connected to government sewage treatment facilities.

Operational Phase

4.7.8 With a sewage system constructed, no direct discharge or accidental spillage of domestic sewage would be expected during the operation of the new Checkpoint at Shek Chung Au. No additional pollution loads on Mirs Bay would be anticipated. Thus, no impact is anticipated during the operation of the Project.

Residual Impacts

4.7.9 No residual impact is anticipated during the construction or operation of the Project.

Cumulative Impacts

4.7.10 No cumulative impact is expected.

4.8 Environmental Monitoring and Audit

4.8.1 A site auditing programme at weekly intervals is proposed to ensure mitigation measures during construction phase will be implemented to protect the water environment in the sensitive area from being further degraded. The audit details will be given in the EM&A Manual.

4.9 Conclusions

4.9.1 Water quality impacts during the construction phase will be controlled through the implementation of good site practice. With appropriate mitigation and precautions measures in place during construction, there should be relatively minor impacts associated with this project during or following construction. In the operation phase, the impact from sanitary facilities is anticipated to be negligible.

4.10 References

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5 WASTE MANAGEMENT IMPLICATIONS

5.1 Introduction

5.1.1 This section of the EIA report identifies the potential wastes arising from the construction and demolition of the proposed boundary fences and boundary patrol roads and provides an assessment of the potential environmental impacts associated with the handling and disposal of these wastes as per the requirements of the Study Brief item 3.4.4. This section also provides an assessment of possible land contamination within the Project Area.

5.1.2 The options for reuse, minimization, recycling treatment, storage, collection, transport and disposal of wastes arising from the Project have been examined. Where appropriate, procedures for waste reduction and management are considered and environmental control measures for avoiding and minimizing the potential impacts are recommended with reference to the applicable waste legislation and guidelines.

5.2 Environmental Legislation and Standards

Legislation

5.2.1 The following legislation encompasses the storage, collection treatment and disposal of the wastes arising from the Project:

- Waste Disposal Ordinance (Cap 354);
- Waste Disposal (Chemical Waste) (General) Regulation (Cap 354);
- Waste Disposal (Charges for Disposal of Construction Waste) Regulations (Cap 354);
- Land (Miscellaneous Provisions) Ordinance (Cap 28); and
- Public Health and Municipal Services Ordinance (Cap 132) - Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws.

Guidelines

5.2.2 The following documents, guidelines and circulars provide guidance on waste management as follows:

- Waste Reduction Framework Plan, 1998 to 2007, Planning, Environment and Lands Bureau, Government Secretariat (5 November 1998);
- Environmental Guidelines for Planning in Hong Kong (1990), Hong Kong Planning and Standards Guidelines, Hong Kong Government;
- New Disposal Arrangements for Construction Waste (1992); Environmental Protection Department & Civil Engineering Department;
- Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992), Environmental Protection Department;
- Works Branch Technical Circular No. 12/2000, Fill Management;
- Works Branch Technical Circular No. 2/93, Public Dumps;
- Works Branch Technical Circular No. 16/96, Wet Soil in Public Dumps; and
- Environment, Transport and Works Bureau Technical Circular (Works) No. 19/2005, Environmental Management on Construction Sites.

5.3 Assessment Methodology

5.3.1 The potential environmental impacts due to the management of the wastes arising from the Project have been assessed according to the criteria presented in Annex 7 and 15 of the EIAO-TM and are summarized as follows:

- Estimation of the types and quantities of the wastes to be generated;
- Assessment of the secondary environmental impacts due to the management of waste with respect to potential hazards, air and odour emissions, noise, wastewater discharges and traffic; and
- Assessment of the potential impacts on the capacity of waste collection, transfer and disposal facilities.

5.4 Construction Waste Impact

Potential Sources of Impact

5.4.1 The Project will involve the following works:

5.4.2 Construction of a secondary boundary fence (SBF) along the existing boundary patrol road (BPR);

- Conversion of the existing maintenance services road along the Shenzhen River bank into new section of BPR with a primary boundary fence (PBF) and an SBF;
- Construction of BPR with a PBF and an SBF;
- Construction of a checkpoint at the entrance to the Sha Tau Kok town ("Gate One");
- Replacement of an existing checkpoint at Pak Hok Chau;
- Removal of 4 existing checkpoints at Lok Ma Chau, Sha Ling, Ping Che and Shek Chung Au; and
- Removal of the existing PBF along sections where existing PBF will be replaced by new *sections of PBF.*

5.4.3 The works to be carried out for the proposed Project will result in the generation of a variety of wastes which may include:

- Site clearance waste;
- Construction and demolition materials;
- Chemical waste; and
- General refuse.

5.4.4 If not properly managed, the handling and disposal of these wastes may cause adverse environmental nuisance and impacts. The nature of each of these wastes is discussed below.

Site Clearance Waste

5.4.5 Most part of the land requirement limit of the Project is mainly the existing boundary roads or assess roads, except the two new sections of the BPR with a PBF and an SBF along the Shenzhen River side to the north of Pak Fu Shan and northwest of Lin Ma Hang Village. As these areas are currently rural areas and covered by vegetation, the site clearance wastes may include:

- Topsoil
- Grass
- Low and tall shrub
- Trees

Construction and Demolition Materials

5.4.6 Construction and demolition (C&D) material arising from the proposed Project may include:

- Excavated materials from construction of footing of fence and checkpoint structures
- Waste timber formwork
- Spent concrete and cement screening
- Material and equipment wrappings
- Damaged / surplus construction materials
- Concrete and structural steel from checkpoints to be removed
- Ceramic / ceiling tiles
- Glass, wood and plastics of fixtures and scaffolding
- Trimmings from scaffolding
- Wiring

Chemical Waste

5.4.7 Plant and vehicle servicing will likely be the primary source of chemical waste in the construction period. This may include:

- Scarp battery or spend acid / alkali from their maintenance
- Used engine oils hydraulic fluids and waste fuel
- Spent mineral oils / cleaning fluids from mechanical machinery
- Spent solvents / solutions, some of which may be halogenated, from equipment cleaning activities

General Refuse

5.4.8 Municipal sold waste will be generated by workers during the construction period, and the waste may include:

- Food waste
- Packaging
- Wastepaper

5.4.9 In the operational phase, small amount of municipal solid waste, such as packaging and wastepaper will be generated at the new and replacement checkpoints.

5.5 Evaluation of Impacts

5.5.1 The main construction works of the boundary fences and patrol roads is scheduled to commence in 2009 with an occupation date of 2012. The estimates of wastes arising from the construction activities and the potential environmental impacts associated with the handling, storage, transport and disposal of these wastes are discussed below.

Site Clearance Waste

5.5.2 The major construction works for the Project include the PBF and SBF along the existing BPR, "Gate One" checkpoint in Sha Tau Kok and the new section of BPR along the Shenzhen River side to the north of Pak Fu Shan and northwest of Lin Ma Hang Village. As the proposed location of Checkpoints to be constructed, replaced or removed and the existing BPR are currently used as roads, site clearance would be limited to the removal of a vegetation and topsoil for the construction of the new section of BPR. Approximately 140m^3 of site clearance wastes will be generated. These wastes are anticipated to be reused as far as possible for landscaping purposes on-site. However, due to the limited landscaping of the checkpoints, BPR and boundary fences, those materials cannot be reused on-site should be separated and disposed of at designated landfill.

Construction & Demolition Materials

5.5.3 The volume of C&D materials generated from excavation, scaffolding works, fence installation, checkpoints removal and construction of new and replacement checkpoints is estimated as approximately 72,200m^3. Approximately 70000m^3 from these are excavated materials likely to be some breaking up hard paving, soil with some rock. These excavated materials will be reused as backfilling on-site, wherever possible, to minimize the waste amount of disposal off-site to a public fill facility.

5.5.4 C&D materials should be sorted into inert C&D materials, metals, timber and non-inert C&D materials. The generation of C&D materials should be minimized while the reuse of inert C&D materials on-site should be maximized. Inert materials should be stockpiled for reuse in the construction as far as possible. It is estimated that the remaining 2,200m^3 of C&D materials will be generated from the demolition of fence and checkpoints, such as old fences and fixtures with low recycle value. These C&D materials will be reused or recycled as far as possible in order to minimize the volume of C&D waste disposing to landfill. Disposal to landfill will be the last resort. The contractor is responsible for the separation of the C&D materials and transfer of these materials to the public filling areas or landfills. The contractor is also encouraged to reuse the C&D materials in other proper sites according to contract provision.

Chemical Waste

5.5.5 Waste oil and solvent from plant and vehicles are considered to be the major chemical waste produced in the construction phase. It is difficult to quantify the amount of chemical waste, if any, generated as this will depend on the works within the Project Area. It is expected that the quantity of chemical waste, such as lubricating oil and solvent, produced from plant maintenance will be minimum. These wastes will be readily collected by a licensed waste haulier and send to the Chemical Waste Treatment Centre at Tsing Yi or other approved treatment facility.

5.5.6 Storage, handling, transport and disposal of chemical waste should be arranged in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Waste published by the EPD. As the anticipated chemical waste generation is in small quantity, the potential environmental impacts arising from the storage, handling and disposal

can be negligible.

General Refuse

5.5.7 According to Figure 11 in EPD's Monitoring of Solid Waste in 1999, the projection of per capita generation rates of commercial and industrial waste in year 2011 is 0.55 kg/employee/day (the employment size of this value includes all sectors under the Hong Kong Standard Industrial Classification). This value is adopted to estimate the quantity of municipal solid waste generated on-site by workforce.

5.5.8 The total volume of waste generated depends on the number of workers to be employed on-site during the course of the works from 2009 to 2012. It is anticipated that the number of workers and site staff to be employed is about 100 – 200. Considering there will be 200 workers work on-site 6 days per week, the amount of municipal solid waste generated will be approximately 660 kg/week.

5.5.9 Municipal solid waste generated by site workers will have potential impacts in terms of nuisance, insects and vermin if there is no appropriate management. This may give rise to adverse environmental impacts to both workers and nearby villagers. Therefore disposal of refuse at the sites other than approved waste transfer or disposal facilities will be prohibited. Effective collection of site wastes will prevent waste materials being blown around by wind, or creating an odour nuisance or pest and vermin problem. Waste storage areas should be well maintained and cleaned regularly. Contractor should undertake the responsibility of disposal of unwanted materials at such a frequency to avoid nuisance, according to the general avoidance of nuisances measures required under the Contract. The measures include set-up a temporary refuse collection facilities by the Contractor and store the waste in appropriate containers prior to collection and disposal.

5.5.10 With the implementation of good waste management practices at the site, adverse environmental impacts are not expected to arise from the storage, handling and transportation of workforce wastes.

5.6 Mitigation Measures

Introduction

5.6.1 Recommendations on recycling, storage, transportation and disposal measures are listed in this section for avoiding or minimizing the potential adverse impacts associated with waste arising from the Project. The recommendations should be incorporated into an on-site waste management plan for the construction works to be undertaken by the Contractor. The waste management plan should incorporate site-specific factors, such as the designation of area for the segregation and temporary storage of reusable and recyclable materials.

5.6.2 Contractor should undertake the responsibility to ensure that only approved licensed waste collectors are used and that appropriate measures to minimize adverse impacts, including windblown litter and dust from the transportation of these wastes are employed. Moreover, it is also the Contractor's responsibility to ensure all the necessary waste disposal permits are obtained.

Waste Management Hierarchy

5.6.3 Various waste management options are as followed:

- Avoidance and minimization, i.e. not generating waste through changing or improving practices and design;
- Reuse of materials, thus avoiding disposal (generally with only limited reprocessing);
- Recovery and recycling, thus avoiding disposal (although reprocessing may be required); and
- Treatment and disposal, according to relevant laws, guidelines and good practice.

5.6.4 This hierarchy should be used to evaluate waste management options, thus allowing waste reduction measures to be introduced at the detailed design stage and carried through to the construction phase.

5.6.5 Training and supervision of construction staff should be given at the site to increase awareness and draw attention to waste management issues and the need to minimize waste generation. Training requirement should be included in the site waste management plan.

Storage, Collection and Transport of Waste

5.6.6 Permitted waste hauliers should be used to collect and transport waste to the appropriate disposal points. Measures to minimize adverse impacts shall be instigated as appropriate and as far as practical, such as:

- Handle and store waste in a manner to ensure that they are held securely without loss or leakage, thereby minimizing the potential for pollution;
- Use authorized / licensed waste hauliers to collect specific category of waste;
- Remove waste in a timely manner;
- Maintain and clean waste storage area regularly;
- Minimize windblown litter and dust during transportation by either covering trucks or transporting waste in enclosed containers;
- Obtain the necessary waste disposal permits from the appropriate authorities, if they are required;
- Disposal waste at licensed waste disposal facilities; and
- Maintain records of the quantities of waste generated, recycled and disposed.

Site Clearance

5.6.7 The topsoil and vegetation removed and excavated material may have to be temporarily stockpiled on-site. Control measures should be taken at the stockpiling area to prevent the generation of dust and pollution of stormwater channels, fish ponds or river channels. However, to eliminate the risk of blocking drains in the wet season, it is recommended that stockpiling of excavated materials during the wet season should be avoided as far as practicable.

Dust:

- Wetting the surface of the stockpiled soil with water when necessary, especially during the dry season;
- Covering the stockpiled soil with sheets;
- Minimizing disturbance of the stockpiled soil; and
- Enclosure of stockpiling area.

Water Quality:

- Installation of silt traps for the surface water drainage system; and
- Covering stockpiled material with tarpaulin during heavy rainstorm.

5.6.8 Potential dust impacts due to the haulage of site clearance / excavated materials should be minimized by employing the following control measures:

- Dropping heights for those materials should be controlled to a practical height to minimized the fugitive dust arising from unloading;
- Materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport;
- The travelling speed should be reduced to 10km hr-1 to reduce dust dispersion and re-suspension from the operation haul trucks; and
- Wheel washing facilities should be installed and used by all vehicles leaving the Project Area.

Construction & Demolition Materials

5.6.9 In order to minimize waste generation and to keep environmental impacts within acceptable levels, environmental control measures are recommended.

5.6.10 Careful design, planning and good site management can minimize over-ordering and generation of waste materials such as concrete, mortars and cement grouts. The design of formwork should maximize the use of standard wooden panels so to achieve high reuse levels. Alternatives such as steel formwork or plastic facing should be considered to increase the potential for reuse.

5.6.11 The Contractor should recycle as much of the C&D materials as possible on-site. Proper segregation of waste on-site will increase the feasibility of certain components of the waste stream by the recycling contractors. Different areas of the worksite shall be designated for such segregation and storage wherever site conditions permit.

5.6.12 Trip-ticket system should be employed to monitor the disposal of C&D material and solid at public filling facilities and landfills, and to control fly-tipping. Government has established a differentiated charging scheme for the disposal of waste to landfill, construction waste sorting facilities and public fill facilities. This will provide additional incentives to reduce the volume of waste generated and to ensure proper segregation of wastes.

Chemical Waste

5.6.13 For those processes which would generate chemical waste, alternatives which generate reduced quantities or even no chemical waste, or less dangerous types of chemical wastes should be considered.

5.6.14 The Contractor should register with the EPD as a Chemical Waste Producer if chemical wastes are produced at the construction site. The guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes should be followed strictly:

Containers used for the storage of chemical wastes should:

- be suitable for the substance they are holding, resistant to corrosion, maintained in good condition, and securely closed;
- have a capacity of less then 450 litres unless the specification has been approved by EPD; and
- display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the Regulations.

The storage and disposal of chemical wastes should:

- be covered to prevent rainfall entering (water collected within the bund must be tested and disposed as chemical waste if necessary);
- be arranged so that incompatible materials are adequately separated;
- be via a licensed waste collector; and
- be to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Facility which also offers a chemical waste collection service and can supply the necessary storage containers.

5.6.15 Waste Exchange Scheme operated by the Centre of Environmental Technology can assist finding receivers or buyers for the small quantity of chemical waste to be generated from the Project.

General Refuse

5.6.16 General refuse should be stored in enclosed bins or compaction units separate from C&D materials and chemical wastes. A reputable waste collector should be employed by the Contractor to remove general refuse from the Project Area, separately from C&D wastes, on a daily or every second day basis to minimize odour, pest and litter impacts. Burning of refuse on construction sites is prohibited by law.

5.6.17 In the operational phase, small amount of municipal waste may be generated at checkpoints, but the associated adverse impacts are unlikely under the proper management and no mitigation measures are required.

Construction Waste Management Plan

5.6.18 A construction waste management plan (CWMP) should be prepared and developed by the contractor to ensure proper collection, treatment and disposal of waste on site. This CWMP

will also take into account the requirement to handle chemical wastes on site which will need to be managed by a licensed waste collection contractor.

5.7 Land Contamination

Land contamination Environmental Legislation and Standards

5.7.1 Comprehensive desktop study for land contamination assessment was carried out during March to June 2008. The following legislation, guidelines and guidance notes were in force for land contamination assessment:

- Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM);
- Guidance Notes for Contaminated Land Assessment and Remediation (2007);
- Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management (dated December 2007); and
- EPD Guidance Notes for Investigation and Remediation of Contaminated Sites of: Petrol Filling Stations; Boatyards; and Car Repair/Dismantling Workshops (1999).

Assessment Methodology

5.7.2 In accordance with Guidance Note for Contaminated Land Assessment and Remediation, an assessment evaluation should:

- provide a clear and detailed account of the present use of the land and the relevant past land use history, in relation to possible land contamination;
- identify potential contamination and associated impacts, risks or hazards; and
- if required, submit a plan to evaluate the actual soil contamination conditions.

5.7.3 To identify and evaluate the potential contamination impacts within the land requirement limit of the Project, the tasks listed below have been done:

- Desktop appraisal to review the historic and current land uses; and
- Walk-over site survey to confirm the current land uses.

Desktop Appraisal

5.7.4 Aerial photographs from the Aerial Photograph Library (APL) of the Civil Engineering and Development Department (CEDD) were reviewed and collated. As the Project area is under the jurisdiction of the Hong Kong Police Force (HKPF) and Drainage Services Department (DSD), questionnaires for the land use history and possible site contamination (**Appendix E-1A**) were sent to the mentioned two authorities to acquire and confirm the historic and present information needed.

Walk-over Site Survey

5.7.5 Walk-over site surveys were carried out to verify the desktop appraisal and to identify any contamination hotspots within the land requirement limit along the proposed alignment of BPR, PBF, SBF and the checkpoints to be replaced, constructed and removed. All accessible area were visited as far as practicable to collect information about the current conditions,

land uses, activities undertaking within the land requirement limit. Photographs were taken wherever possible and presented in **Appendix E-2**.

Potential for land contamination

Desktop Appraisal

5.7.6 Aerial photographs from 1940s to 2006, whichever available in the APL of CEDD, were studied. The historical aerial photos covering the land requirement limit were reviewed and the land use was evaluated as summarized in **Table 5-1.**

Table 5-1 Reviewed Historical Aerial Photographs and Land Use in the Land Requirement Limit

Section 1			
Year	**Ref. No**	**Height (ft)**	**Land Use**
1949	Y02582, Y02584-Y02585	8000	Intertidal mudflat
1986	A07477	4000	Road, Checkpoint
1995	CN10607, CN10523R	3000	Road, Checkpoint
2000	CN27657R, CN27659R	3000	Road, Checkpoint
2002	CW42719, CW42740R	4000	Road, Checkpoint
2004	CW54625R	20000	Road
Section 2			
Year	**Ref. No**	**Height (ft)**	**Land Use**
1973	4779-4780, 4786-4787	6000	Road near fish pond and agricultural land
1986	A06238, A06240	4000	Road, Checkpoint
1995	CN10523R, CN10467R-CN10468	3000	Road, Shenzhen River, DSD Maintenance Access
2000	CN27661R,CN27663R, CN27665, CN27667R	3000	Road, DSD Maintenance Access, Checkpoint
2002	CW42710R, CW42713R, CW42715R	4000	Road, DSD Maintenance Access
2004	CW54625R-CW54626R	20000	Road, DSD Maintenance Access
Section 3			
Year	**Ref. No**	**Height (ft)**	**Land Use**
1986	A05593-A05594	4000	Grassland (Proposed PBR near Pak Fu Shan), Road (Existing PBR)
1993	A34391R-A34393R, A36402R-A36403R	4000	Road (Man Kam To to Muk Wu Nga Yiu, Ta Kwu Ling to Chuk Yuen), Checkpoint, Grassland and Shenzhen River
1995	CN10421R-CN10422R	3000	Road (Ma Kam To to Lo Shue Ling)
2000	CN28518R, CN28523R, CN28527R, CN28530R	4000	Road (Lo Wu to Chuk Yuen), Checkpoint
2002	CW42701R, CW42703R, CW42704R, CW42706R, CW42708R	4000	Road (Lo Wu to Chuk Yuen), Checkpoint
2004	CW54652R, CW54626R	20000	Road, Grassland, Checkpoint
Section 4			

Year	Ref. No	Height (ft)	Land Use
1986	A05584	4000	Road near Sha Tau Kok Control Point, Grassland
1995	CN10423R	3000	Road near Sha Tau Kok Control Point
2002	CW42795R	4000	Road near Sha Tau Kok Control Point

5.7.7 From the aerial photos available, the area of Section 1, Mai Po, was still intertidal mudflat and rural area in the 1940s, while boundary patrol road was found from the photos taken in 1980s. For the remaining Section 2, 3 and 4, upon the photos from 1970s or 1980s, the existing boundary patrol can be identified easily. No recognised industries with potential for causing land contamination as listed in the EPD Guidance Note were found within or in the vicinity of the land requirement limit of construction, removal and replacement of the Boundary Fences and Checkpoints. Detailed alignment and land requirement plan are shown in the Contamination Assessment Plan (CAP) submitted to and reviewed by EPD in December 2008.

5.7.8 Most of the area along the proposed alignment of boundary fences was used as road and checkpoints throughout at least the last 20 years, since 1986. Aerial photographs of parts of the study area were missing or not available in the APL, especially those from 1950s to early 1980s. There was no photo-taking within those areas for that period of time according to the photograph index in the APL, while some were borrowed by other parties.

5.7.9 To fill in the information gap of the aerial photograph study, questionnaires were sent to the DSD and HKPF, which the Project area is under their jurisdiction, for the land use history and possible contamination within the Project area. The questionnaire and reply from the DSD and HKPF are shown in **Appendix E-1B** and **E-1C**.

5.7.10 A nil return as per the questionnaire mentioned in Section 5.7.9 was received from DSD in June 2008 regarding the possible site contamination and land use history of the area of the existing maintenance access along the Shenzhen River bank to the north of the Lok Ma Chau Loop and Hoo Hok Wai, where a new Boundary Patrol Road and Boundary Fences are proposed to be built. The questionnaire was sent again and reply from DSD was received in September 2008 (**Appendix E-1B**). The existing maintenance access along the Shenzhen River to the north of the Lok Ma Chau was formed under the Shenzhen River Regulation Project Stage 1 while section to the north of Hoo Hok Wai was formed under the Shenzhen River Regulation Project Contract A of Stage 2 and the access have been used since 1997. Under the Shenzhen River Regulation Project (Stage I & II), there is no record of land contamination over the area of the existing maintenance access shown on the Project plan. Most of the land used for the river regulation project was originally fish ponds or landscaping areas. Although the Lok Ma Chau Loop area was filled by contaminated and uncontaminated mud dredged from the old Shenzhen River, the maintenance access was constructed on the embankment formed only by uncontaminated materials. As the works of this Project will only carry out within the required land limit, where limited to the maintenance access, the potential land contamination and hazardous risks are expected to be low.

5.7.11 According to the HKPF, the land use of the area before BPR was rural area immediately due south of the boundary with no specific land use, while the area used as checkpoints were

rural area within the FCA. The BPR is situated at the boundary between Hong Kong Special Administration Region and Shenzhen while the area located south of the boundary is declared as Closed Area under the Public Order Ordinance, CAP 245 since 1951. For the Checkpoints studied in this assessment, except the "Gate One" Checkpoint, are used to control the access to the FCA. In 1979, British Army units were stationed on the Sino-British border to bolster hard-pressed policeman after a worrying illegal immigration. The BPR and the Checkpoints involved in this Project, except "Gate One" Checkpoint, were built by the British Army along with the old border fence and other security features, such as the observation towers. The Hong Kong Police Force formally took over the BPR and Checkpoints together with other security facilities from the British Army in 1990. After taken over by the Police, materials listed in the questionnaire had not been used, stored or generated in the land requirement limit of boundary patrol road. As to the Checkpoints, only anti-corrosive paints have been used on the drop bars and associated metalwork and electrical wiring for the supply of electricity. Based on the information provided, the area was rural area within FCA with no specific use before taken over by the HKPF. As such, there is no indication of concerned industrial activities and usage, storage or generation of concerned materials listed in the Questionnaire leading to land contamination. The potential land contamination is therefore anticipated to be low.

Walk-over Site Survey

5.7.12 Walk-over site surveys have been conducted to verify the desk-top appraisal of the current land use of the land requirement limit. Surveys confirmed that majority of the alignment of the Boundary Patrol Road is primarily fenced off by a boundary fence which runs mainly along the northern side of the BPR as shown in **Plate 1 – Plate 3** of **Appendix E-2**. Along the edge of BPR, steep slopes, marshland, fish ponds and private agricultural and poultry farm are commonly found. For the Section 4, the land requirement limit, where the new BPR and boundary fences to be built, is used as road paved with concrete (**Plate 4** of **Appendix E-2**). No visible oil or chemical stains were observed during the site survey.

5.7.13 The area along the Shenzhen River bank to the north of the Lok Ma Chau Loop and Hoo Hok Wai is an existing maintenance services road of Drainage Services Department (**Plate 5** of **Appendix E-2**). No visible sign of industrial activity was noted. The area at the Shenzhen River side to the north Pak Fu Shan and northwest of Lin Ma Hang Village are undeveloped rural areas, which were not accessible during the site surveys (**Plate 6** of **Appendix E-2**). The possibility of land contamination in these two areas is considered to be low as there is no recognised industrial land use history.

5.7.14 The Pak Hok Chau Checkpoint, which is proposed to be replaced in the Project, is no longer manned according to the HKPF and our site survey. It is located at the border roadside in the plantation / woodland area of Mai Po as shown in **Plate 7** of **Appendix E-2.**

5.7.15 For the checkpoints proposed to be removed, Lok Ma Chau Checkpoint and Shek Chung Au Checkpoint are located next to the plantation / woodland area at the roadside (**Plate 8** and **Plate 9** of **Appendix E-2**). Ping Che Checkpoint is located next to grassland area (**Plate 10** of **Appendix E-2**) while the Sha Ling Checkpoint is located in the middle of the road with other surface structures, including the shelter, located next to an open storage area (**Plate 11** of **Appendix E-2**). The footings of these Checkpoints would be removed and therefore, limited excavation, approximately 0.3m in depth, will be involved. The land requirement

limit for the demolition is estimated to be less than 1m around the surface structures of the Checkpoints to be removed. Without any recognised industrial use of the areas, the possibility of land contamination is anticipated as low.

5.7.16 For the new "Gate One" Checkpoint, the area for the surface structures, including the shelter, is currently used as road with concrete paving as shown in **Plate 12 and Plate 13** of **Appendix E-2**. No visible oil or chemical stains were observed in the land requirement limit. Minor excavation, approximately 0.3m in depth will be involved for the construction of footings. Potential land contamination and hazardous risks are expected to be low.

Prediction and Evaluation of Environmental Impacts

5.7.17 Based on the findings from the desktop appraisal and walk-over site survey, no contaminated sites and industrial activities were identified within or in vicinity of the land requirement limit of the Project. The potential land contamination by previous land use as rural area is anticipated to be minimal. In the operational phase, no industrial activities will be carried out and the completed boundary patrol road will be concrete-paved. The likelihood of land contamination as a result of the boundary fence operation is expected to be minimal. Hence, no adverse environmental impacts on land contamination for the Project are predicted in both construction and operational phase.

5.7.18 A Contamination Assessment Plan, which included the aerial photos studied, detailed alignment and land requirement plan, has been subitted to and reviewed by EPD in December 2008.

5.8 Environmental Monitoring and Audit Requirements

5.8.1 It is recommended that auditing of each waste stream should be carried out periodically to determine if wastes are managed in accordance with approved procedures and the site waste management plan. The audits should look at all aspects of waste management including waste generation, storage, recycling, treatment, transport and disposal. An appropriate audit programme would be defined as the commencement of any related physical activity undertaken within the Project Area boundary.

5.9 Conclusions

Site construction waste

5.9.1 The construction activities generate waste types include site clearance, C&D material, chemical waste from the maintenance of construction plant and equipment and general refuse from the workforce. Provided that these wastes are maximally reused, handled, transported and disposed of using approved methods and that the recommended good site practices are followed, adverse environmental impacts are not expected during the construction phase.

5.9.2 During operation phase, only small amount of general refuse is expected to be generated and therefore no adverse environmental impact is expected provided that they are stored and disposed properly.

Land contamination

5.9.3 Based on the available information and results of the desktop appraisal together with the walk-over site survey, potential land contamination for this Project is expected to be insignificant. No adverse environmental impact is expected during operational phase. No further site investigations or laboratory testing are proposed.

6 ECOLOGICAL IMPACT ASSESSMENT

6.1 Introduction

6.1.1 This Chapter describes the ecological profile of the assessment area for the ecological impact assessment of the potential impacts that may arise from the construction and operation of the secondary boundary fence, the demolition and relocation of some sections of the primary boundary fence, boundary patrol roads and checkpoints.

6.1.2 The objectives of this ecological assessment are as follows:

- to establish an ecological baseline for the boundary fence project study area, focusing on key habitats and species present;
- to assess the ecological impacts of the proposed fencing works;
- to recommend ecological mitigation measures to reduce or eliminate significant impacts. The order of priority of these measures should be: avoidance, minimization, compensation; and
- to determine whether residual impacts are acceptable.

6.2 Assessment Area

6.2.1 The Assessment Area for ecological surveys covered an area of 500 m radius around the proposed alignment of the construction of the boundary fence, patrol roads and the removal of primary fence in some sections (**Figure 6.1**).

6.2.2 Methodology and the transect routes for fauna survey of the ecological baseline assessment are presented in **Appendix F-1** and **Figure F1** in **Appendix F**.

6.3 Sites of Conservation Importance in the Area

Wetland Conservation Area (WCA)

6.3.1 In order to to conserve the ecological value of the existing contiguous and adjoining active/abandoned fishponds in the landward part of the Ramsar, a Wetland Conservation Area (WCA) was designated by the Town Planning Board (TPB PG-No. 12B) to maintain the ecological vlue of the fishponds which form an integral part of the wetland ecosystem in the Deep Bay Area. It also mitigates the negative impact arising from undesirable land uses and human disturbance, by protecting the ecological resources of the wetland and fishponds and conserves the integrity of the Deep Bay wetland ecosystem. The Mai Po fishponds, ecological mitigation area at Sham Po Shue and part of the Lok Ma Chau fishpond areas are fall within WCA of the Assessment Area. This habitat is an important foraging site for waterbird species, including the globally threathened Black-faced Spoonbill *Platalea minor* and the ardeids breeding at ajacent egreties.

Wetland Buffer Area (WBA)

6.3.2 The Wetland Buffer Area is a buffer area of about 500m landward of the WCA boundary. A substantial number of the fishponds within the WBA have been filled or degraded by the presence of open storage use. These degraded areas may be considered as target areas to

allow an appropriate level of residential/recreational development so as to provide an incentive to restore some of the lost fishponds (Town Planning Board, 1999). The Assessment Area around Lok Ma Chau and Tai Law Hau are within the WBA, which cover hillside grassland, wet agricultural land and villages.

Mai Po Inner Deep Bay Ramsar Site

6.3.3 *The Mai Po Inner Deep Bay Ramsar Site* covers the Mai Po Marshes SSSI (**Figure 6.1**), the Inner Deep Bay area and the inter-tidal mudflats with 1,500 hectares of wetlands. It was designated as a "Wetland of International Importance" under the Ramsar Convention on 4 September 1995. The Ramsar Site is a natural shallow estuarine area, with extensive inter-tidal mudflats, dwarf mangroves, gei wai and fishponds. These wetlands provide a wide range of habitats to support a high diversity of fauna (Tsim and Lock, 2002), including some rare mammals and restricted-range invertebrates. This habitat is particularly important to migratory waterbirds for roosting and feeding. More than 40,000 waterbirds including a number of globally threatened species stop-over or overwinter at this wetland annually. Moreover, at least 28 globally threatened bird species, including 3 critically endangered, have been recorded in the Ramsar Site.

Mai Po Nature Reserve

6.3.4 The Mai Po Nature Reserve is situated inside the Mai Po Marsh SSSI which was designated in 1976. Since 1983, World Wide Fund for Nature Hong Kong (WWFHK) have assisted the Hong Kong Government in managing the Nature Reserve (some 380 ha) in particular habitat and visitor facility management (Tsim *et al*, 2002). The man-made gei wai provide a valuable feeding and nesting habitat for vaious wildlife species and especially important to the migratory waterbirds including the globally threatened Black-faced Spoonbill *Platalea minor*.

Mai Po Marshes SSSI

6.3.5 Mai Po Marshes SSSI contains 393 hectares of marsh, of which 53% of the marshes are gei wai. These marshes contain the largest and most important dwarf mangrove in Hong Kong. In addition, the gei wai also provides both feeding and nesting habitats for various waterbirds.

Tam Kon Chau Egretry

6.3.6 Egretry count by Agriculture, Fisheries and Conservation Department (AFCD) in 2007 recorded 26 breeding pairs of Chinese Pond Heron at Tam Kon Chau Egretry, which comprises 9.1% of the total active nest for Chinese Pond Heron of that year (Annon, 2007c). All nests at the Tam Kon Chau colonies were built on Banyan trees (*Ficus microcarpa*).

Ecological Mitigation Area at Yuen Leng Chai

6.3.7 Two fishponds temporarily affected by the construction works of the Shenzhen River Regulation Project Stage 3 (near Yuen Leng Chai) were restored and enhanced after the completion of the construction works as an ecological mitigation measure.

Lok Ma Chau Loop

6.3.8 Lok Ma Chau (LMC) Loop is located at the direct vicinity of WCA and WBA. The wetland west of the LMC Loop and the area south of the Loop were designated by the Town Planning Board (TPB) as WCA and WBA respectively in order to retain the ecological integrity of the Deep Bay wetland ecosystem and avoid adverse impacts of development which may possibly affect the Mai Po Inner Deep Bay Ramsar Site (No. 32 Working Paper of HK2030). The LMC Loop was previously used as dumping site for soft sediment, about 1 million m^3 of the Loop is contaminated. It has been reinstated to form part of the mitigation area for the loss of fishpond due to the training of Shenzhen River.

Hoo Hok Wai and Ta Sha Lok

6.3.9 Hoo Hok Wai and Ta Sha Lok cover the wetland area with large number of active fishponds, reinstated ponds for the Shenzhen River Stage 2 Project and marshes. These habitats provide feeding and roosting grounds for a variety of wetland fauna especially waterbirds and dragonflies are not within but adjacent to the Wetland Buffer Area. It was identified as an area of conservation importance under the Land Use Planning for the Closed Area (Planning Department, 2008).

Lin Ma Hang Lead Mines Site of Special Scientific Interest (SSSI)

6.3.10 The site is situated on a hillside near San Kwai Tin northeast of the Lin Ma Hang. Lin Ma Hang Lead Mines SSSI was recognized as the most important resting and breeding roost site for Greater Bent-winged Bat *Miniopterus magnater* and Lesser Bent-winged Bat *Miniopterus pusillus*. Endangered species Common Bent-winged Bat *Miniopterus schreibersii* listed in IUCN and China Red Data Book was also recorded (Shek and Chan, 2005). Other uncommon species to be found in the area included Intermediate Horseshoe Bat *Rhinolophus affinus*, Least Horseshoe Bat *Rhinolophus pusillus*, Rickett's Big-footed Bat *Myotis ricketti* and Chinese Myotis *Myotis chinensis* (Shek and Chan, 2005).

Lin Ma Hang Stream SSSI

6.3.11 Lin Ma Hang Stream is listed as one of the Ecologically Important Stream (EIS) in the ETWB Technical Circular No. 5/2005 and was designated as a Site of Special Scientific Interest (SSSI) due to the rich in freshwater fish records (**Figure 6.1**). The stream supports 15 species of primary freshwater fishes including several species of conservation concern *Channa asiatica, Mastacembelus armatus, Rasbora steineri* and *Rasborinus lineatus* (DSD, 2007). It also supports some common but local concerned species (Fellowes *et al.,* 2002), which includes Sapphire Flutterer (*Rhyothemis triangularis*) and Dancing Shadow-emerald (*Idionyx victor*). Butterfly of conservation concern found included Glassy Bluebottle (*Graphium cloanthus*), Small Grass Yellow (*Eurema brigitta*), Centaur Oak Blue (*Arhopala pseudocentaurus*) (KFBG, 2004). Wetland-dependent herpetofauna species, Chinese Waterside Skink (*Tropidophorus sinicus*) was also reported from the stream.

Further Study

6.3.12 Although some ecological baseline and sites of conservation importance were identified, the large Assessment Area in particular Hoo Hok Wai and Yuen Leng Chai has limited

information available. Therefore detailed ecological surveys were carried out in accordance with the methodology set out in **Appendix F-1** to fill the information gap.

6.4 Ecological Baseline

Overview of Ecological Profile of 500m Assessment Area

6.4.1 A habitat survey was conducted within the Assessment Area (**Figures 6.2-6.9**). A total of 15 types of habitat were identified:

- Woodland;
- Shrubland;
- Plantation;
- Gei Wai;
- Mangrove;
- Pond;
- Marsh;
- Wet Agricultural Land;
- Dry Agricultural Land;
- Abandoned Agricultural Land / Low-lying Grassland;
- Hillside Grassland;
- Stream / River;
- Drainage Channel;
- Open Field;
- Developed Area.

6.4.2 The areas of each habitat type within the Assessment Area and Project Area are listed in **Table 6-1** and **Table 6-2** respectively. Project Area refers to the proposed land required for the construction works.

Table 6-1 Habitats present in Assessment Area

Habitat	Project Area	
	Area (ha)	%
Woodland	80.4	3.2
Shrubland	35.4	1.4
Plantation	91.7	3.6
Gei Wai	22.4	0.9
Mangrove	1.3	0.1
Pond	389.6	15.5
Marsh	106.8	4.2
Wet Agricultural Land	13.2	0.5
Dry Agricultural Land	32.4	1.3
Abandoned Agricultural Land / Low-lying Grassland	310.0	12.3
Hillside Grassland	318.9	12.7
Stream / River	38.2	1.5
Drainage Channel	140.2	5.6
Open Field	4.3	0.2

Habitat	Project Area	
	Area (ha)	%
Developed Area	933.9	37.1
Total	**2519.1**	**100**

Table 6-2 Habitats present in Project Area

Habitat	Project Area	
	Area (ha)	%
Woodland	0	0.0
Shrubland	0	0.0
Plantation	0	0.0
Mangrove	0	0.0
Pond	0	0.0
Marsh	0	0.0
Wet Agricultural Land	0	0.0
Dry Agricultural Land	0	0.0
Abandoned Agricultural Land / Low-lying Grassland	5.9	26.3
Hillside Grassland	0	0.0
Stream / River	0	0.0
Drainage Channel	0	0.0
Open Field	0.1	0.5
Developed Area	16.4	73.2
Total	**22.4**	**100**

6.4.3 Representative photographs of each type of habitats are illustrated in **Plates F1-F15** in **Appendix F**.

Woodland

6.4.4 Majority of the woodlands within the Assessment Area is secondary woodland, with few fung shui woods behind some rural villages.

6.4.5 Several secondary woodlands located along the existing patrol roads, which includes woodlands near Liu Pok, Man Kam To Boundary Crossing and Pak Fu Shan.

6.4.6 Five fung shui woods were identified within the Assessment Area. Fung Shui Woods refer to woodlands preserved by the villagers for traditional fung shui beliefs. These fung shui woods situated behind rural villages Kan Tau Wai, Tsung Yuen Ha, Sheung Tam Shui Hang, Shan Tsui and Lin Ma Hang. Most of these fung shui woods located far away from the alignment of at least 200m. Shan Tsui fung shui wood is located about 150m away from the proposed alignment.

6.4.7 Dominant species are native tree and shrub species such as *Aquilaria sinensis, Aporusa dioica, Celtis sinensis, Cinnamomum camphora, Cratoxylum cochinchinense, Mallotus paniculatus, Schefflera heptaphylla, Schima superba, Psychotria asiatica* and *Uvaria macrophylla.*

Shrubland

6.4.8 Shrubland is a subsequent succession stage of grassland. Most of these habitats are located along hillside where human disturbance particularly hill fire due to Chung Yeung Festival event is not serious.

6.4.9 Common shrubs include *Rhodomyrtus tomentosa, Melastoma candidum, Melastoma sanguineum, Ficus hirta, Litsea rotundifolia, Ilex asprella, Phyllanthus reticulates* and *Desmos chinensis* etc.

Plantation

6.4.10 Plantation is forest dominated by planted species for reforestation, landscape or fruit production purposes. Common plantation species include *Acacia auriculiformis, Acacia confusa, Lophostemon confertus, Casuarina equisetifolia, Clausena lansium, Dimocarpus longan, Litchi chinensis* and *Syzygium jambos*.

Gei Wai

6.4.11 Gei wai is a kind of inter-tidal pond traditionally managed for shrimp production. In the Assessment Area of the project, it can only be found at Mai Po (**Figure 6.3**). Dominant mangrove species include *Kandelia obovata, Avicennia marina* and *Aegiceras corniculatum,* while *Phragmites australis* and *Brachiaria mutica* are common species along the banks of the gei wai.

6.4.12 Gei wais in Mai Po Nature Reserve are internationally important to migratory waterbirds. A large variety of waterbirds can be found in gei wai habitat including the globally threatened species Black-faced Spoonbill *Platalea minor*. The high diversity of avifauna in this habitat is due to the low disturbance, high naturalness and good ecological linkage to Deep Bay ecosystem.

Mangrove

6.4.13 Only two small patches of mangrove were identified in Sha Tau Kok (**Figure 6.9**). Its plant composition is similar to other mangrove stands found in coastal areas along Starling Inlet. Dominant mangrove species are *Kandelia obovata, Avicennia marina* and *Aegiceras corniculatum*.

Pond

6.4.14 A large area of fishpond habitat is identified at Mai Po, San Tin, Lok Ma Chau and Hoo Hok Wai. Except those at Hoo Hok Wai, most of the ponds are within either WCA or WBA at Deep Bay areas.

6.4.15 Floral composition of this habitat is comparatively simple. Common species found along the pond bund and the slopes include *Brachiaria mutica, Phragmites australis, Panicum maximum* and *Cynodon dactylon*.

6.4.16 Due to its large and continuous area, the fishponds provide a good habitat for various groups

of wetland-dependent birds for both feeding and roosting. Different micro-habitats in the fishponds are utilized by birds of different foraging groups and thereby support a rich diversity of avifauna. The clear open fishpond area is also attractive to some raptors which are not wetland related in its natural habitat such as Bonelli's Eagle *Hieraaetus fasciatus*.

6.4.17 The riparian vegetation and shallow water margin at the fishpond also provide microhabitats for dragonfly and herpetofauna species of conservation concern. Dragonfly species Scarlet Basker *Urothemis signata* and reptile species such as Many-banded Krait *Bungarus multicinctus multicinctus,* Chinese Cobra *Naja atra* and Burmese Python *Python molurus bivittatus* were recorded in this study.

Marsh

6.4.18 Marshes are mainly found in Hoo Hok Wai areas north of Ma Tso Lung. These marshes were originated from disused fishponds or agricultural lands. Dominant wetland plant species include *Colocasia esculenta, Ludwigia octovalvis, Phragmites australis, Brachiaria mutica, Commelina diffusa* and *Cyclosorus interruptus*.

6.4.19 This kind of habitat is favourable to a certain kind of freshwater wetland birds such as Yellow Bittern *Ixobrychus sinensis* and Greater Painted Snipe *Rostratula benghalensis.* A dragonfly species of local concern Sapphire Flutterer *Rhyothemis triangularis* was recorded in the marsh habitat.

Wet Agricultural Land

6.4.20 Wet agricultural lands were recorded at Lok Ma Chau Village and Chow Tin Tsuen. Major crops include *Ipomoea aquatica* and *Nasturtium officinale*. These would be favourable habitat to a certain species of freshwater wetland birds such as Wood Sandpiper *Tringa glareola*, Green Sandpiper *Tringa ochropus*, Long-toed Stint *Calidris subminuta* and Temminck's Stint *Calidris temminckii*.

Dry Agricultural Land

6.4.21 These are also artificial habitats for crop production. They occur in small patches near the rural villages within the Assessment Area. Common crops observed during surveys included *Lactuca sativa, Brassica parachinensis, Brassica chinensis, Colocasia esculenta, Apium graveolens* and *Daucus carota*.

Abandoned Agricultural Land / Low-lying Grassland

6.4.22 These habitats were originated from agricultural lands after abandonment and are common in the areas between Ma Tso Lung and Sha Tau Kok via Man Kam To, Ta Kwu Leng and Lin Ma Hang.

6.4.23 Common plant species include *Ipomoea cairica, Brachiaria mutica, Conyza bonariensis, Bidens alba, Amaranthus viridis, Ipomoea triloba, Emilia sonchifolia, Youngia japonica, Mikania micrantha, Mimosa pudica, Polygonum chinense, Scoparia dulcis, Solanum nigrum, Panicum maximum* and *Cynodon dactylon* etc.

Hillside Grassland

6.4.24 This is the dominant habitat on the hill range along the southern edge of the Assessment Area. The grasslands are maintained by frequent hill fire and can be rapidly replaced by shrubs when fires are prevented. Common grass species include *Arundinella* sp., *Eulalia* sp., and *Ischaemum* sp.

Stream / River

6.4.25 The longest river within the Assessment Area is the unchannelised section of Shenzhen River at its uppercourse. The Lin Ma Hang Stream is an ecologically important tributary of the unchannelised Shenzhen River. Others also include ditches within the fishpond areas at San Tin.

6.4.26 Dominant plant species along the streams and ditches are common riparian vegetation such as *Brachiaria mutica, Commelina diffusa, Pennisetum purpureum, Alocasia odora* and *Rumex trisetifer*.

6.4.27 Common lowland fish species recorded in streams and ditches include Chinese Barb *Puntius semifasciolatus*, Gupy *Poecilia reticulata* and the exotic species Mosquito Fish *Gambusia affinis* and Nile Tilapia *Oreochromis niloticus*.

Drainage Channel

6.4.28 Major drainage channels include the channelised Shenzhen River, lower course of the Ng Tung River, Ping Yuen River and Tam Shui Hang. Common riparian plants found on the concrete banks include *Brachiaria mutica, Commelina diffusa, Phragmites australis* and *Sesbania javanica*.

6.4.29 Due to its close ecological linkage to Deep Bay mudflat, the downstream Mai Po-San Tin section of the channelized Shenzhen River is rich in bird diversity. The exposed mudflats along both sides of the channel provide a foraging habitat for ardeids and waders. Those birds common in Inner Deep Bay Mudflat can also be found in this section of Shenzhen River

Open Field

6.4.30 This habitat type refers to those open areas with compacted and exposed soil where limited coverage of vegetation is found. Dominant plant species usually are those common weeds such as *Rhynchelytrum repens, Bidens alba, Panicum maximum, Mikania micrantha* and *Cynodon dactylon*.

Developed Area

6.4.31 These are habitats under heavy human disturbance and mainly consist of village houses, residential estates, infrastructures, construction sites and container yards.

6.4.32 This is the dominant land use type in the Assessment Area at Shenzhen.

Ecological Profile of the Four Proposed Sections

6.4.33 Ecological profiles of each section of the proposed alignment are described below separately.

Ecological Profile of Section 1 (Mai Po-San Tin)

Habitat & Vegetation

6.4.34 As shown in **Figure 6.1- 6.4,** this section runs on the existing boundary patrol road at Mai Po-San Tin area. This Mai Po-San Tin area is characterized by the high dominance of the pond habitat.

6.4.35 Ponds (fishponds) are the major habitats within the Assessment Area of this section. Almost all of the ponds in this section are within the Wetland Conservation Area designated by Town Planning Board to promote preservation of the integrity of the ecological function of these ponds. These ponds are recognised important feeding and roosting grounds for a variety of waterbird species. A few ponds are located within the boundary of Mai Po Nature Reserve, Mai Po Marsh SSSI and Mai Po Inner Deep Bay Ramsar Site at the west end of the Assessment Area.

6.4.36 Few gei wais are located at the western end of the Assessment Area. These gei wais are now managed by World Wide Fund Hong Kong (WWF) to maintain the ecological value of the nature reserve.

6.4.37 Beside from gei wai, wetland habitat found in this section also include fishpond associated habitat such as abandoned fishponds originated marshes and artificially modified streams. Although these habitats are not naturally established, they could provide refuge and feeding grounds for some waterbirds such as White-breasted Waterhen and Green Sandpiper.

6.4.38 The channelised Shenzhen River runs along the Hong Kong – Shenzhen Boundary and the proposed project alignment. Another drainage channel is the Shek Sheung River east of the Lok Ma Chau MTR Station.

6.4.39 Open fields are areas of exposed soil and dominated by common wasteland weeds such as *Rhynchelytrum repens, Bidens alba* and *Cynodon dactylon*. Developed areas in this section refer to the existing roads, the Lok Ma Chau MTR station, the Shenzhen Town and some rural villages.

6.4.40 The Project Area of this section is proposed on the existing boundary patrol road from the existing Pak Hok Chau Check point to Lok Ma Chau Railway Station (**Figure 6.3-6.4**). In terms of habitat type, the Project Area will cover mainly developed area (i.e. road) and some open fields (i.e. some exposed soil vegetated with roadside plants). A total of 74 species were identified within the Project Area of Section 1. Dominant species include *Panicum maximum, Bidens alba, Cynodon dactylon, Pennisetum purpureum, Brachiaria mutica, Hibiscus tiliaceus, Leucaena leucocephala, Cleistocalyx operculatus* and *Casuarina equisetifolia*. *Ipomoea cairica, Paederia scandens* and *Mikania micrantha* are common climbers along this section.

6.4.41 Neither protected nor rare plant species were identified. The plant list of the Project Area of

Section 1 is presented in **Table F-1a** in **Appendix F**.

Fauna

6.4.42 This section covers the area of Mai Po (T1_MP refer to Figure F1 of Appendix F) and San Tin (T2_SPS). The ecological baseline findings of fauna survey are described below.

Mammals

6.4.43 A total of three mammal species was recorded in the Mai Po fishponds and Ecological Mitigation Area at Lok Ma Chau during mammal surveys. Two bat species were seen during night-time surveys foraging over the fishponds and 10 Brown Rat *Rattus norvegicus* were found dead along the footpaths at fishpond bunds on 20 June 2008.

6.4.44 The Brown Rat is an introduced species and human commensal throughout urban areas. It is widespread and prefers moist habitat types (Shek, 2006).

6.4.45 The two bat species were suspected to be Japanese Pipistrelle *Pipistrellus abramus* and Lesser Yellow Bat *Scotophilus kuhlii* which were previously recorded in the Mai Po Nature Reserve (Chan and Shek, 2006). Japanese Pipistrelle, a very common bat species in wetland countryside and urban areas of Hong Kong, is not of conservation importance. Lesser Yellow Bat is an uncommon species but with common roosting preferences as Japanese Pipistrelle that often roosts in the attics of houses. They also roosts under modified fronds of palm trees, holes in walls or abandoned bird nest (Chan and Shek, 2006). This species has a fairly wide distribution in Hong Kong, the colony sizes range from a few to hundreds of individuals (Shek, 2006). The abundance of the bats was from few to around 30 individuals foraging over the fishponds and around the lights along the boundary patrol road.

6.4.46 The previous records of Eurasian Otter *Lutra lutra chinensis* in the Mai Po Inner Deep Bay Ramsar Site and nearby region was not recorded in this study. This species has a highly restricted distribution which inhabits terrestrial areas adjacent to ponds, streams, coastal areas and rivers. It is protected under the Wild Animals Protection Ordinance (Cap. 170) and the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). It is also listing in the IUCN Red List as Lower Risk/ Near Threatened; in the China Red Data Book as “Vulnerable” and in the CITES.

Birds

6.4.47 The avifauna in this section is dominated by wetland-dependent species as a result of wide variety of wetland habitat. Different groups of waterbirds such as ducks, ardeids, cormorant, spoonbills, bitterns and warders can be found at gei wai and mangrove inside Mai Po Nature Reserve. The nearby fishponds and channelized Shenzhen River are also rich in waterbird diversity due to its close ecology linkage to Inner Deep Bay ecosystem. Besides from waterbirds, a number of raptor species were recorded in this area including the globally threatened species Imperial Eagle *Aquila heliaca*. A patch of woodland in Tam Kon Chau was identified as ecological important as it is used by Chinese Pond Heron *Ardeola bacchus* as a breeding site, egrety.

Results of transect survey

6.4.48 A total of 63 species was recorded during the transect surveys in Section 1, of which 23 species are of conservation importance including the globally threatened species Black-faced Spoonbill *Platalea minor*. A full list of species recorded is given in **Table F-1b** in **Appendix F**. The species recorded in the Assessment Area are mainly typical fishpond birds, of which 31 species account for 50 percent of the list are wetland-dependent birds.

Table 6-3 Mean of individuals of bird species of conservation concern and wetland-dependent bird species recorded during transect survey in Section 1 Assessment Area, Nov 2007 - Oct 2008. (Level of Concern based on Fellowes *et al.* 2002)

Common Name	Level of Concern	Wetland-dependent	Mean#
Little Grebe *Tachybaptus ruficollis*	LC	Y	3.11
Great Cormorant *Phalacrocorax carbo*	PRC	Y	29.67
Grey Heron *Ardea cinerea*	PRC	Y	21.00
Great Egret *Egretta alba*	PRC(RC)	Y	40.78
Intermediate Egret *Egretta intermedia*	RC	Y	0.11
Little Egret *Egretta garzetta*	PRC(RC)	Y	40.00
Cattle Egret *Bubulcus ibis*	(LC)	Y	0.11
Chinese Pond Heron *Ardeola bacchus*	PRC(RC)	Y	7.00
Black-crowned Night Heron *Nycticorax nycticorax*	(LC)	Y	0.44
Black-faced Spoonbill *Platalea minor*	PGC	Y	1.00
Eurasian Wigeon *Anas penelope*	RC	Y	18.11
Common Teal *Anas crecca*	RC	Y	1.56
Northern Pintail *Anas acuta*	RC	Y	33.33
Northern Shoveler *Anas clypeata*	RC	Y	0.11
Osprey *Pandion haliaetus*	RC	Y	0.11
Black Kite *Milvus migrans*	(RC)	N	6.00

Common Name	Level of Concern	Wetland-dependent	Mean#
White-breasted Waterhen *Amaurornis phoenicurus*	-	Y	1.44
Common moorhen *Gallinula chloropus*	-	Y	4.22
Little Ringed Plover *Charadrius dubius*	(LC)	Y	2.22
Green Sandpiper *Tringa ochropus*	-	Y	0.44
Wood Sandpiper *Tringa glareola*	LC	Y	2.44
Common Sandpiper *Actitis hypoleucos*	-	Y	7.44
Pacific Swift *Apus pacificus*	(LC)	N	0.33
Little Swift *Apus affinis*	-	Y	0.56
Pied Kingfisher *Ceryle rudis*	(LC)	Y	0.33
Common Kingfisher *Alcedo atthis*	-	Y	1.11
White-throated Kingfisher *Halcyon smyrnensis*	(LC)	Y	0.89
Barn Swallow *Hirundo rustica*	-	Y	20.00
Yellow Wagtail *Motacilla flava*	-	Y	3.78
Grey Wagtail *Motacilla cinerea*	-	Y	1.00
White Wagtail *Motacilla alba*	-	Y	9.78
Red-billed Starling *Sturnus sericeus*	(RC)*	Y	33.33
Collared Crow *Corvus torquatus*	LC	Y	0.22

Level of concern follows Fellowes *et al.*(2002): LC=Local Concern; RC=Regional Concern; GC=Global Concern; PRC=Potential Regional Concern; PGC=Potential Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
#Mean values given are the mean number recorded on all transects. This is included to reflect the regularity of a species in the study area.
*Red-billed Starling is considered by Fellowes et al. (2002) to be of Global Concern. Since then, the global population has been increasing and the species is not now considered globally threatened (BirdLife International 2008). A listing of Regional Concern (RC), based on the importance of the large roosts present near Deep Bay, is considered to be more appropriate.

Monthly monitoring of waterbirds at fishponds area by Hong Kong Bird Watching Society

6.4.49 The abundance and diversity of wetland-dependent birds utilizing fishponds in Deep Bay area are monthly surveyed by the Hong Kong Bird Watching Society as part of the long-term monitoring of the Ramsar Site for AFCD. The ponds within Section 1 Assessment Area largely lie into count area Tam Kon Chau (TKC), Mai Po San Tsuen (MPST),

Shenzhen River A (SRA) and partially lie into count area San Tin and Mai Po Nature Reserve (MPNR). The monitoring data was used to supplement data collected on the transect surveys. Some ponds of the count area lying just outside the Assessment Area are also used for analysis as they share the same habitat to the ponds within Assessment Area. However, the count of Mai Po Nature Reserve was not used as the data mainly describe the waterbirds at core gei wai habitat of the Reserve rather than the ponds at northeast side of the Reserve which lie into the Section 1 Assessment Area.

6.4.50 A checklist of wetland-dependent birds utilizing the fishpond and river area at Section 1 was obtained by summarizing five years waterbird monitoring data for count area at San Tin, Tam Kong Chau, Mai Po San Tsuen and Shenzhen River A (**Table 6-4**). A total of 76 wetland-dependent species was recorded at the area including 5 globally threatened species Lesser White-fronted Goose *Anser erythropus*, Oriental Stork *Ciconia boyciana*, Black-faced Spoonbill *Platalea minor*, Greater Spotted Eagle *Aquila clanga* and Imperial Eagle *Aquila heliaca.*

Table 6-4 Wetland-dependent bird species recorded in the Tam Kon Chau, Mai Po San Tsuen, San Tin and Shenzhen River A count area on monthly waterbird counts conducted by the Hong Kong Bird Watching Society, April 2003 - March2008 (data from Anon 2008, Anon 2007a, Anon 2007b, Anon 2006a, Anon 2006b, Anon 2005a, Anon 2005b, Anon 2004a, Yu 2004 and Yu 2003)

Common Name	Species Name	Level of Concern	IUCN 2008
Little Grebe	*Tachybaptus ruficollis*	LC	-
Great Crested Grebe	*Podiceps cristatus*	RC	-
Great Cormorant	*Phalacrocorax carbo*	PRC	-
Lesser White-fronted Goose	*Anser erythropus*	GC**	VU
Greater White-fronted Goose	*Anser albifrons*	-	-
Purple Heron	*Ardea purpurea*	RC	-
Grey Heron	*Ardea cinerea*	PRC	-
Great Egret	*Egretta alba*	PRC(RC)	-
Intermediate Egret	*Egretta intermedia*	RC	-
Little Egret	*Egretta garzetta*	PRC(RC)	-
Cattle Egret	*Bubulcus ibis*	(LC)	-
Chinese Pond Heron	*Ardeola bacchus*	PRC(RC)	-
Striated Heron	*Butorides striatus*	(LC)	-
Black-crowned Night Heron	*Nycticorax nycticorax*	(LC)	-
Yellow Bittern	*Ixobrychus sinensis*	(LC)	-
Oriental Stork	*Ciconia boyciana*	GC	EN
Eurasian Spoonbill	*Platalea leucorodia*	LC	-
Black-faced Spoonbill	*Platalea minor*	PGC	EN
Eurasian Wigeon	*Anas penelope*	RC	-
Falcated Duck	*Anas falcata*	RC	-
Common Teal	*Anas crecca*	RC	-
Greater Scaup	*Aythya marila*	-	-
Northern Pintail	*Anas acuta*	RC	-
Northern Shoveler	*Anas clypeata*	RC	-
Mallard	*Anas platyrhynchos*	RC	-
Spot-billed Duck	*Anas poceilorhyncha*	RC	-
Garganey	*Anas querquedula*	-	-
Tufted Duck	*Aythya fuligula*	LC	-
Osprey	*Pandion haliaetus*	RC	-
Black Kite	*Milvus migrans*	(RC)	-
Common buzzard	*Buteo buteo*	-	-
Crested Serpent Eagle	*Spilornis cheela*	(LC)	-
Eastern Marsh Harrier	*Circus spilonotus*	LC	-
Greater Spotted Eagle	*Aquila clanga*	GC	VU
Imperial Eagle	*Aquila heliaca*	GC	VU
White-bellied Sea Eagle	*Haliaeetus leucogaster*	GC	-
Common Kestrel	*Falco tinnunculus*	-	-
Peregrine Falcon	*Falco peregrinus*	(LC)	-
White-breasted Waterhen	*Amaurornis phoenicurus*	-	-

Common Name	Species Name	Level of Concern	IUCN 2008
Common Moorhen	*Gallinula chloropus*	-	-
Eurasian Coot	*Fulica atra*	RC	-
Watercock	*Gallicrex cinerea*	RC	-
Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	LC	-
Greater Painted-snipe	*Rostratula benghalensis*	LC	-
Black-winged Stilt	*Himantopus himantopus*	RC	-
Oriental Pratincole	*Glareola maldivarum*	LC	-
Pied Avocet	*Recurvirostra avosetta*	RC	-
Little Ringed Plover	*Charadrius dubius*	(LC)	-
Kentish Plover	*Charadrius alexandrinus*	RC	-
Greater Sand Plover	*Charadrius leschenaultii*	RC	-
Common Redshank	*Tringa totanus*	RC	-
Spotted Redshank	*Tringa erythropus*	RC	-
Common Greenshank	*Tringa nebularia*	RC	-
Red-necked Phalarope	*Phalaropus lobatus*	-	-
Green Sandpiper	*Tringa ochropus*	-	-
Wood Sandpiper	*Tringa glareola*	LC	-
Marsh Sandpiper	*Tringa stagnatilis*	RC	-
Common Sandpiper	*Actitis hypoleucos*	-	-
Common Snipe	*Gallinago gallinago*	-	-
Pintail Snipe	*Gallinago stenura*	-	-
Swinhoe's Snipe	*Gallinago megala*	LC	-
Little Stint	*Calidris minuta*	LC	-
Temminck's Stint	*Calidris temminckii*	LC	-
Long-toed Stint	*Calidris subminuta*	LC	-
Red-necked Stint	*Calidris ruficollis*	LC	-
Curlew Sandpiper	*Calidris ferruginea*	RC	-
Heuglin's Gull	*Larus heuglini*	LC	-
Black-headed Gull	*Larus ridibundus*	PRC	-
Whiskered Tern	*Chlidonias hybridus*	-	-
Gull-billed Tern	*Sterna nilotica*	-	-
Common Kingfisher	*Alcedo atthis*	-	-
Pied Kingfisher	*Ceryle rudis*	(LC)	-
White-throated Kingfisher	*Halcyon smyrnensis*	(LC)	-
Black-capped Kingfisher	*Halcyon pileata*	(LC)	-
Red-billed Starling	*Sturnus sericeus*	GC*	-
Collared Crow	*Corvus torquatus*	LC	-

Level of concern follows Fellowes *et al.*(2002): LC=Local Concern; RC=Regional Concern; GC=Global Concern; PRC=Potential Regional Concern; PGC=Potential Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.

*Red-billed Starling is considered by Fellowes *et al.* (2002) to be of Global Concern. Since then, the global population has been increasing and the species is not now considered globally threatened (BirdLife International 2008). A listing of Regional Concern (RC), based on the importance of the large roosts present near Deep Bay, is considered to be more appropriate.

**No rating was given to Lesser White-fronted Goose by Fellowes *et al.* (2002) but based on the estimate of its global population (BirdLife International 2008b), it is considered as Global Concern (GC).

Monitoring of Egretry

6.4.51 Deep Bay area is known for its importance to breeding egrets and herons (Young 1998). In 2007, the numbers of nests in the Deep Bay area accounted for 33.5% of the total in Hong Kong (Anon 2007). Active and abandoned egretries were identified and surveyed annually by the Hong Kong Bird Watching Society as part of the Ramsar Site Waterbird Monitoring Programme for AFCD. The only egretry lie within Section 1 Assessment Area is Tam Kon Chau Egretry (**Figure 6.1**).

6.4.52 Results of the monitoring data from 2003 to 2007 are summarized in **Table 6-5** to review the recent history of Tam Kon Chau Egrety which lies within Section 1 Assessment Area. Only Chinese Pond Heron utilized the site for breeding although the site was sometimes occupied by other ardeids for night roost during winter. The number of nests ranged from 23 to 47 accounted for 2.2 to 5.4 percent of total number of nests in Hong Kong from 2003-2007. The status of the egretry was confirmed on 8 May and 20 June 2008, when the egretry was still actively used by Chinese Pond Heron. All nests at the Tam Kon Chau colonies were built on Banyan trees *Ficus microcarpa*, in which both juveniles and breeding adults of Chinese Pond Heron were observed.

Table 6-5 Summary of Tam Kon Chau Egretry 2003-2007 (data from Anon 2007c, Anon 2006c, Anon 2005c, Anon 2004b and Wong 2003)

	2003	**2004**	**2005**	**2006**	**2007**
No. of nests	37	47	23	37	26
Percentage of nest in Hong Kong	3.2%	3.6%	2.2%	5.4%	5.1%

Herpetofauna

6.4.53 Six species of reptiles and amphibians were recorded in Section 1 during day and night surveys, in which only one species Many-banded Krait *Bungarus multicinctus multicinctus* is of conservation concern. Two individuals were observed along the pond bunds with vegetation covered on 19 August 2008 during the night survey. Many-banded Krait is stated as 'Vulnerable' in China Red Data Book and of 'Potential Regional Concern' (Fellowes *et al.* 2002). This species is widely distributed in the New Territories, Hong Kong Island and Lantau Island (Karsen, 1998). The relative abundance of the species recorded in Section 1 is summarised in **Table 6-6** below.

Table 6-6 Relative abundance of herpetofauna species recorded in Section 1

Species	Project Area	Assessment Area (other than Project Area)	Commonness	Level of Concern/ Protection Status
Asian Common Toad *(Bufo melanostictus)*	+	+++	Widely Distributed	
Gunther's Frog *(Rana guentheri)*	++	++++	Widely Distributed	
Chinese Gecko *(Gekko chinensis)*		++	Widely Distributed	
Common Blind Snake *(Ramphotyphlops braminus)*		+	Widely Distributed	
Many-banded Krait *(Bungarus multicinctus multicinctus)*		+	Widely Distributed	Listed as Vulnerable in China Red Data Book; Considered as Potential Regional Concern
Red-eared Slider *(Trachemys scripta elegans)*		+	Widely Distributed	

Note: +- 1-3; ++- 4-6; +++- 7-10; ++++- >10.

Dragonflies and Butterflies

6.4.54 There were ten species of odonata recorded in this Section with most of them found at wetland area such as fishpond, marshes and streams. None of them are considered as conservation concern. **Table 6-7** summarised the odonata species recorded in Section 1 during November 2007 to October 2008.

Table 6-7 Odonata species recorded in Section 1

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness
Asian Amberwing (*Brachythemis contaminata*)		4 (0.44)	Abundant and widely distributed
Blue Dasher *(Brachydiplax chalybea flavovittata)*		1 (0.11)	Common and widely distributed
Common Bluetail (*Ischnura senegalensis)*	1 (0.11)	20 (2.22)	Abundant and widely distributed
Common Flangetail *(Ictinogomphus pertinax)*		1 (0.11)	Abundant and widely distributed

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness
Crimson Darter *(Crocothemis servilia servilia)*		6 (0.67)	Abundant and widely distributed
Green Skimmer *(Orthetrum sabina sabina)*	3 (0.33)	81 (9)	Common and widely distributed
Orange-tailed Sprite *(Ceriagrion auranticum)*		21 (2.33)	Abundant and widely distributed
Saddlebag Glider *(Tramea virginia)*		9 (1)	Common and widely distributed
Variegated Flutterer *(Rhyothemis variegata)*	5 (0.56)	127 (14.11)	Common and widely distributed
Wandering Glider *(Pantala flavescens)*	47 (5.22)	104 (11.56)	Abundant and widely distributed

Note: Commonness follows Hong Kong Biodiversity Database (AFCD, 2006).

6.4.55 Eleven butterfly species were recorded in Section 1 during November 2007 to October 2008. Only 4 very common species, the Common Bluebottle, Common Grass Yellow, Indian Cabbage White and Pale Grass Blue of 1 or 2 individuals were recorded along the proposed works area. Most of the species recorded were along the riparian vegetation of fishpond bund, marshes, streams, grassland, plantation and developed area which are not within the Project Area. Most of the species recorded were along the riparian vegetation of fishpond bund, marshes, streams, grassland, plantation and developed area which are not within the Project Area. All the butterfly species recorded in this Section are common and widespread in Hong Kong. No species of conservation concern was recorded in this section. **Table 6-8** below summarised the butterfly species recorded in Section 1.

Table 6-8 Butterfly species recorded in Section 1

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness
Angled Castor *(Ariadne ariadne)*		1 (0.11)	Common and widely distributed
Common Bluebottle *(Graphium sarpedon)*	1 (0.11)	8 (0.89)	Common and widely distributed
Common Grass Yellow *(Eurema hecabe)*	2 (0.22)	4 (0.44)	Common and widely distributed
Common Mormon *(Papilio polytes)*		13 (1.44)	Common and widely distributed
Common Tiger *(Danaus genutia)*		3 (0.33)	Common and widely distributed
Dark-brand Bush Brown *(Mycalesis mineus)*		8 (0.89)	Common and widely distributed
Great Eggfly *(Hypolimnas bolina kezia)*		4 (0.44)	Common and widely distributed
Indian Cabbage White *(Pieris canidia)*	1 (0.11)	47 (5.22)	Common and widely distributed
Lemon Emigrant *(Catopsilia pomona)*		1 (0.11)	Common and widely distributed
Pale Grass Blue *(Zizeeria maha)*	1 (0.11)		Common and widely distributed
Red-base Jezebel *(Delias pasithoe)*		1 (0.11)	Common and widely distributed

Note: Commonness follows Hong Kong Biodiversity Database (AFCD, 2006).

Aquatic Fauna

6.4.56 Spotted Snakehead *Channa maculata,* Nile Tilapia *Oreochromis niloticus*, Big Head Carp *Aristichthys nobilis*, Common Carp *Cyprinus carpio* and Mosquito Fish *Gambusia affinis* were recorded in the Mai Po fishponds. The Spotted Snakehead and Nile Tilapia were found dead on 20 February 2008. Except Mosquito Fish is exotic species, all the other species are food fish in cultivated fishponds. No rare and species of conservation concern was recorded in this section.

Ecological Profile of Section 2 (Lok Ma Chau-Hoo Hok Wai)

Habitat & Vegetation

6.4.57 There are three proposed alignments within Section 2 (**Figure 6.1**). The green alignment is for removal of the existing boundary fence which running from Ha Wan Tsuen in Lok Ma Chau to Tak Yue Lau along the existing boundary patrol road; the short blue alignment at Ha Wan Tsuen is for construction of a secondary boundary fence; while the red Alignment

is for construction of new boundary patrol road, primary and secondary boundary fence which running from Ha Wan Tsuen to Tak Yue Lau along the existing maintenance access besides the re-aligned Shenzhen River.

6.4.58 As shown in **Figure 6.2**, this Lok Ma Chau-Hoo Hok Wai area is characterised by the large area of mixed wetland habitat of fishponds and freshwater marshes which are important feeding and roosting grounds of waterbirds. Similar to Section 1, the channelised Shenzhen River runs along the Hong Kong – Shenzhen Boundary. The Lok Ma Chau Bend is the remnant of the original section of Shenzhen River after the Shenzhen River training works, which surrounding the Lok Ma Chau Loop.

6.4.59 As described in *Section 6.3.7*, the Lok Ma Chau Loop was previously used as dumping site for soft sediment, about 1 million m^3 of the Loop is contaminated. It has been reinstated and largely covered with vegetation. Herbs and grasses commonly found in low-lying grassland and wasteland such as *Bidens alba, Wedelia trilobata, Neyraudia reynaudiana, Imperata koenigii* are dominant plant species. A freshwater marsh situated inside the Loop, which like those in Hoo Hok Wai, was derived from abandoned fishponds.

6.4.60 Hillside grasslands dominate the area south of the Lok Ma Chau Road. This type of habitat is maintained by frequent hill fires particularly during Ching Ming and Chung Yeung festivals. Woodlands and shrublands can be found along some downhill areas near Shun Yee San Tsuen and Liu Pok village. Common native plant species such as *Cinnamomum camphora, Celtis sinensis, Schefflera heptaphylla, Sterculia lanceolata* and *Microcos paniculata* were found. The Ma Tso Lung marsh and Liu Pok marsh were identified near these two villages. These marshes however are different from those marshes found at Hoo Hok Wai area that they are derived from abandoned agricultural lands rather than fishpond. Common plant species found in the secondary marsh include *Colocasia esculenta, Hedychium coronarium* and *Commelina diffusa*.

6.4.61 One area of wet agricultural land was also found within the Assessment Area south of the Lok Ma Chau Road (**Figure 6.4**). *Ipomoea aquatica* was the main crop of the agricultural land while few areas were found planting *Nelumbo nucifera*.

Green and Blue Alignment

6.4.62 The Project Area of the green and blue alignment runs along the existing Lok Ma Chau Road (**Figure 6.1**). In terms of habitat, this alignment only covers developed area (i.e. the existing Lok Ma Chau Road) (**Figure 6.4-6.5**).

6.4.63 A total of 237 plant species were identified within the Project Area of the green and blue alignment in Section 2. Dominant plant species include *Microstegium ciliatum, Bidens alba, Lantana camara, Ficus hispida, Microcos paniculata, Ficus hirta, Neyraudia reynaudiana, Rhodomyrtus tomentosa, Dicranopteris pedata* and *Ligustrum sinense*. *Lygodium japonicum, Ipomoea cairica* and *Mikania micrantha* are common climbers along the alignment.

6.4.64 No protected species were identified but one rare species *Berchemia lineata* was recorded on the roadside near Liu Pok Village (**Figure 6.5**). It is a climbing shrub and has distribution records in Shatin, Sheung Shui, Sai Kung, Ma Wan and Ping Chau (Mirs Bay).

6.4.65 The plant list of the Project Area of the green alignment in Section 2 is presented in **Table F-2a** in **Appendix F**.

Red Alignments

6.4.66 The red alignment is proposed on the exiting DSD maintenance access along the channelised Shenzhen River. Thus it will only cover one type of habitat of developed area. A total of 40 species were identified. Dominant plant species include *Cynodon dactylon, Sesbania cannabina, Rhynchelytrum repens, Wedelia trilobata, Imperata koenigii, Bidens alba, Cynodon dactylon* and *Mimosa pudica.*

6.4.67 Neither protected nor rare plant species were identified. The plant list of the Project Area of the green alignment in Section 2 is presented in **Table F-2b** in **Appendix F**.

Fauna

6.4.68 This section covers the area of Lok Ma Chau Loop (T3_LMCL refers to **Figure F1** of **Appendix F**), Lok Ma Chau (T4_LMC), Shun Yee San Tsuen (T5_SYST), wetlands at Hoo Hok Wai (T6_HHW) and Ta Sha Lok (T7_TSL). The ecological survey findings for fauna species are described below.

Mammals

6.4.69 A total of five mammal species was recorded in Section 2 fishponds and ecological mitigation area at Hoo Hok Wai and Ta Sha Lok during mammal surveys. They include Brown Rat *Rattus norvegicus,* Domestic Ox *Bos taurus,* Small Asian Mongoose *Herpestes javanicus,* Japanese Pipistrelle *Pipistrellus abramus* and a bat species with small and short wing span. Two bat species of different sizes were seen during night-time surveys foraging over the fishponds. There was no literature on bat species recored in this Section, one species of bat observed is suspected to be Japanese Pipistrelle, as this species was recorded in abundant in wetland areas of Mai Po and the size is similar to it. All bat species are protected under the Wild Animals Protection Ordinance (Cap.170).

6.4.70 Eight sightings of Small Asian Mongoose were recorded during 7 daytime surveys around the Shenzhen River riparian vegetation and fishpond bund at Lok Ma Chau Loop, the marsh and the roadside vegetation along the existing boundary patrol road at Shun Yee Sun Tsuen and fishpond bunds at Hoo Hok Wai and Ta Sha Lok. This species was observed crossing between fishponds and the Shenzhen River meander at Lok Ma Chau Loop via the base of the existing boundary fence at Ha Wan Tsuen. The Small Asian Mongoose has a fairly wide distribution in Hong Kong and can inhabit a wide variety of habitats ranging from wetlands to open plains and open areas (Shek, 2006). It is also protected under the Wild Animals Protection Ordinance (Cap.170).

6.4.71 One Brown Rat *Rattus norvegicus* was recorded in a ditch at Lok Ma Chau during a night survey on 17 July 2008 and seven Domestic Oxes were observed foraging and resting in marsh and fishpond bunds of Ta Sha Lok. These two species are widely distributed in Hong Kong but not protected under the local legislations.

Birds

6.4.72 A significant portion of wetland-dependent bird species was recorded in this section as a result of large area of wetland habitat. The less disturbed and continuous wetland habitat in close proximity to hillside shrub supports a wide variety of wetland-dependent birds and a few species of raptor such as Bonelli's Eagle *Hieraaetus fasciatus*.

Results of transect survey

6.4.73 A total of 75 species was recorded during the transect surveys in Section 2, of which 35 species are of conservation concern. A full list of species recorded is given in **Table F-2c** in **Appendix F**. The species recorded in this section of Assessment Area are mixture of wetland-dependent birds, shrubland birds and open country area birds. Those shrubland and open country birds recorded are common and widespread throughout Hong Kong territory while the wetland-dependent birds recorded are uncommon in Hong Kong but common throughout the Deep Bay area.

Table 6-9 Mean of individuals of bird species of conservation concern and wetland-dependent bird species recorded during transect survey in section 2 Assessment Area, Nov 2007 - Oct 2008. (Level of Concern based on Fellowes *et al*. 2002)

Common Name	Level of Concern	Wetland-dependent	Mean#
Little Grebe *Tachybaptus ruficollis*	LC	Y	5.22
Great Crested Grebe *Podiceps cristatus*	RC	Y	0.11
Great Cormorant *Phalacrocorax carbo*	PRC	Y	66.11
Grey Heron *Ardea cinerea*	PRC	Y	7.89
Purple Heron *Ardea purpurea*	RC	Y	0.22
Great Egret *Egretta alba*	PRC(RC)	Y	10.44
Little Egret *Egretta garzetta*	PRC(RC)	Y	13.78
Cattle Egret *Bubulcus ibis*	(LC)	Y	1.00
Chinese Pond Heron *Ardeola bacchus*	PRC(RC)	Y	10.11
Striated Heron *Butorides striatus*	(LC)	Y	0.11
Black-crowned Night Heron *Nycticorax nycticorax*	(LC)	Y	6.56
Yellow Bittern *Ixobrychus sinensis*	(LC)	Y	0.33

Common Name	Level of Concern	Wetland-dependent	Mean#
Cinnamon Bittern *Ixobrychus cinnamomeus*	LC	Y	0.11
Great Bittern *Botaurus stellaris*	RC	Y	0.22
Eurasian Wigeon *Anas penelope*	RC	Y	0.22
Common Teal *Anas crecca*	RC	Y	3.00
Northern Pintail *Anas acuta*	RC	Y	0.33
Tufted Duck *Aythya fuligula*	LC	Y	2.78
Osprey *Pandion haliaetus*	RC	Y	0.11
Black Kite *Milvus migrans*	(RC)	N	7.78
White-bellied Sea Eagle *Haliaeetus leucogaster*	(RC)	Y	0.11
White-breasted Waterhen *Amaurornis phoenicurus*	-	Y	2.56
Common Moorhen *Gallinula chloropus*	-	Y	2.44
Eurasian Coot *Fulica atra*	RC	Y	1.00
Black-winged Stilt *Himantopus himantopus*	RC	Y	0.11
Little Ringed Plover *Charadrius dubius*	(LC)	Y	10.11
Green Sandpiper *Tringa ochropus*	-	Y	2.00
Wood Sandpiper *Tringa glareola*	LC	Y	0.78
Common Sandpiper *Actitis hypoleucos*	-	Y	19.00
Common Snipe *Gallinago gallinago*	-	Y	1.89
Little Swift *Apus affinis*	-	Y	7.11
Pied Kingfisher *Ceryle rudis*	(LC)	Y	2.00
Common Kingfisher *Alcedo atthis*	-	Y	0.67
White-throated Kingfisher *Halcyon smyrnensis*	(LC)	Y	4.22
Barn Swallow *hirundo rustica*	-	Y	3.78

Common Name	Level of Concern	Wetland-dependent	Mean#
Red-rumped swallow *Hirundo daurica*	-	Y	1.67
Yellow Wagtail *Motacilla flava*	-	Y	4.44
Grey Wagtail *Motacilla cinerea*	-	Y	0.78
White Wagtail *Motacilla alba*	-	Y	7.56
Red-throated Pipit *Anthus cervinus*	LC	N	0.11
Pallas's Grasshopper Warbler *Locustella certhiola*	LC	Y	0.11
Zitting Cisticola *Cisticola juncidis*	LC	N	1.11
Red-billed Starling *Sturnus sericeus*	(RC)*	Y	18.67
White-cheeked Starling *Sturnus cineraceus*	PRC	N	1.56
White-shouldered Starling *Sturnus sinensis*	(LC)	N	17.00
Ashy Drongo *Dicrurus leucophaeus*	LC	N	0.11
Collared Crow *Corvus torquatus*	LC	Y	0.44

Level of concern follows Fellowes *et al.* (2002): LC=Local Concern; RC=Regional Concern; GC=Global Concern; PRC=Potential Regional Concern; PGC=Potential Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sits rather than in general occurrence.
#Mean values given are the mean number recorded on all transects. This is included to reflect the regularity of a species in the study area.
*Red-billed Starling is considered by Fellowes *et al.* (2002) to be of Global Concern. Since then, the global population has been increasing and the species is not now considered globally threatened (BirdLife International 2008a). A listing of Regional Concern (RC), based on the importance of the large roosts present near Deep Bay, is considered to be more appropriate.

Monthly monitoring of waterbirds at fishpond area by Hong Kong Bird Watching Society

6.4.74 The abundance and diversity of waterbirds utilizing fishponds in Deep Bay area are monthly surveyed by the Hong Kong Bird Watching Society as part of the long-term monitoring of the Ramsar Site for AFCD. The ponds within section 2 Assessment Area largely lie into count area Shenzhen River B.

6.4.75 A checklist of wetland-dependent birds utilizing the fishpond and river area at Section 2 was obtained by summarizing five years waterbird monitoring data for count area at Shenzhen River B **(Table 6-10).** A total of 65 wetland-dependent species was recorded at the area including two globally threatened species Greater Spotted Eagle *Aquila clanga* and Imperial Eagle *Aquila heliaca*.

Table 6-10 Wetland-dependent bird species recorded in the Shenzhen River B count area on monthly waterbird counts conducted by the Hong Kong Bird Watching Society, April 2003 - March2008 (Data from Anon 2008, Anon 2007a, Anon 2007b, Anon 2006a, Anon 2006b, Anon 2005a, Anon 2005b, Anon 2004a, Yu 2004 and Yu 2003)

Common Name	Species Name	Level of Concern	IUCN 2008
Little Grebe	*Tachybaptus ruficollis*	LC	-
Great Cormorant	*Phalacrocorax carbo*	PRC	-
Purple Heron	*Ardea purpurea*	RC	-
Grey Heron	*Ardea cinerea*	PRC	-
Great Egret	*Egretta alba*	PRC(RC)	-
Little Egret	*Egretta garzetta*	PRC(RC)	-
Cattle Egret	*Bubulcus ibis*	(LC)	-
Chinese Pond Heron	*Ardeola bacchus*	PRC(RC)	-
Striated Heron	*Butorides striatus*	(LC)	-
Black-crowned Night Heron	*Nycticorax nycticorax*	(LC)	-
Yellow Bittern	*Ixobrychus sinensis*	(LC)	-
Cinnamon Bittern	*Ixobrychus cinnamomeus*	LC	-
Falcated Duck	*Anas falcata*	RC	-
Common Teal	*Anas crecca*	RC	-
Greater Scaup	*Aythya marila*	-	-
Gadwall	*Anas strepera*	-	-
Northern Pintail	*Anas acuta*	RC	-
Spot-billed Duck	*Anas poceilorhyncha*	RC	-
Tufted Duck	*Aythya fuligula*	LC	-
Eurasian Wigeon	*Anas penelope*	RC	-
Northern Shoveler	*Anas clypeata*	RC	-
Mallard	*Anas platyrhynchos*	RC	-
Common Pochard	*Aythya ferina*	-	-
Osprey	*Pandion haliaetus*	RC	-
Black-winged Kite	*Elanus caeruleus*	LC	-
Black Kite	*Milvus migrans*	(RC)	-
Common Buzzard	*Buteo buteo*	-	-
Crested Serpent Eagle	*Spilornis cheela*	(LC)	-
Grey-faced Buzzard	*Butastur indicus*	-	-
Pied Harrier	*Circus melanoleucos*	LC	-
Greater Spotted Eagle	*Aquila clanga*	GC	VU
Imperial Eagle	*Aquila heliaca*	GC	VU
Bonelli's Eagle	*Hieraaetus fasciatus*	(RC)	-
Besra	*Accipiter virgatus*	-	-
Common Kestrel	*Falco tinnunculus*	-	-
White-breasted Waterhen	*Amaurornis phoenicurus*	-	-
Common Moorhen	*Gallinula chloropus*	-	-
Eurasian Coot	*Fulica atra*	RC	-
Grey-headed Lapwing	*Vanellus cinereus*	LC	-

Common Name	Species Name	Level of Concern	IUCN 2008
Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	LC	-
Black-winged Stilt	*Himantopus himantopus*	RC	-
Oriental Partincole	*Glareola maldivarum*	LC	-
Pacific Golden Plover	*Pluvialis fulva*	LC	-
Little Ringed Plover	*Charadrius dubius*	(LC)	-
Kentish Plover	*Charadrius alexandrinus*	RC	-
Greater Sand Plover	*Charadrius leschenaultii*	RC	-
Green Sandpiper	*Tringa ochropus*	-	-
Wood Sandpiper	*Tringa glareola*	LC	-
Marsh Sandpiper	*Tringa stagnatilis*	RC	-
Common Sandpiper	*Actitis hypoleucos*	-	-
Common Snipe	*Gallinago gallinago*	-	-
Pintail Snipe	*Gallinago stenura*	-	-
Swinhoe's Snipe	*Gallinago megala*	LC	-
Red-necked Stint	*Calidris ruficollis*	LC	-
Temminck's Stint	*Calidris temminckii*	LC	-
Long-toed Stint	*Calidris subminuta*	LC	-
Ruff	*Philomachus pugnax*	LC	-
Black-headed Gull	*Larus ridibundus*	PRC	-
Whiskered Tern	*Chlidonias hybridus*	-	-
Gull-billed Tern	*Sterna nilotica*	-	-
Common Kingfisher	*Alcedo atthis*	-	-
Pied Kingfisher	*Ceryle rudis*	(LC)	-
White-throated Kingfisher	*Halcyon smyrnensis*	(LC)	-
Red-billed Starling	*Sturnus sericeus*	GC*	-
Collared Crow	*Corvus torquatus*	LC	-

Level of concern follows Fellowes *et al.* (2002): LC=Local Concern; RC=Regional Concern; GC=Global Concern; PRC=Potential Regional Concern; PGC=Potential Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
*Red-billed Starling is considered by Fellowes *et al.* (2002) to be of Global Concern. Since then, the global population has been increasing and the species is not now considered globally threatened (BirdLife International 2008a). A listing of Regional Concern (RC), based on the importance of the large roosts present near Deep Bay, is considered to be more appropriate.

Herpetofauna

6.4.76 A total of 14 amphibian and reptile species were recorded during daytime and night surveys. Most of them were found at the fishponds, marshes, streams, agricultural lands and developed area. Four snake species are considered of conservation concern namely Burmese Python *Python molurus,* Chinese Cobra *Naja atra,* Chinese Water Snake *Enhydris chinensis* and Common Rat Snake *Ptyas mucosus*. Burmese Python considered as Potential Regional Concern (Fellows *et al*., 2002), was recorded hibernating at riparian vegetation of Lok Ma Chau fishpond bund in vicinity to the Project Area (**Figure 6.4** and **Plate F16**) on 14 February 2008. Burmese Python was stated as 'Critically Endangered' in the China Red Data Book and was protected under the Wild Animals Protection Ordinance (Cap. 170) and listed in Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). This species is widely distributed in the Hong Kong territory, including all major islands (Karsen, 1998).

6.4.77 One Chinese Cobra was recorded on 5 September 2008 at riparian vegetation of fishpond bund during night survey at Lok Ma Chau (**Plate F17**). Chinese Cobra is considered as Potential Regional Concern (Fellowes *et al.,* 2002). It also listed as vulnerable species in the China Red Data Book and protected under Cap. 586. Another snake species Chinese Water Snake was recorded at Lok Ma Chau stream on 13 August 2008. It is listed as 'Least Concern' in the China Red Data Book. This species distributed in freshwater or brackish wetlands in central and northern New Territories (Karsen, 1998). A Common Rat Snake listed as "Endangered" in the China Red Data Book, protected under Cap. 586 and considered as Potential Regional Concern was recorded in a stream at Lok Ma Chau during a daytime survey on 25 September 2008. This species is common in open habitats throughout Hong Kong.

6.4.78 Seven frog species were recorded in Section 2. The most abundant species are Asian Common Toad *Bufo melanostictus* and Günther's Frog *Rana guentheri.* Most of them were observed or heard in riparian vegetation along fishpond bunds. Few of them were recorded around the existing boundary fence, patrol road and developed area of the Project Area. **Table 6-11** summarises the relative abundance of herpetofauna species recorded in Section 2.

Table 6-11 Relative abundance of herpetofauna species recorded in Section 2

Species	Project Area	Assessment Area (other than Project Area)	Commonness	Level of Concern/ Protection Status
Asian Common Toad *(Bufo melanostictus)*	++	++++	Widely Distributed	
Asiatic Painted Frog *(Kaloula pulchra pulchra)*	+	++	Widely Distributed	
Brown Tree Frog *(Polypedates megacephalus)*		+	Common and Abundant, Widespread throughout Hong Kong	
Günther's Frog *(Rana guentheri)*	++	++++	Widely Distributed	
Ornate Pigmy *(Microhyla ornata)*	+		Widely Distributed	
Paddy Frog *(Rana limnocharis)*	+	++	Widely Distributed	
Spotted Narrow-mouthed Frog (*Kalophrynus interlineatus)*	+	+	Widely distributed from low to moderate altitudes in northern and central New Territories	
Chinese Gecko *(Gekko chinensis)*	+	++	Widely Distributed	

Species	Project Area	Assessment Area (other than Project Area)	Commonness	Level of Concern/ Protection Status
Chinese Waterside Skink *(Tropidophorus sinicus)*		+	Widely distributed in streams	
Burmese Python *(Python molurus)*	+		Widely Distributed	Protected under Cap. 170 & Cap. 586; Listed as Critically Endangered in China Red Data Book; Listed in IUCN 2008 as Lower Risk/near threatened; Considered as Potential Regional Concern in Fellowes *et al.* (2002)
Chinese Cobra *(Naja atra)*		+	Widely Distributed	Protected under Cap. 586; Listed as Vulnerable in China Red Data Book; Considered as Potential Regional Concern
Chinese Water Snake *(Enhydris chinensis)*		+	Distributed in freshwater or brackish wetlands in central and northern New Territories	Listed as Least Concern in China Red Data Book
Common Rat Snake *(Ptyas mucosus)*		+	Widely distributed	Protected under Cap. 586; Listed as Endangered in China Red Data Book; Considered as Potential Regional Concern
Taiwan Kukri Snake (*Oligodon formosanus*)		+	Widely distributed	

Note: +- 1-3; ++- 4-6; +++- 7-10; ++++- >10

Dragonflies and Butterflies

6.4.79 There were 23 species of odonata recorded in Section 2. Most of them were found at wetland area including the fishpond margin, grassland and streams. Only 8 species with mean number less than 1 individual per visit were recorded within the Project Area. The most abundant species recorded within the Assessment Area is Variegated Flutterer

Rhyothemis variegata, with mean number of individual recorded per visit as 85. All species recorded are either abundant or common in wetland habitats. One species Scarlet Basker *Urothemis signata* of local concern was recorded mostly in the fishponds with 3.44 mean number of individual per visit. This species becomes common in New Territories as many fishponds have been abandoned and choked with aquatic vegetation to which the dragonfly fond. **Table 6-12** summarises the odonata species recorded in Section 2.

Table 6-12 Odonata species recorded in Section 2

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness	Level of Concern
Amber-winged Glider (*Hydrobasileus croceus*)		2 (0.22)	Common and widely distributed	
Asian Amberwing (*Brachythemis contaminata*)	6 (0.67)	142 (15.78)	Abundant and widely distributed	
Asian Pintail (*Acisoma panorpoides panorpoides*)		38 (4.22)	Common and widely distributed	
Blue Dasher *(Brachydiplax chalybea flavovittata)*	1 (0.11)	2 (0.22)	Common and widely distributed	
Blue Percher (*Diplacodes trivialis*)		2 (0.22)	Abundant and widely distributed	
Common Bluetail (*Ischnura senegalensis)*		1 (0.11)	Abundant and widely distributed	
Common Flagetail (*Ictinogomphus pertinax*)		6 (0.67)	Abundant and widely distributed	
Common Red Skimmer *(Orthetrum pruinosum neglectum)*		14 (1.56)	Abundant and widely distributed	
Crimson Darter *(Crocothemis servilia servilia)*	2 (0.22)	41 (4.56)	Abundant and widely distributed	
Crimson Dropwing (*Trithemis aurora*)		5 (0.56)	Abundant and widely distributed	
Evening Skimmer (*Tholymis tillarga*)		2 (0.22)	Common and widely distributed	
Green Skimmer *(Orthetrum sabina sabina)*	2 (0.22)	50 (5.56)	Common and widely distributed	

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness	Level of Concern
Lesser Blue Skimmer (*Orthetrum Triangulare*)		2 (0.22)	Common and widely distributed	
Orange-faced Sprite (*Pseudagrion rubriceps rubriceps*)	1 (0.11)	3 (0.33)	Common and widely distributed in ponds	
Orange-tailed Midget (*Agriocnemis femina oryzae*)		1 (0.11)	Abundant and widely distributed	
Orange-tailed Sprite *(Ceriagrion auranticum)*		25 (2.78)	Abundant and widely distributed	
Pale-spotted Emperor (*Anax guttatus*)		1 (0.11)	Abundant and widely distributed	
Pied Percher *(Neurothemis tullia tullia)*		14 (1.56)	Common and widely distributed	
Pied Skimmer (*Pseudothemis zonata*)		20 (2.22)	Common and widely distributed	
Saddlebag Glider *(Tramea virginia)*	2 (0.22)	8 (0.89)	Common and widely distributed	
Scarlet Basker (*Urothemis signata*)		31 (3.44)	Common in areas with abundant fishponds	Considered as Local Concern
Variegated Flutterer *(Rhyothemis variegata)*	6 (0.67)	765 (85)	Common and widely distributed	
Wandering Glider *(Pantala flavescens)*	8 (0.89)	423 (47)	Abundant and widely distributed	

Note: Commonness follows Hong Kong Biodiversity Database (AFCD, 2006).

6.4.80 Baron *Euthalia aconthea* with conservation status defined as 'Local Concern' (Fellows et al, 2002) was recorded at the grassland of Lok Ma Chau Loop on 17 July 2008. This species is uncommon in Hong Kong and was recorded from Tai Po Kau, Shing Mun, Pat Sin Leng, Plover Cove and Sai Kung West (Lo and Hui 2005).

Table 6-13 Butterfly species recorded in Section 2

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness	Level of Concern
Angled Castor *(Ariadne ariadne)*	1 (0.11)	1 (0.11)	Common and widely distributed	
Banana Skipper (*Erionota torus*)	2 (0.22)	3 (0.33)	Common and widely distributed in agricultural field	
Baron (*Euthalia aconthea*)		1 (0.11)	Uncommon but widely distributed in woodland	Considered as Local Concern
Black Prince (*Rohana parisatis*)		14 (1.56)	Common and widely distributed in woodland	
Blue Admiral (*Kaniska canace canace*)		2(0.22)	Common and widely distributed	
Blue Pansy (*Junonia orithya*)		1(0.11)	Uncommon	
Blue-spotted Crow (*Euploea midamus*)		1(0.11)	Common and widely distributed	
Chinese Dart (*Potanthus confucius confucius*)		1 (0.11)	Common and widely distributed in Grassland	
Common Bluebottle *(Graphium sarpedon)*	1 (0.11)	14 (1.56)	Common and widely distributed	
Common Five-ring (*Ypthima baldus*)		8 (0.89)	Common and widely distributed in Grassland	
Common Grass Yellow *(Eurema hecabe)*	2 (0.22)	49 (5.44)	Common and widely distributed	
Common Hedge Blue (*Acytolepis puspa*)		1 (0.11)	Common and widely distributed	
Common Indian Crow (*Euploea core*)	1 (0.11)	6 (0.67)	Common and widely distributed	
Common Jay (*Graphium doson*)		1 (0.11)	Uncommon but widely distributed	

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness	Level of Concern
Common Mime (*Chilasa clytia*)	2 (0.22)	3 (0.33)	Common and widely distributed	
Common Mormon *(Papilio polytes)*	16(1.78)	34(3.78)	Common and widely distributed	
Common Sailer (*Neptis hylas*)	1(0.11)	2(0.22)	Common and widely distributed	
Common Sergeant (*Athyma perius*)	3(0.33)	14(1.56)	Common and widely distributed	
Common Straight Swift (*Parnara guttata*)		2(0.22)	Common and widely distributed in Grassland	
Common Tiger *(Danaus genutia)*	1(0.11)	4(0.44)	Common and widely distributed	
Dark-brand Bush Brown *(Mycalesis mineus)*		28(3.11)	Common and widely distributed	
Gram Blue (*Euchrysops cnejus*)		1(0.11)	Common and widely distributed	
Great Eggfly *(Hypolimnas bolina kezia)*		9(1)	Common and widely distributed	
Great Mormon (*Papilio memnon*)	2(0.22)	3(0.33)	Common and widely distributed	
Indian Cabbage White *(Pieris canidia)*	11(1.22)	95(10.56)	Common and widely distributed	
Large Faun (*Faunis eumeus*)		1(0.11)	Common and widely distributed	
Lemon Emigrant *(Catopsilia pomona)*		5(0.56)	Common and widely distributed	
Lesser Grass Blue (*Zizina otis*)		5(0.56)	Common and widely distributed	
Lime Butterfly *(Papilio demoleus)*		1(0.11)	Common and widely distributed	

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness	Level of Concern
Long-tailed Blue (*Lampides boeticus*)		3(0.33)	Common and widely distributed in abandoned field	
Pale Grass Blue *(Zizeeria maha)*		37(4.11)	Common and widely distributed	
Paris Peacock (*Papilio paris*)	4(0.44)	9(1)	Common and widely distributed	
Peacock Pansy (*Junonia almana*)		6(0.67)	Common and widely distributed	
Plum Judy (*Abisara echerius*)		1(0.11)	Common and widely distributed	
Purple Sapphire (*Heliophorous epicles phoenicoparyphus*)		2(0.22)	Common and widely distributed	
Red-base Jezebel *(Delias pasithoe)*		3(0.33)	Common and widely distributed	
Rustic (*Cupha erymanthis*)		2(0.22)	Common and widely distributed	
Swallowtail (*Papilio xuthus*)		1(0.11)	Uncommon	
White-edged Blue Baron (*Euthalia phemius seitzi*)		2(0.22)	Common and widely distributed	

Note: Commonness follows Hong Kong Biodiversity Database (AFCD, 2006).

Aquatic Fauna

6.4.81 Six freshwater fish species were recorded in this section. Most of them are food fish, such as Spotted Snakehead, Chinese Catfish and Common Carp, cultivated in the active fishponds around Lok Ma Chau and Ta Sha Lok. Three introduced species namely Nile Tilapia, Mosquito Fish and Redbelly Tilapia, were recorded in the abandoned meander of Shenzhen River at Lok Ma Chau Loop and small streams and ditches around Shun Yee San Tsuen and Ta Sha Lok. No rare and species of conservation concern recorded in this section. **Table 6-14** summarises the freshwater fish species recorded in Section 2.

Table 6-14 Freshwater fish species recorded in Section 2

Species	Relative Abundance	Habitat	Status
Chinese Catfish *(Clarias fuscus)*	++++	Shenzhen River, fishponds, marsh, ditch	Common
Nile Tilapia (*Oreochromis niloticus*)	++++	Shenzhen River	Common and widespread, introduced species
Mosquito Fish (*Gambusia affinis*)	++++	Stream	Common, introduce species.
Redbelly Tilapia (*Tilapia zillii*)	++++	Ditch	Common, introduce species.
Spotted Snakehead (*Channa maculata*)	+	Fishpond	Food fish and cultivated in fishponds
Common Carp (*Cyprinus carpio*)	++	Fishpond	Cultivated in fishponds as food fish or for aquarium

Note: Status follows Lee *et al*. (2004).

Ecological Profile of Section 3 (Man Kam To-Ta Kwu Ling-Pak Fu Shan-Lin Ma Hang)

Habitat & Vegetation

6.4.82 This is the longest section of the Project (**Figure 6.1**), running from Lo Wu to Lin Ma Hang via Man Kam To, Ta Kwu Ling and Pak Fu Shan. Most of the proposed alignment will be along the existing boundary road (i.e. the blue alignment) with two short sections of red and green alignments near Pak Fu Shan.

6.4.83 Two mitigation areas of the Shenzhen River Regulation Project Stage III were identified at Yuen Leng Chai and Nam Hang (**Figure 6.6**). As described in Section 6.3.6, Yuen Leng Chai Mitigation Area was established by restoration of two fishponds after the completion of the Shenzhen River Regulation Project. The Nam Hang Mitigation Area was established as a compensatory woodland for the Shenzhen River Regulation Project but its vegetation cover currently is dominated by grasses and herbs such as *Sesbania javanica, Mimosa pudica, Pennisetum purpureum, Neyraudia reynaudiana, Rhynchelytrum repens* and *Ipomoea cairica* with few mitigation shrub and tree plantings such as *Cinnamomum camphora, Liquidambar formosana, Acacia confusa, Ficus superba, Gardenia jasminoides* and *Rhaphiolepis indica*. Therefore the habitat is shown as grassland (i.e. Abandoned Agricultural Land/ Low-lying Grassland) rather than woodland in the habitat map.

6.4.84 The Nam Hang woodland east of these two mitigation areas and west of the Man Kam To Boundary Crossing is the largest woodland within the Assessment Area of Section 3. *Sterculia lanceolata, Celtis sinensis, Cinnamomum camphora, Bridelia tomentosa, Microcos paniculata* and *Macaranga tanarius* are the dominant plant species. Its close proximity to the two fishponds establishes an ecological linkage between the two habitats.

6.4.85 Lin Ma Hang Stream SSSI and Lin Ma Hang Lead Mines SSSI are located within the Assessment Area near the eastern end of the alignment of Section 3. Lin Ma Hang Lead Mines SSSI is located more than 100m away from the proposed alignment. Lin Ma Hang Stream SSSI is in close proximity to the proposed blue alignment where the existing

primary boundary fence and boundary patrol road situated. It is a semi-natural stream with some modification due to its surrounding agricultural land use in the past. The proposed secondary boundary fence will be on the opposite side of the primary boundary fence and thus further away from the stream.

6.4.86 Three fung shui woods at Kan Tau Wai, Tsung Yuen Ha and Lin Ma Hang were identified within the Assessment of Section 3. *Cinnamomum camphora, Celtis sinensis, Aquilaria sinensis, Schima superba, Aporosa dioica* and *Syzygium levinei* are the dominant species. Other woodlands found within the Assessment Area are secondary woodlands. Dominant species include *Aquilaria sinensis, Aporusa dioica, Celtis sinensis, Cinnamomum camphora, Cratoxylum cochinchinense, Mallotus paniculatus, Schefflera heptaphylla* and *Schima superba*.

6.4.87 Hillside grassland is a common habitat at Nam Hang and Lin Ma Hang (**Figure 6.2**). *Arundinella* sp., *Ischaemum* sp. and *Dicranopteris pedata* are common dominant species of the habitat. Shrublands were found on some hillsides, *Rhodomyrtus tomentosa, Melastoma candidum, Melastoma sanguineum*, *Ficus hirta, Litsea rotundifolia, Ilex asprella, Phyllanthus reticulates* and *Desmos chinensis* are the common plant species recorded in this habitat.

6.4.88 The Ta Kwu Ling area (**Figure 6.7**) is a large low-lying flatland where a large numbers of scattered abandoned agricultural lands / low-lying grasslands, active agricultural lands, marsh, plantations, ponds, roads and villages distributed. Apart from the downstream section west of the Ping Yuen River, the Shenzhen River found in this section is un-channelised. The river is in very close proximity to the highly urbanised Shenzhen Town.

6.4.89 Wet agricultural land can be found in the area west of Ping Yuen River. Other than the crop *Ipomoea aquatica*, common wetland species such as *Panicum repens, Eclipta prostrata,* and *Ammannia areneria* can also be found in the edges of the farmlands.

Blue and Green Alignment

6.4.90 The Project Area of the blue and green alignment in Section 3 is proposed on the existing Boundary Patrol Road and therefore in terms of habitat, it will only cover developed area.

6.4.91 A total of 270 species were identified. Dominant plant species include *Sesbania javanica, Mimosa pudica, Cynodon dactylon, Imperata koenigii, Brachiaria mutica, Eleusine indica, Flueggea virosa, Phyllanthus reticulates, Pennisetum purpureum, Vitex negundo, Bidens alba, Mallotus apelta, Neyraudia reynaudiana, Dicranopteris pedata* and *Microstegium ciliatum. Mikania micrantha, Paederia scandens, Lygodium japonicum* and *Ipomoea cairica* are common climbers along the existing patrol road.

6.4.92 One young individual of *Aquilaria sinensis* (of height less than 1.5m) was found within the proposed Project Area (roadside along a section of Lin Ma Hang Road northwest of Wang Lek, **Figure 6.8**). *Aquilaria sinensis* is scheduled under the under Protection of Endangered Species of Animals and Plants Ordinance (Cap 586) which aims to restrict the import, export and possession of certain animals and plants. It is also listed as Near Threatened (NT) in Mainland China. In Hong Kong, it is a common tree species with wide spreading distribution.

6.4.93 The plant list of the Project Area of the blue and green alignment in Section 3 is presented in **Table F-3a** in **Appendix F**.

Red Alignments

6.4.94 The whole red alignment runs through the riparian grassland along the unchannelised Shenzhen River and therefore dominated by common riparian plant species *Bidens alba, Panicum maximum* and *Pennisetum purpureum*. A total of 32 species were identified.

6.4.95 Neither protected nor rare plant species were identified. The plant list of the Project Area of the red alignment in Section 3 is presented in **Table F-3b** in **Appendix F**.

Fauna

6.4.96 Section 3 covers the area of Yuen Leng Chai and Nam Hang (T8_YLC&NH refers to **Figure F1** of **Appendix F**), Ta Kwu Ling (T9_TKLV), Pak Fu Shan (T10_PFS) and Lin Ma Hang (T11_LMH). The ecological survey findings for fauna species are described below.

Mammals

6.4.97 Mammals recorded in this section are dominated by bats emerged after sunset. From literature review, Lin Ma Hang Lead Mines SSSI was recognized as the most important resting and breeding roost site for Greater Bent-winged Bat *Miniopterus magnater* and Lesser Bent-winged Bat *Miniopterus pusillus*. Endangered species Common Bent-winged Bat *Miniopterus schreibersii* listed in IUCN and China Red Data Book was also recorded (Shek and Chan, 2005). Other uncommon species to be found in the area included Intermediate Horseshoe Bat *Rhinolophus affinus*, Least Horseshoe Bat *Rhinolophus pusillus*, Rickett's Big-footed Bat *Myotis ricketti* and Chinese Myotis *Myotis chinensis* (Shek and Chan, 2005). Himalayan Leaf-nosed Bat *Hipposideros armiger,* Japanese Pipistrelle *Pipistrellus abramus* and Lesser Bamboo Bat *Tylonycteris pachypus* were also recorded by mist netting surveys conducted by Agriculture, Fisheries and Conservation Department (AFCD) in 2005 (Shek, 2006).

6.4.98 Five mammal species Malayan Porcupine *Hystrix brachyuran,* Wild Boar *Sus scrofa,* Ferret Badger *Melogale moschata,* Indian Muntjac *Muntiacus muntjak* and Small Indian Civet *Viverra indica* were recorded by infrared camera trapping under *A Pilot Biodiversity Study of the Eastern Frontier Closed Area and North East New Territories* (KFBG, 2004). Among these species, Indian Muntjac and Malayan Porcupine are considered as "Potential Regional Concern" and "Potential Global Concern" (Fellowes *et al.,* 2002). Apart from the five mammal species recorded above, the rare species Crab-eating Mongoose *Herpestes urva* and Yellow-bellid Weasel *Mustela kathiah* considered as "Local Concern" were also recorded in woodland habitats of Lin Ma Hang by camera trapping (AFCD, 2006). The Ferret Badger, Small Indian Civet and Crab-eating Mongoose are protected under Cap. 170.

6.4.99 Night surveys conducted during July to October 2008 recorded two non-flying mammals which include Roof Rat *Rattus rattus* recorded in abundant around the existing boundary fence and patrol road adjacent to a chicken farm at Pak Fu Shan and a few individuals of Brown Rat *Rattus norvegicus* in grassland of Pak Fu Shan. Roof Rat is largely commensal

with human and lives in close association with people, while Brown Rat favours moist habitats and compete with Roof Rat for habitat.

6.4.100 Small Asian Mongoose *Herpestes javanicus* is also common in this section. Three individuals were recorded at the Ping Yuen River and one individual was recorded sneaking out the existing boundary fence at Pak Fu Shan during daytime surveys. This species is protected under the Wild Animals Protection Ordinance (Cap. 170) but has a fairy wide distribution in wetland and open plains (Shek, 2006).

6.4.101 Domestic sheep of 20 individuals and a domestic cat were recorded in Lin Ma Hang and Yuen Leng Chai respectively. No other species of conservation concern is recorded other than the bats species which are all protected under Cap.170.

Birds

6.4.102 A mixture of wetland and agriculture land birds was recorded in this section. Most of the birds recorded are common in Hong Kong territory. A few of woodland bird species were recorded in the woodland habitat of this section, which include a conservation concerned species Orang-headed Thrush *Zoothera citrina* in Lin Ma Hang secondary forest.

Results of transect survey

6.4.103 A total of 66 species was recorded during the transect surveys in Section 3, of which 20 species are of conservation concern including the globally threatened species Greater Spotted Eagle *Aquila clanga*. A full list of species recorded is given in **Table F-3c** in **Appendix F**. The species recorded in this section of Assessment Area are mixture of wetland-dependent birds, shrubland birds and open country area birds as the area comprise of wide diversity of habitat. Among these, 20 species account for 30 percent of the list are of conservation importance.

Table 6-15 Mean of individuals of bird species of conservation concern and wetland-dependent bird species recorded during transect survey in Section 3 Assessment Area, Nov 2007- Oct 2008. (Level of Concern based on Fellowes *et al.* 2002)

Common Name	Level of Concern	Wetland-dependent	Mean#
Grey Heron *Ardea cinerea*	PRC	Y	1.11
Great Egret *Egretta alba*	PRC(RC)	Y	1.22
Little Egret *Egretta garzetta*	PRC(RC)	Y	5.22
Cattle Egret *Bubulcus ibis*	(LC)	Y	0.44
Chinese Pond Heron *Ardeola bacchus*	PRC(RC)	Y	5.11
Black-crowned Night Heron *Nycticorax nycticorax*	(LC)	Y	0.56

Common Name	Level of Concern	Wetland-dependent	Mean#
Yellow Bittern *Ixobrychus sinensis*	(LC)	Y	0.11
Cinnamon Bittern *Ixobrychus cinnamomeus*	LC	Y	0.11
Black Kite *Milvus migrans*	(RC)	N	0.89
Common buzzard *Buteo buteo*	-	Y	0.11
Greater Spotted Eagle *Aquila clanga*	GC	Y	0.11
White-breasted Waterhen *Amaurornis phoenicurus*	-	Y	0.89
Little Ringed Plover *Charadrius dubius*	(LC)	Y	3.78
Common Greenshank *Tringa nebularia*	RC	Y	0.11
Green Sandpiper *Tringa ochropus*	-	Y	1.78
Wood Sandpiper *Tringa glareola*	LC	Y	1.56
Common Sandpiper *Actitis hypoleucos*	-	Y	1.67
Common Snipe *Gallinago gallinago*	-	Y	0.11
Pacific Swift *Apus pacificus*	(LC)	N	0.44
Little Swift *Apus affinis*	-	Y	1.56
Pied Kingfisher *Ceryle rudis*	(LC)	Y	0.11
Common Kingfisher *Alcedo atthis*	-	Y	0.44
White-throated Kingfisher *Halcyon smyrnensis*	(LC)	Y	1.00
Barn Swallow *H irundo rustica*	-	Y	7.44
Yellow Wagtail *Motacilla flava*	-	Y	1.00
Grey Wagtail *Motacilla cinerea*	-	Y	0.56
White Wagtail *Motacilla alba*	-	Y	9.33
Red-throated Pipit *Anthus cervinus*	LC	N	0.33
Zitting Cisticola *Cisticola juncidis*	LC	N	0.22

Common Name	Level of Concern	Wetland-dependent	Mean#
Red-billed Starling *Sturnus sericeus*	(RC)*	Y	0.22
Collared Crow *Corvus torquatus*	LC	N	0.11

Level of concern follows Fellowes *et al.* (2002): LC=Local Concern; RC=Regional Concern; GC=Global Concern; PRC=Potential Regional Concern; PGC=Potential Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
#Mean values given are the mean number recorded on all transects. This is included to reflect the regularity of a species in the study area.
*Red-billed Starling is considered by Fellows *et al.* (2002) to be of Global Concern. Since then, the global population has been increasing and the species is not now considered globally threatened (BirdLife International 2008a). A listing of Regional Concern (RC), based on the importance of the large roosts present near Deep Bay, is considered to be more appropriate.

Pilot Biodiversity Study at the Eastern Frontier Closed Area by Kadoorie Farm and Botanic Garden

6.4.104 A pilot ecological study was conducted in 2003 at the Eastern Frontier Closed Area and North Easet New Territories by various expertises of Kadoorie Farm and Botanic Garden. The Study Area at Lin Ma Hang fung shui woods and secondary forest are situated within the Assessment Area of this proposed project. The bird survey result can be used to supplement the transect survey data.

6.4.105 A total of 48 bird species were recorded in the visual surveys and camera trapping. Among these, four species are of conservation concern although most of the species are common and widespread. Also, a few of woodland specialist birds were recorded at the area reflecting the high ecological value of the woodland. Key finding on bird survey is an Orange-headed Thrush recorded by camera trapping in July 2003. Orange-headed Thrush is a scarce passage migrant as well as local breeder with limited distribution in Hong Kong woodland. More sighting record of this species in recent years at other locations reveal the regularity of its migratory pattern but the one recorded in the study at summer is a potential breeder and of conservation concern.

Table 6-16 Record of conservation concerned species and woodland specialist at Lin Ma Hang fung shui wood and secondary woodland in the pilot biodiversity study conducted by Kadoorie Fam and Botanic Garden. (Data from Kadoorie Farm and Botanic Garden 2004; Level of Concern based on Fellowes *et al.* 2002)

Common Name	Species Name	Woodland Specialist	Level of Concern
Chinese Pond Heron	*Ardeola bacchus*	N	PRC(RC)
Crested Serpent Eagle	*Spilornis cheela*	Y	(LC)
Crested Goshawk	*Accipiter trivirgatus*	Y	
Grey Bushchat	*Saxicola ferrea*	N	LC
Greater Necklaced Laughingthrush	*Garrulax pectoralis*	Y	

Common Name	Species Name	Woodland Specialist	Level of Concern
Black-throated Laughingthrush	*Garrulax chinensis*	Y	
Orange-headed Thrush	*Zoothera citrina*	Y	LC
Striated Yuhina	*Yuhina castaniceps*	Y	
Asian Stubtail	*Urosphena squameiceps*	Y	

Level of concern follows Fellowes *et al.* (2002): LC=Local Concern; RC=Regional Concern; GC=Global Concern; PRC=Potential Regional Concern; PGC=Potential Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.

Herpetofauna

6.4.106 Among the 8 species of herpetofauna recorded in Section 3, all of them are common and widespread (Karsen, 1998) and are not of conservation concern. Five Brown Tree Frog *Polypedates megacephalus* were recorded resting on the existing boundary fence at Pak Fu Shan during a night survey on 3 October 2008. Other species recorded are mainly in plantation, grassland, stream and marsh off-site of the proposed Project Area. **Table 6-17** summarises the Herpetofauna species recorded in Section 3.

Table 6-17 Herpetofauna recorded in Section 3

Species	Project Area	Assessment Area (other than Project Area)	Commonness
Asian Common Toad *Bufo melanostictus*		++++	Widely Distributed
Asiatic Painted Frog *Kaloula pulchra pulchra*		++	Widely Distributed
Brown Tree Frog *(Polypedates megacephalus)*	++	+	Common and Abundant, Widespread throughout Hong Kong
Günther's Frog *Rana guentheri*		++++	Widely Distributed
Paddy Frog *Rana limnocharis*		+	Widely Distributed
Spotted Narrow-mouthed Frog *Kalophrynus interlineatus*		++	Widely distributed from low to moderate altitudes in northern and central New Territories
Chinese Gecko *Gekko chinensis*		++++	Widely Distributed
Reeve's Smooth skink *Scincella reevesii*		++	Widely Distributed

Note: +- 1-3; ++- 4-6; +++- 7-10; ++++- >10

Dragonflies and Butterflies

6.4.107 Twenty-nine species of dragonflies were recorded in Section 3. All species recorded are common or abundant and widely distributed in Hong Kong. Two dragonfly species, the *Sapphire* Flutterer *Rhyothemis triangularis* and Scarlet Basker *Urothemis signata* of local

concern were recorded in Yuen Leng Chai marsh and pond adjacent to the proposed Project Area respectively (Fellows *et al,* 2002). However, these two species are common and widely distributed in weedy ponds, sluggish rivers and marshes in Hong Kong (Wilson, 2003). Only 4 species Common Blue Skimmer, Red-faced Skimmer, Variegated Flutterer and Wandering Glider of mean number of individual less than 1 were recorded around the proposed alignment. All these species are not of conservation concern and are widely distributed in Hong Kong. **Table 6-18** summarises the odonata species recorded in Section 3.

Table 6-18 Odonata species recorded in Section 3

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness	Level of Concern
Asian Amberwing (*Brachythemis contaminata*)		3 (0.33)	Abundant and widely distributed	
Asian Pintail (*Acisoma panorpoides panorpoides*)		39 (4.33)	Common and widely distributed	
Black-kneed Featherlegs (*Copera ciliata*)		6 (0.67)	Abundant and widely distributed	
Black Threadtail (*Prodasineura autumnalis*)		5 (0.56)	Abundant and widely distributed	
Blue Dasher *(Brachydiplax chalybea flavovittata)*		15 (1.67)	Common and widely distributed	
Chinese Greenwing (*Neurobasis chinensis chinensis*)		1 (0.11)	Common and widely distributed	
Common Bluetail (*Ischnura senegalensis)*		20 (2.22)	Abundant and widely distributed	
Common Blue Jewel (*Rhinocypha perforata perforata*)		5 (0.56)	Abundant and widely distributed	
Common Blue Skimmer (*Orthetrum glaucum*)	1 (0.11)	11 (1.22)	Abundant and widely distributed	
Common Red Skimmer *(Orthetrum pruinosum neglectum)*		50 (5.56)	Abundant and widely distributed	
Crimson Darter *(Crocothemis servilia servilia)*		34 (3.78)	Abundant and widely distributed	
Crimson Dropwing (*Trithemis aurora*)		35 (3.89)	Abundant and widely distributed	
Green Skimmer *(Orthetrum sabina sabina)*		30 (3.33)	Common and widely distributed	
Indigo Dropwing (*Trithemis festiva*)		12 (1.33)	Abundant and widely distributed	

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness	Level of Concern
Lesser Blue Skimmer (*Orthetrum Triangulare*)		1 (0.11)	Common and widely distributed	
Marsh Skimmer (*Orthetrum luzonicum*)		18 (2)	Abundant and widely distributed	
Orange-tailed Midget (*Agriocnemis femina oryzae*)		1 (0.11)	Abundant and widely distributed	
Orange-tailed Sprite *(Ceriagrion auranticum)*		16 (1.78)	Abundant and widely distributed	
Pale-spotted Emperor (*Anax guttatus*)		4 (0.44)	Abundant and widely distributed	
Pied Percher *(Neurothemis tullia tullia)*		85 (9.44)	Common and widely distributed	
Pied Skimmer (*Pseudothemis zonata*)		3 (0.33)	Common and widely distributed	
Red-faced Skimmer (*Orthetrum chrysis*)	1 (0.11)	4 (0.44)	Common and widely distributed	
Russet Percher (*Neurothemis fulvia*)		1 (0.11)	Abundant and widely distributed	
Saddlebag Glider *(Tramea virginia)*		17 (1.89)	Common and widely distributed	
Sapphire Flutterer (*Rhyothemis triangularis*)		17 (1.89)	Common and widely distributed	Considered as Local Concern
Scarlet Basker (*Urothemis signata*)		10 (1.11)	Common in areas with abundant fishponds	Considered as Local Concern
Variegated Flutterer *(Rhyothemis variegata)*	1 (0.11)	134 (14.89)	Common and widely distributed	
Wandering Glider *(Pantala flavescens)*	7 (0.78)	247 (27.4)	Abundant and widely distributed	
Yellow Featherlegs (*Copera marginipes*)		10 (1.11)	Abundant and widely distributed	

6.4.108 Fifty-one species of butterfly were recorded in Section 3. Nineteen of them were recorded around the existing fence and roadside vegetation along the proposed Project Area. All these species are common and widely distributed in Hong Kong. Three species recorded off-site are considered as having conservation concern. They include the uncommon species Baron

Euthalia aconthea of Local Concern (Fellows *et al*, 2002) recorded at ditch, stream and developed area of Lin Ma Hang and Nam Hang and an uncommon species of Danaid Eggfly *Hypolimnas misippus* of Local Concern (Fellows *et al*, 2002) recorded in grassland of Pak Fu Shan. The dominant species recorded in Section 3 are Indian Cabbage White and Common Grass Yellow, which have a wide range of habitat preference, mostly occur in degraded grassland or abandoned field. **Table 6-19** summarises the butterfly species recorded in Section 3.

6.4.109 Literature review of other study also recorded two local concern species on the forest edge and fung shui woods of Lin Ma Hang. They are Glassy Bluebottle *Graphium cloanthus* and Small Grass Yellow *Eurema brigitta* (KFBG, 2004). These two species were not recorded during this study.

Table 6-19 Butterfly species recorded in Section 3

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness	Level of Concern
Angled Castor *(Ariadne ariadne)*	2 (0.22)	14 (1.56)	Common and widely distributed	
Banana Skipper (*Erionota torus*)		2 (0.22)	Common and widely distributed in agricultural field	
Banded Tree Brown (*Lehte confusa*)		2 (0.22)	Common and widely distributed in woodland	
Baron (*Euthalia aconthea*)		5 (0.55)	Uncommon but widely distributed in woodland	Considered as Local Concern
Black Prince (*Rohana parisatis*)		13 (1.44)	Common and widely distributed in woodland	
Blue Tiger (*Tirumala limniace*)		1 (0.11)	Common and widely disturbuted	
Blue-spotted Crow (*Euploea midamus*)		13 (1.44)	Common and widely distributed	
Ceylon Blue Glassy Tiger (*Ideopsis similis*)		2 (0.22)	Common and widely disturbuted	
Chinese Dart (*Potanthus confucius confucius*)		1 (0.11)	Common and widely distributed in Grassland	

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness	Level of Concern
Colour Sergeant (*Athyma nefte*)		2 (0.22)	Common and widely disturbuted	
Common Bluebottle *(Graphium sarpedon)*	2 (0.22)	12 (1.33)	Common and widely distributed	
Common Five-ring (*Ypthima baldus*)		3 (0.33)	Common and widely distributed in Grassland	
Common Grass Yellow *(Eurema hecabe)*	8 (0.89)	117 (13)	Common and widely distributed	
Common Hedge Blue (*Acytolepis puspa*)		1 (0.11)	Common and widely distributed	
Common Indian Crow (*Euploea core*)		5 (0.56)	Common and widely distributed	
Common Jay (*Graphium doson*)		1 (0.11)	Uncommon but widely distributed	
Common Mapwing (*Cyrestis thyodamas*)		2 (0.22)	Common and widely distributed in woodland area	
Common Mime (*Chilasa clytia*)	5 (0.56)	4 (0.44)	Common and widely distributed	
Common Mormon *(Papilio polytes)*	42 (4.67)	80 (8.89)	Common and widely distributed	
Common Sailer (*Neptis hylas*)	1(0.11)	7 (0.78)	Common and widely distributed	
Common Sergeant (*Athyma perius*)		8 (0.89)	Common and widely distributed	
Common Straight Swift (*Parnara guttata*)		1 (0.11)	Common and widely distributed in Grassland	
Common Tiger *(Danaus genutia)*		12 (1.33)	Common and widely distributed	
Common Tree Brown (*Lethe rohria permagnis*)	1 (0.11)	8 (0.89)	Uncommon and widely distributed in woodland	

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness	Level of Concern
Danaid Eggfly (*Hypolimnas misippus*)		1 (0.11)	Uncommon	Local Concern
Dark-brand Bush Brown *(Mycalesis mineus)*		50 (5.56)	Common and widely distributed	
Glassy Tiger (*Parantica aglea*)		2 (0.22)	Common and widely distributed	
Gram Blue (*Euchrysops cnejus*)	1(0.11)		Common and widely distributed	
Great Eggfly *(Hypolimnas bolina kezia)*	4 (0.44)	23 (2.56)	Common and widely distributed	
Great Mormon (*Papilio memnon*)	6 (0.67)	24 (2.67)	Common and widely distributed	
Great Orange Tip (*Hebomoia glaucippe*)		8 (0.89)	Common and widely distributed	
Grey Pansy (*Junonia atlites*)		5 (0.56)	Common and widely distributed in abandoned grassland and abandoned agricultural field	
Indian Cabbage White *(Pieris canidia)*	18 (2)	227 (25.22)	Common and widely distributed	
Indian Red Admiral (*Vanessa indica*)		1 (0.11)	Common and widely distributed	
Large Faun (*Faunis eumeus*)		6 (0.67)	Common and widely distributed	
Lemon Emigrant *(Catopsilia pomona)*	1 (0.11)	32 (3.56)	Common and widely distributed	
Long-tailed Blue (*Lampides boeticus*)		2 (0.22)	Common and widely distributed	
Mottled Emigrant (*Catopsilia pyranthe*)		4 (0.44)	Common and widely distributed	
Pale Grass Blue *(Zizeeria maha)*		57 (6.33)	Common and widely distributed	

Species	Project Area (mean no. of individual per visit)	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness	Level of Concern
Paris Peacock (*Papilio paris*)	5 (0.56)	8 (0.89)	Common and widely distributed	
Peacock Pansy (*Junonia almana*)	1 (0.11)	9 (1)	Common and widely distributed	
Plum Judy (*Abisara echerius*)	1 (0.11)	9 (1)	Common and widely distributed	
Purple Sapphire (*Heliophorous epicles phoenicoparyphus*)	2 (0.22)		Common and widely distributed	
Red Helen (*Papilio helenus*)	1 (0.11)		Common and widely distributed	
Red Ring Skirt (*Hestina assimilis*)		1 (0.11)	Common and widely distributed in woodland	
Red-base Jezebel *(Delias pasithoe)*	4 (0.44)	1 (0.11)	Common and widely distributed	
Rustic (*Cupha erymanthis*)		1 (0.11)	Common and widely distributed	
Slate Flash (*Rapala manea*)		1 (0.11)	Common and widely distributed	
Staff Sergeant (*athyma selenophora*)	1 (0.11)		Common and widely distributed	
Straight Five-ring (*Ypthima lisandra*)		1 (0.11)	Common and widely distributed	
White-edged Blue Baron (*Euthalia phemius seitzi*)		2 (0.22)	Common and widely distributed	

Note: Commonness follows Hong Kong Biodiversity Database (AFCD, 2006).

Aquatic Fauna

6.4.110 Fifteen species of aquatic fauna were recorded in Section 3 during the study period. The most concern aquatic fauna in this section are those recorded in Lin Ma Hang Stream SSSI. The stream supports 15 species of primary freshwater fishes including several species of conservation concern *Channa asiatica, Mastacembelus armatus, Rasbora steineri* and *Rasborinus lineatus* (DSD, 2007). The ecological baseline survey in this study recorded three species of conservation concern including Chinese Rasbora *Rasbora steineri,* Precedaceous Chub *Parazacco spilurus* and Topmouth Gudgeon *Pseudorasbora parva* (**Figure 6.8**).They are considered as Global Concern, Vulnerable in China and Local

Concern (Fellowes *et al.,* 2002 and Lee *et al.*, 2004) respectively.

6.4.111 Topmouth Gudgeon was found at downstream of Lin Ma Hang on 6 December 2007. This species is uncommon in Hong Kong mainly distributed in several streams in North District (Lee *et al*., 2004). The fish is considered as a pest in Mainland China and is available on market as fish feed. Predaceous chub was recorded in abundant in Lin Ma Hang Stream. This species is common, widely distributed and occurs in most unpolluted hill streams in both upper and lower courses (Lee *et al* 2004). However, this species is considered as 'Vulnerable' in China Red Data Book since the population in China decreases due to habitat loss.

6.4.112 Chinese Rasbora is a rare species only recorded in North District and Kam Tin (Lee *et al*., 2004). This primary freshwater fish occurs in both hill streams and lower reaches of lowland streams. Both juvenile and adult of this fish were recorded in Lin Ma Hang Stream during the study period.

6.4.113 Other species recorded in large abundance at streams, ditches and ponds in this section are either common and widespread or introduced species of no conservation concern. **Table 6-20** summarises the aquatic fauna species recorded in Section 3.

Table 6-20 Aquatic fauna species recorded in Section 3

Species	Relative Abundance	Habitat	Status
Chinese Barb (*Puntius semifasciolatus*)	++++	Streams, ponds and drainage channel	Common and widely distributed
Chinese Catfish *(Clarias fuscus)*	+	Marsh	Common
Chinese Rasbora (*Rasbora steineri*)	++	Lin Ma Hang Stream	Rare; considered as Global Concern
Goldfish (*Carassius auratus*)	+++	Stream and pond	Not common in streams but cultivated in fishponds
Guppy (*Poecilia reticulata*)	++++	Ditch	Common and occurs in large numbers in many local streams and ponds
Nile Tilapia (*Oreochromis niloticus*)	++++	Marsh, pond and river	Common and widespread, introduced species
Mosquito Fish (*Gambusia affinis*)	++++	Stream and ditches	Common, introduce species.
Paradise Fish (*Macropodus opercularis*)	++	Lin Ma Hang Stream	Common
Predaceous Chub (*Parazacco spilurus*)	++++	Lin Ma Hang Stream	Common and widespread; considered as "Vulnerable" in China
Goby (*Rhinogobius duospilus*)	+	Lin Ma Hang Stream	Common and widely distributed
Topmouth Gudgeon (*Pseudorasbora parva*)	++++	Lin Ma Hang Stream	Uncommon in streams; considered as Local Concern

Species	Relative Abundance	Habitat	Status
Common Carp (*Cyprinus carpio*)	++++	Fishponds and ponds	Cultivated in fishponds as food fish or for aquarium
Apple Snail (*Pomacea lineata*)	++++	Ditches	Exotic species common in drainage channel or irrigation ditches
Freshwater Shrimp (*Caridina cantonensis*)	++++	Streams	Common and widespread
Freshwater Shrimp (*Macrobrachium hainanence*)	+	Stream	Abundant in pools and breeds in estuaries

Note: Status follows Lee et al. (2004).

Ecological Profile of Section 4 (Sha Tau Kok)

Habitat & Vegetation

6.4.114 The whole alignment of Section 4 will be within the urban area at Sha Tau Kok (**Figure 6.9**). Apart from the developed area, woodland, marsh and abandoned agricultural land / low-lying grassland are the three largest habitats within the Assessment Area.

6.4.115 Woodlands at Sheung Tam Shui Hang, Shan Tsui, and Muk Min Tau are distant with the proposed alignment of nearly 200m. The largest marsh was identified at Shan Tsui are derived from abandoned agricultural land. *Colocasia esculenta, Commelina diffusa, Leersia hexandra* and *Cyclosorus interruptus* are dominant species identified within the marsh.

6.4.116 Large area of abandoned agricultural land / low-lying grassland was found at west of the Tam Shui Hang Tsuen and the channalised Tam Shui Hang Stream divides the habitat roughly into two halves. *Microstegium ciliatum, Ipomoea cairica, Panicum maximum, Imperata koenigii* and the common weed climber *Mikania micrantha* are dominant species.

6.4.117 Two small pieces of mangrove were identified at west of the Sha Tau Kok Town. Mangrove species include *Kandelia obovata, Avicennia marina* and *Aegiceras corniculatum*. Two fishponds were found adjacent to these mangrove habitats.

6.4.118 The whole Section 4 will be within the urban area at Sha Tau Kok. Plants identified within the Project Area are dominated by common landscaping planting typical to similar environments with few weed species. Amenity species include *Acacia confusa, Delonix regia, Grevillea robusta, Lagerstroemia speciosa* and *Elaeocarpus hainanensis* are recorded.

6.4.119 Neither protected nor rare plant species was identified. A total of 56 species was identified. The plant list of the Project Area of the Section 4 is presented in **Table F-4a** in **Appendix F**.

Fauna

6.4.120 Section 4 covers the Sha Tau Kok alignment and area within 500m from the proposed works boundary. Ecological baseline surveys for fauna species include those areas of ecological interest, such as Tam Shui Hang and Shan Tsui (T12_HTSH&ST refers to **Figure F1** of

Appendix F).

Mammals

6.4.121 Apart from bat species recorded foraging over streams, mangrove and marshes are protected under Cap. 170, only Domestic Cats *Felis catus* and House Mouse *Mus musculus* were recorded in drainage channels of Sha Tau Kok.

6.4.122 From literature review, four bat species were recorded by mist netting or roost census conducted by AFCD in 2003 to 2005 (Shek, 2006). They include Himalayan Leaf-nosed Bat *Hipposideros armiger*, Japanese Pipistrelle *Pipistrellus abramus*, Short-nosed Fruit Bat *Cynopterus sphinx* and Lesser Bamboo Bat *Tylonycteris pachypus*. The later two species are listed in the China Red Data Book and considered of having local concern but abundant in Hong Kong.

Birds

6.4.123 Bird species found in this section are all common and widespread in Hong Kong including four conservation concerned species. Pacific swift recorded in this area is of uncommon species but this sky-high gliding species has very little ecological linkage to the habitat.

Results of transect survey

6.4.124 A total of 28 species was recorded during the transect surveys in Section 4, of which 5 species are of conservation concern. A full list of species recorded is given in **Table F-4b** in **Appendix F**. A high proportion of generalist birds recorded at the transect survey as a result of a dominance of anthropogenic habitat at the Assessment Area in which all the birds recorded are common and widespread in Hong Kong.

Table 6-21 Mean of individuals of bird species of conservation concern and wetland-dependent bird species recorded during transect survey in Section 4 Assessment Area, Nov 2007- Oct 2008. (Level of Concern based on Fellowes *et al.* 2002)

Common Name	Level of Concern	Wetland-dependent	Mean#
Black-crowned Night Heron *Nycticorax nycticorax*	(LC)	Y	0.25
Black Kite *Milvus migrans*	(RC)	N	0.25
White-breasted Waterhen *Amaurornis phoenicurus*	-	Y	0.13
Pacific Swift *Apus pacificus*	(LC)	N	0.25
Little Swift *Apus affinis*	-	Y	2.13
White-throated Kingfisher *Halcyon smyrnensis*	(LC)	Y	0.75
White Wagtail *Motacilla alba*	-	Y	0.13

Common Name	Level of Concern	Wetland-dependent	Mean#
Red-billed Starling *Sturnus sericeus*	(RC)*	Y	0.50

Level of concern follows Fellowes *et al.* (2002): LC=Local Concern; RC=Regional Concern; GC=Global Concern; PRC=Potential Regional Concern; PGC=Potential Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
#Mean values given are the mean number recorded on all transects. This is included to reflect the regularity of a species in the study area.
*Red-billed Starling is considered by Fellowes *et al.* (2002) to be of Global Concern. Since then, the global population has been increasing and the species is not now considered globally threatened (BirdLife International 2008a). A listing of Regional Concern (RC), based on the importance of the large roosts present near Deep Bay, is considered to be more appropriate.

Herpetofauna

6.4.125 Two species of amphibians and six species of reptiles were recorded in Section 4. They include 3 conservation concerned species: Burmese Python *Python mourus bibittatus*, Common Rat Snake *Ptyas mucosus* and Chinese Soft-shelled Turtle *Pelodiscus sinensis*. A Burmese Python juvenile was recorded at a drainage channal near Sha Tau Kok Village during a night survey on 10 September 2008. This conservation concerned species is listed as "Lower Risk/ Near Threatened" in IUCN Red Data List (2008) and as potential regional concern in Fellowes *at el.* (2002) although it is widely distributed in Hong Kong. Common Rat Snake, a common and widespread species in Hong Kong could be found in a wide variety of habitats, is listed as "Vulnerable" species in China Red Data Book. Chinese Soft-shelled Turtle is a globally threatened species, listed as "Vulnerable" in IUCN Red Data List (2008). This species is rare and localized in Hong Kong but also a common food item sold in Hong Kong markets. Sighting record of this species outside Deep Bay fishponds is thought to be released by the local people (Karsen et al. 1998). The record in Tam Shui Hang Channel in this study was found near a local village is thereby considered as a released individual. **Table 6-22** summarises the herpetofauna recorded in Section 4.

Table 6-22 Herpetofauna recorded in Section 4

Species	Assessment Area (other than Project Area)	Commonness	Level of Concern/ Protection Status
Asian Common Toad *Bufo melanostictus*	+++	Widely Distributed	
Günther's Frog *Rana guentheri*	++++	Widely Distributed	
Burmese Python *Python mourus bivittatus*	+	Widely Distributed	Protected under Cap. 170 & Cap. 586; Listed as Critically Endangered in China Red Data Book; Listed in IUCN 2008 as Lower Risk/near threatened; Considered as Potential Regional Concern in Fellowes *et al.* (2002)
Chinese Gecko *Gekko chinensis*	++	Widely Distributed	
Chinese Soft-shelled Turtle *Pelodiscus sinensis*	+	Locally found in reservoirs and fishponds in Deep Bay area	Listed as Vulnerable in IUCN 2008 and China Red Data Book; Protected under Cap. 170; Considered as Global Concern in Fellowes *et al.* (2002)
Common Rat Snake Ptyas mucosus	+	Widely Distributed	Listed as Vulnerable in China Red Data Book; Protected under Cap. 586
Greater Green Snake *Cyclophiops major*	+	Widely Distributed	
Spotted Narrow-mouthed Frog *Kalophrynus interlineatus*	+	Widely distributed from low to moderate altitudes in northern and central New Territories	

Note: (1) +- 1-3; ++- 4-6; +++- 7-10; ++++- >10
(2) No record within Project Area.

Dragonflies and Butterflies

6.4.126 Eighteen species of dragonflies were recorded in Section 4 during the study period. All species are recorded off-site at drainage channel and marsh. No species of conservation concern were recorded in this Section. **Table 6-23** summarises the odonata species recorded in Section 4.

Table 6-23 Odonata species recorded in Section 4

Species	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness
Asian Amberwing (*Brachythemis contaminata*)	4(0.44)	Abundant and widely distributed
Asian Pintail (*Acisoma panorpoides panorpoides*)	39(4.33)	Common and widely distributed
Black Threadtail (*Prodasineura autumnalis*)	2(0.22)	Abundant and widely distributed
Black-kneed Featherlegs *(Copera ciliata)*	4(0.44)	Abundant and widely distributed
Common Blue Skimmer *(Orthetrum glaucum)*	32(3.56)	Abundant and widely distributed
Common Bluetail (*Ischnura senegalensis)*	1(0.11)	Abundant and widely distributed
Common Red Skimmer *(Orthetrum pruinosum neglectum)*	45(0.5)	Abundant and widely distributed
Crimson Darter *(Crocothemis servilia servilia)*	3(0.33)	Abundant and widely distributed
Crimson Dropwing (*Trithemis aurora*)	14(1.56)	Abundant and widely distributed
Green Skimmer *(Orthetrum sabina sabina)*	4(1.44)	Common and widely distributed
Indigo Dropwing (*Trithemis festiva*)	8(0.89)	Abundant and widely distributed
Marsh Skimmer *(Orthetrum luzonicum)*	34(3.78)	Common and widely distributed
Orange-tailed Midget *(Agriocnemis femina oryzae)*	2(0.22)	Abundant and widely distributed
Orange-tailed Sprite *(Ceriagrion auranticum)*	2(0.22)	Abundant and widely distributed
Red-faced Skimmer *(Orthetrum chrysis)*	2(0.22)	Common and widely distributed
Russet Percher *(Neurothemis fulvia)*	3(0.33)	Abundant and widely distributed
Wandering Glider *(Pantala flavescens)*	186(20.67)	Abundant and widely distributed
Yellow Featherlegs (*Copera marginipes*)	2(0.22)	Abundant and widely distributed

Note: (1) Commonness follows Hong Kong Biodiversity Database (AFCD, 2006).
(2) No record within Project Area.

6.4.127 Eighteen species of butterfly were recorded in Section 4. All the species recorded are at off-site habitats from the Project Area with status common and widespread in Hong Kong. No species of conservation concern was recorded. **Table 6-24** summarises the butterfly species recorded in Section 4.

Table 6-24 Butterfly species recorded in Section 4

Species	Assessment Area Other than Project Area (mean no. of individual per visit)	Commonness
Banana Skipper (*Erionota torus*)	1(0.11)	Common and widely distributed in agricultural field
Black Prince (*Rohana parisatis*)	3(0.33)	Common and widely distributed in woodland
Common Bush Brown (*Mycalesis zonata*)	1(0.11)	Common and widely distributed in woodland
Common Five-ring (*Ypthima baldus*)	2(0.22)	Common and widely distributed in Grassland
Common Grass Yellow *(Eurema hecabe)*	8(0.89)	Common and widely distributed
Common Mormon *(Papilio polytes)*	9(1.00)	Common and widely distributed
Common Sergeant (*Athyma perius*)	12(1.33)	Common and widely distributed
Common Tiger *(Danaus genutia)*	1(1.00)	Common and widely distributed
Dark-brand Bush Brown *(Mycalesis mineus)*	30(3.33)	Common and widely distributed
Five-bar Swordtail (*Pathysa antiphates*)	1(0.11)	Common and widely distributed
Great Mormon (*Papilio memnon*)	2(0.22)	Common and widely distributed
Great Orange Tip (*Hebomoia glaucippe glaucippe*)	1(0.11)	Common and widely distributed
Indian Cabbage White *(Pieris canidia)*	46(5.11)	Common and widely distributed
Lemon Pansy (*Junonia lemonias lemonias*)	2(0.22)	Uncommon
Mottled Emigrant (*Catopsilia pyranthe*)	2(0.22)	Common and widely distributed
Pale Grass Blue *(Zizeeria maha)*	8(0.89)	Common and widely distributed
Peacock Pansy (*Junonia almana*)	5(0.56)	Common and widely distributed
Rustic (*Cupha erymanthis*)	2(0.22)	Common and widely distributed

Note: (1) Commonness follows Hong Kong Biodiversity Database (AFCD, 2006).
(2) No record within Project Area.

Aquatic Fauna

6.4.128 Freshwater fishes recorded in Ha Tam Shui Hang Channel include Predaceous Chub *Parazacco spilurus* (**Figure 6.9**), Chinese Barb *Puntius semifasciolatus,* Barcheek Goby *Rhinogobius giurinus,* Swordtail *Xiphophorus hellerii* and Mud Carp *Cirrhinus molitorella.*

Water Skater *Ptilomera tigrina* and Mitten Crab *Eriocheir japonicus* were also recorded in this stream. Exotic Apple Snail *Pomacea lineata* was recorded in irrigation ditches around Tam Shui Hang. Apart from Predaceous Chub is considered as "Vulnerable" in China Red Data Book, no other species of conservation concern was recorded in this section.

6.4.129 Fiddler Crabs *Uca arcuata* and *Perisesarma bidens* and Mudskipper *Periophthalmus modestus* were recorded in large abundance in the mangrove at Sha Tau Kok. They are common species recorded in mangrove and mudflat of Hong Kong (Fong *et al.,* 2005).

6.5 Ecological Value of Project Area / habitats within the Assessment Area

6.5.1 Habitats identified within the Assessment Area were evaluated according to the guidelines set out in Annex 8 of the EIAO-TM. Overall ecological values for each habitat type were ranked. Rankings starting with the highest ecological value range from:

High
Moderate-high
Moderate
Moderate-low
Low
Very Low

Evaluation of the Project Areas

6.5.2 Evaluation of the Project Areas in different Sections was presented in the following tables:

Section 1

6.5.3 The whole proposed Project Area will be within the existing boundary patrol road running from Pak Hok Chau check point to Lok Ma Chau control point near the Lok Ma Chau railway station. Common roadside plants and streetscape plantings can be found along this section.

6.5.4 The Project Area will only cover two artificial habitats of developed area and open field. However as it is within or in close proximity to several sites of conservation importance (WCA, Mai Po Inner Deep Bay Ramsar Site, Mai Po Nature Reserve and Mai Po Marshes SSSI), the ecological linkage between the Project Area and these sites has also been taken into account during the preparation of the evaluation.

6.5.5 Due to the low naturalness (man-made) of habitats to be affected and the narrow profile (road) of the Project Area, ecological linkage and potential value to species as breeding or feeding grounds are not expected. All birds found in the area were flying across or temporary roosting at road side vegetation.

6.5.6 The overall ecological value is considered to be very low.

Table 6-25 Ecological Evaluation of Project Area in Section 1

Criteria	
Naturalness	Man-made habitat (existing road and some open fields)
Size	approx. 4.1km in length
Diversity	Low in both flora and fauna species
Rarity	Common habitat. No species of conservation concern were identified depending on these habitats
Re-creatability	Readily re-creatable
Fragmentation	No fragmentation
Ecological linkage	Although the Project Area is within the WCA and in close proximity to Mai Po Inner Deep Bay Ramsar Site, Mai Po Nature Reserve and Mai Po Marshes SSSI, no significant ecological linkage was identified
Potential value	Low
Nursery/ breeding ground	Potential for nursery / breeding grounds is low
Age	No available information
Abundance/ Richness of wildlife	Low in wildlife abundance
Ecological value	**Very Low**

Section 2

Red Alignment

6.5.7 The Project Area at the red alignment in Section 2 will be within the existing maintenance services road of Drainage Services Department.

6.5.8 This alignment runs along the northern boundary of the Hoo Hok Wai and Ta Sha Lok wetlands which provide important habitats for various waterbirds, amphibians and dragonflies species. The concrete paved Project Area and its narrow landform greatly limit the ecological linkage with these offsite habitats. All birds found in the area were flying across or temporary roosting at road side vegetation.

6.5.9 No species of conservation concern were identified depending on this man-made habitat. The overall ecological value is considered very low.

Table 6-26 Ecological Evaluation of Project Area at Red Alignment in Section 2

Criteria	
Naturalness	Man-made habitat (existing DSD maintenance access)
Size	approx. 5.6km in length
Diversity	Low in both flora and fauna species
Rarity	Common habitat; no species of conservation concern were identified depending on this Project Area
Re-creatability	Readily re-creatable
Fragmentation	No fragmentation

Criteria	
Ecological linkage	No significant ecological linkage was identified despite its close proximity to the Hoo Hok Wai and Ta Sha Lok wetlands
Potential value	Low
Nursery/ breeding ground	Potential for nursery / breeding grounds is low
Age	No available information
Abundance/ Richness of wildlife	Low in wildlife abundance
Ecological value	**Very Low**

Blue and Green Alignment

6.5.10 The Project Area at the blue and green alignments in Section 2 will be within the existing boundary patrol road.

6.5.11 These two alignments run along the southern boundary of the Lok Ma Chau, Hoo Hok Wai and Ta Sha Lok wetlands. Similar to the red alignment in Section 2, the concrete paved Project Area and its narrow landform greatly limit the ecological linkage with these offsite habitats. All birds found in the area were flying across or temporary roosting at road side vegetation.

6.5.12 No species of conservation concern were identified depending on this man-made habitat. The overall ecological value is considered very low.

Table 6-27 Ecological Evaluation of Project Area at Blue and Green Alignments in Section 2

Criteria	
Naturalness	Man-made habitat (existing Boundary Patrol Road)
Size	approx. 6km in length
Diversity	Low in both flora and fauna species
Rarity	Common habitat; one rare plant *Berchemia lineata* was recorded; One Burmese Python was found on roadside but not depends on this habitat as roosting ground.
Re-creatability	Readily re-creatable
Fragmentation	No fragmentation
Ecological linkage	No significant ecological linkage was identified despite its close proximity to the Lok Ma Chau, Hoo Hok Wai and Ta Sha Lok wetlands
Potential value	Low
Nursery/ breeding ground	Potential for nursery / breeding grounds is low
Age	No available information
Abundance/ Richness of wildlife	Low in wildlife abundance
Ecological value	**Very Low**

Section 3

Red Alignment

6.5.13 The Project Area at the red alignment in Section 3 will be within some riparian grasslands south of the unchannelised Shenzhen River which is heavily polluted. The northern side of the river is the highly urbanised Shenzhen Town.

6.5.14 No species of conservation concern were identified depending on this habitat. The overall ecological value is considered as low.

Table 6-28 Ecological Evaluation of Project Area at Red Alignment in Section 3

Criteria	
Naturalness	Habitats derived from abandoned agricultural lands and dominated by exotic flora species; Adjacent to the heavily polluted Shenzhen River
Size	Approx. 4km in length
Diversity	Low
Rarity	Common habitat
Re-creatability	Re-creatable
Fragmentation	No fragmentation
Ecological linkage	No significant ecological linkage with recognised site or species of conservation concern
Potential value	Low
Nursery/ breeding ground	Potential breeding grounds of amphibians
Age	No available information
Abundance/ Richness of wildlife	Low
Ecological value	**Low**

Blue and Green Alignments

6.5.15 The Project Area along the blue and green alignments in Section 3 will be within the existing boundary patrol road from Ng Tung River to Lin Ma Hang. Offsite habitats of conservation interest include Yuen Leng Chai fishponds, Nam Hang mitigation area and Lin Ma Hang Stream.

6.5.16 However, like those alignments in Section 1 and 2, ecological linkage is not expected for its artificial habitat nature and narrow profile. The overall ecological value is considered very low.

Table 6-29 Ecological Evaluation of Project Area at Blue and Green Alignments in Section 3

Criteria	
Naturalness	Man-made habitat (existing Boundary Patrol Road)
Size	approx. 7.5km in length
Diversity	Low in both flora and fauna species
Rarity	Common habitat; One young individual of *Aquilaria sinensis* was recorded which is listed under the Protection of Endangered Species of Animals and Plants Ordinance (Cap 586); No uncommon fauna species was recorded.
Re-creatability	Readily re-creatable
Fragmentation	No fragmentation
Ecological linkage	No significant ecological linkage was identified
Potential value	Low
Nursery/ breeding ground	Potential for nursery / breeding grounds is low
Age	No available information
Abundance/ Richness of wildlife	Low in wildlife abundance
Ecological value	**Very Low**

Section 4

6.5.17 The whole proposed Project Area will be within the urban areas at Sha Tau Kok.

Table 6-30 Ecological Evaluation of Project Area in Section 4

Criteria	
Naturalness	Man-made habitat
Size	approx. 0.5km in length
Diversity	Low in both flora and fauna species
Rarity	Common habitat
Re-creatability	Readily re-creatable
Fragmentation	No fragmentation
Ecological linkage	No ecological linkage was identified
Potential value	Low
Nursery/ breeding ground	Potential for nursery / breeding grounds is low
Age	No available information
Abundance/ Richness of wildlife	Low in wildlife abundance
Ecological value	**Very Low**

Evaluation of Habitats (Offsite) within the Assessment Area

6.5.18 Evaluation of offsite (i.e. areas outside the proposed Project Area) habitats within the Assessment Area is presented in **Tables F-5-F19** in **Appendix F**.

6.6 Potential Ecological Impacts

Introduction

6.6.1 The following sections identified and evaluated the potential ecological impacts as a result of the project in detail. It identified potential impacts on habitats and their associated species, caused by the proposed boundary fence construction works during the construction and operational phases. As far as possible, any direct, indirect, on-site and off-site ecological impacts have been identified and assessed.

6.6.2 The potential impacts described in the sections below were assessed and evaluated in accordance with the requirements stipulated in the EIAO-TM. Impact levels were ranked using the 6 point range "severe", "severe-moderate", "moderate", "moderate-minor", "minor" and "negligible".

Potential Construction Phase Impacts

6.6.3 During the construction phase the major potential impacts on ecology would include the direct impacts of habitat loss, ecological barrier, impact on onsite species of conservation concern and disturbance to off-site habitats and species.

Potential Operational Phase Impacts

6.6.4 During operational phase, the major potential impacts on ecology would include the direct impacts of habitat loss and ecological barrier.

Mitigation Measures

6.6.5 Practical and effective mitigation measures would be proposed if adverse impacts were identified. The order of priority of the mitigation measures will be avoidance, minimizing and compensation.

6.6.6 As an avoidance measure, alignments are proposed along the existing boundary patrol roads and maintenance access as far as possible since as shown in **Figure 6.1-6.9**, other alternatives could only be established by creating new pathways in adjacent habitats which would inevitably cause adverse ecological impacts. Therefore the currently proposed alignment is considered to be a preferred option in terms of ecological avoidance measure.

6.6.7 Other mitigation measures recommended for particular impact are detailed below.

Habitat Loss

6.6.8 According to the project footprint (i.e. proposed Project Area for the boundary fence works), the construction of the proposed primary / secondary boundary fence and patrol road would cause the permanent loss of part of the existing habitats within the Project Area.

Section 1

6.6.9 The Project Area of this section includes only the habitat of developed area and open field of

4.6 ha in total (i.e. the existing boundary patrol road, exposed grounds along the road and the roadside vegetation).

6.6.10 Proposed works will be the construction of a secondary boundary fence on one side of the boundary patrol road. No fishponds are proposed to be filled. As the potential habitat loss will only involve habitat of low ecological value, the impact level is considered to be negligible. The evaluation of the impact is summarised in **Table 6-31**.

Section 2 (Red Alignment)

6.6.11 The Project Area of this Section includes only the habitat of developed area (i.e. the existing maintenance service access of DSD). Proposed works will be the construction of primary and secondary boundary fence along the two sides of the road. As the potential habitat loss will only involve habitat of low ecological value, the impact level is considered to be negligible. The evaluation of the impact is summarised in **Table 6-31**.

Section 2 (Blue and Green Alignment)

6.6.12 The Project Area of this Section includes only the habitat of developed area (i.e. the existing boundary patrol road and the roadside vegetation). Proposed works will be the construction of secondary boundary fence (along blue aligment) and removal of the existing primary boundary fence (along green alignment) along the either side of the road. As the potential habitat loss will only involve habitat of low ecological value, the impact level is considered to be negligible. The evaluation of the impact is summarised in **Table 6-31**.

Table 6-31 Potential Ecological Impacts of Habitat Loss at Section 1 and 2

Criteria	Section 1	Section 2 (Red Alignment)	Section 2 (Blue & Green Alignment)
Receivers	Habitats of low ecological value	Habitats of low ecological value	Habitats of low ecological value
Size	Small in area (4.6ha) but medium in length (4.1km)	Small in area (5ha) but medium in length (5.6km)	Small in area (2.4ha) but medium in length (6km)
Duration	During construction period	During construction period	During construction period
Reversibility	Reversible (as the lost man-made habitat will be reinstated after the completion of the Project)	Reversible (as the lost man-made habitat will be reinstated after the completion of the Project)	Reversible (as the lost man-made habitat will be reinstated after the completion of the Project)
Magnitude	Low; as only fence construction works is involved	Low; as only fence construction works is involved	Low; as only fence construction works (blue alignment) and fence removal works is involved
Impact Severity before Mitigation	**Negligible**	**Negligible**	**Negligible**
Recommended Mitigation	**None**	**None**	**None**

Section 3 (Red Alignment)

6.6.13 The Project Area of this Section includes the habitat of low-lying grassland. Proposed works will be the construction of a new section of boundary patrol road, primary and secondary boundary fences. The potential habitat loss would involve the habitat of moderate-low ecological value, the impact level is considered to be moderate-minor. The evaluation of the impact is summarised in **Table 6-32**.

Section 3 (Blue and Green Alignment)

6.6.14 The Project Area of this Section includes only the habitat of developed area (i.e. the existing boundary patrol road and the roadside vegetation). Proposed works will be the construction of secondary boundary fence (along blue aligment) and removal of the existing primary boundary fence (along green alignment) along the either side of the road. As the potential habitat loss will only involve habitat of low ecological value, the impact level is considered to be negligible. The evaluation of the impact is summarised in **Table 6-32**.

Section 4

6.6.15 The Project Area of this Section includes only the habitat of developed area (i.e. the existing Sha Tau Kok Town and roadside vegetation). Proposed works will be the construction of a secondary boundary fence along the proposed alignment. As the potential habitat loss will only involve habitat of low ecological value, the impact level is considered to be negligible. The evaluation of the impact is summarised in **Table 6-32**.

6.6.16 Direct impact to bird species and butterflies is expected to be of low significance due to the high disturbance and low ecological value of the artificial habitat. Major affected species are those common grassland species utilizing the road side grassess such as Yellow-bellied Prinia *Prinia flaviventris* and Scaly-breasted Munia *Lonchura punctulata,* Common Grass Yellow *Eurema hecabe,* Common Mormon *Papilio polytes* and Indian Cabbage White *Pieris canidia*.

Table 6-32 Potential Ecological Impacts of Habitat Loss at Section 3 and 4

Criteria	Section 3 (Red)	Section 3 (Blue & Green)	Section 4
Receivers	Habitat of low ecological value	Habitats of low ecological value	Habitats of low ecological value
Size	Small in area (5.9ha) and medium in length (4km)	Small in area (6.7ha) but long in length (7.5km)	Small in area (0.3ha) and short in length (0.5km)
Duration	During construction and operational periods	During construction period	During construction period
Reversibility	Not reversible (as the riparian grassland will be permanently changed to man-made habitat)	Reversible (as the lost man-made habitat will be reinstated after the completion of the Project)	Reversible (as the lost man-made habitat will be reinstated after the completion of the Project)
Magnitude	Moderate	Low	Low
Impact Severity before Mitigation	**Moderate-minor**	**Negligible**	**Negligible**

Criteria	Section 3 (Red)	Section 3 (Blue & Green)	Section 4
Recommended Mitigation	**None**	**None**	**None**

Ecological Barrier

6.6.17 The effect of ecological barrier would arise when a continuous natural ecosystem is cut across by artificial barrier. The impacts may include fragmentation of population and interference of daily foraging activities of fauna species. As the new secondary fence will be in same design to the existing primary fence, the current situation at Mai Po and other frontier area could be used as a reference for predicting potential impact of new boundary.

6.6.18 The existing border fence stretches from west (Tsim Bei Tsui) to east (Sha Tau Kok) for approximately 32km. Although no research has been conducted on the ecological barrier effect caused from the boundary fence, no significant impact caused by the boundary fence on local ecosystem was observed. This is supported by an evident that a high diversity of various wildlife groups was found in both gei wai and intertidal mangrove area which are separated by the existing boundary fence within the Mai Po Nature Reserve but without any significant ecological barrier effect. Moreover, the daily movement of thousands of wintering waterbirds from gei wai to Inner Deep Bay intertidal mudflat and vice versa were not obstructed by the existing boundary fence.

6.6.19 For the proposed secondary boundary fence which will run along the existing border fence in Section 1 and 2, the ecological barrier effect is not expected to exceed the existing boundary fence as similar design was adopted. During this Study, Small Asian Mongoose and domestic dog were observed creeping across the existing boundary fence between fishponds and rivers, which demonstrated that the boundary fence could not stop the free movement of the medium-sized mammals between different habitats.

Section 1 & Blue Alignment of Section 2

6.6.20 The proposed secondary boundary fence will separate the fishpond habitat on the southern side from the channelized river on the northern side. Due to the channelized nature of Shenzhen River, it is not favourable to most of the wildlife species inhabiting adjacent fishpond habitat, except wetland-dependent bird species. The movement of non-flying wildlife between the fishponds and the channalized river is expected to be in very low frequency. For the wetland-dependent species which could be affected, they showed good adaptability to the existing boundary fence and no significant obstruction to their flight line was observed during field observation. Thereby, the new secondary boundary fence is not expected to cause significant additional barrier effect to the highly mobile birds.

Section 2

Red Alignment

6.6.21 A new section of the boundary patrol road with a primary fence and a secondary fence will be constructed at the north of Lok Ma Chau Loop and Hoo Hok Wai. At the Lok Ma Chau Loop sub-section, the proposed boundary fence will separate the habitat of low-lying grassland at south from the channelized river at north. As these two habitats are utilized by

bird of different foraging groups, the ecological linkage among these two habitats is considered to be weak. The construction of the boundary fence will cause interference to the short distance movement of low-flying generalist bird such as Common Tailorbird, and butterfly species such as Common Grass Yellow and Indian Cabbage White. Furthermore, the interference to the bird's flight path of crossing Shenzhen River is thought to be low as most of the habitats at the opposite river side are developed area which is not an attractive habitat for the wetland-dependent birds. In view of the low frequency of inter-habitat movement of the common species, the ecological barrier effect caused by the new boundary fence is expected to be insignificant.

6.6.22 For the Hoo Hok Wai sub-section, the proposed boundary fence will separate the fishpond habitat at the south from the channelized river at the north. The potential affected species would be the waterbirds using both types of wetland habitat such as ducks, ardeids and waders. The short-distance movement of waterbirds from fishponds to channelized river or vice versa will be interfered by the boundary fence. However, the existence of obstruction will be habituated by the waterbirds and the effect to their behaviour is in considered as minor. Habituation to obstruct was shown in a study of bird collision with man-made structures in Hong Kong (Ove, 2002). All birds would react to obstruct by changing altitude or changing flight direction. In finer scale, changing flight altitude to avoid boundary fence was commonly observed in Mai Po Nature Reserve. As the new boundary fence would be in same design as the existing boundary fence, similar habituating behaviour of bird is expected to happen at this section.

Green Alignment

6.6.23 After the removal of the existing section of primary boundary fence between Ha Wan Tsuen and Tak Yuet Lau, the physical barrier between fishpond area at north and hillside shrubland at the south will be eliminated. This will facilitate the flight path of flying animals and insects at understorey habitat and the movement of small mammals, butterflies and herpetofauna between the habitats of the removed fence. Although the effect of ecological enhancement is in low significant as the existing boundary fences do not impose significant ecological barrier effect to these fauna group, the removal of physical barrier is still beneficial to these fauna as they do not need to alter the flight path or finding a corridor for the movement between habitats.

Section 3

Blue Alignment

6.6.24 Most of the existing boundary fences separate the abandoned agricultural land in south from the Shenzhen River and developed area at north. The abundance of bird species at this section of Shenzhen River is relatively low as a result of high disturbance from the adjacent developed area in Shenzhen. The ecological barrier effect of the existing primary fence to the birds is considered as low significant due to the low density and diversity of birds. No additional barrier effect is expected to be imposed in addition to the existing one.

Red Alignment

6.6.25 For the construction of two new sections of the boundary patrol road with a primary

boundary fence and a secondary boundary fence along the Shenzhen River to the north of Pak Fu Shan and northwest of Lin Ma Hang Village, new boundary fence will separate the abandoned agricultural land at south from the unchannelized section of Shenzhen River at north. The proposed boundary patrol road and boundary fences would interfere with the short distance movement of birds from river area to abandoned agricultural land or vice versa. However, in considering the low density of birds at the existing unchannelized Shenzhen River section as a result of high disturbance from the adjacent developed area in Shenzhen, the barrier effect of the new boundary fence is considered to be of low significant.

6.6.26 Bat species of conservation concern recorded in this section will not be affected by the construction of new boundary fence along the Shenzhen River due to their high mobility of flying behaviour that allows the free movement from both sides of the fence.

Green Alignment

6.6.27 The removal of two sections of boundary fences at northwest of Pak Fu Shan and Lin Ma Hang would eliminate the physical barrier. This will facilitate the flight path of flying animals and insects at understorey habitat. However the effect of ecological enhancement is in low significant as the existing boundary fences do not impose significant ecological barrier effect.

Section 4

6.6.28 The boundary fence at this section is located at a highly disturbed urban area beside a lorry parking area. All bird species recorded in this area are dominated by common generalist of low ecological value. The construction of secondary boundary fence would interfere with the movement of those birds from urban area to the shrubs in the village area. In consideration of low density of bird in this type of habitat and the low ecological value of those species to be affected, the effect of ecological barrier is considered to be insignificant.

Table 6-33 Potential Ecological Impacts of Ecological Barrier on Section 1, Blue Alignments of Section 2 and Section 4

Criteria	Section 1, blue alignments of Section 2 and Section 4
Receivers	Birds
Size	Section 1: 4.1km; Blue alignment of Section 2: 0.4km; Section 4: 0.5km.
Duration	Operational phase
Reversibility	Irreversible
Magnitude	Low
Impact Severity before Mitigation	**Minor**
Recommended Mitigation Measures	**None**

Table 6-34 Potential Ecological Impacts of Ecological Barrier on Red and Green Alignments of Section 2

Criteria	Red Alignment in Section 2	Green Alignment in Section 2
Receivers	Waterbirds utilizing the offsite habitats at Lok Ma Chau, Hoo Hok Wai and Ta Sha Lok and the channelized Shenzhen River	Low-flying generalist bird, open country area bird and butterfly species utilizing the grassland and riparian vegetation of fishponds, Burmese Python
Size	The alignment is 5.6km in length	The alignment is 4km in length
Duration	In the operational phase	In the operational phase
Reversibility	Irreversible	Irreversible
Magnitude	Low	Medium-low (positive)
Impact Severity before Mitigation	**Minor**	**Minor (positive)**
Recommended Mitigation Measures	**None**	**None**

Table 6-35 Potential Ecological Impacts of Ecological Barrier on Blue Alignment of Section 3

Criteria	Blue Alignment in Section 3
Receivers	Low abundance of waterbirds
Size	The alignment is 7.5km in length
Duration	In the operational phase
Reversibility	Irreversible
Magnitude	Low
Impact Severity before Mitigation	**Minor**
Recommended Mitigation Measures	**None**

Table 6-36 Potential Ecological Impacts of Ecological Barrier on Red and Green Alignments of Section 3

Criteria	Red Alignment in Section 3	Green Alignments in Section 3
Receivers	Low abundance of waterbirds, bats of conservation concern and butterflies	Shrubland birds, bats of conservation concern, Brown Tree Frog and Danaid Eggfly
Size	The alignment is 4km in length	The alignment is 1.6km in length
Duration	In the operational phase	In the operational phase
Reversibility	Irreversible	Irreversible
Magnitude	Low	Medium-low (positive)
Impact Severity before Mitigation	**Minor**	**Minor (positive)**
Recommended Mitigation Measures	**None**	**None**

Direct Loss of Onsite Species of Conservation Importance

Flora

6.6.29 One rare climber shrub *Berchemia lineata* was recorded along the boundary patrol road in Section 2 northeast of Liu Pok village (**Figure 6.5**) and one young individual of *Aquilaria sinensis* was recorded on the roadside near a village house along a section of the patrol road northwest of Wang Lek (**Figure 6.8**).

6.6.30 Evaluation of the two species are summarised below:

Table 6-37 Ecological Evaluation of Floral Species within Proposed Project Area

Species	Location	Protection Status	Distribution	Rarity
Aquilaria sinensis	Roadside near a village house	Scheduled under *Protection of Endangered Species of Animals and Plants Ordinance* (Cap 586); Listed as Near Threatened in China. (1)	Common in Hong Kong (3)	Common (3)
Berchemia lineata	Roadside near Liu Pok village	Not protected in Hong Kong	Shatin, Sheung Shui, Sai Kung, Ma Wan and Ping Chau (Mirs Bay) (2)	Rare (3)

Reference source: (1) Rare and Precious Plants of Hong Kong;
(2) Hong Kong Plant Check List 2001;
(3) Corlett's study "Hong Kong Vascular Plants: Distribution and Status".

6.6.31 Works in these two sections will only involve the removal of the existing boundary fence and no works will be carried out on the opposite side of the road. As both individuals situate on the non-works area, adverse impact is considered to be avoidable if proper protection measure during the construction period can be provided. Erection of protective fencing together with a sign indicating the protection requirement for the plant is an effective measure to avoid plant damage during the construction period.

6.6.32 The proposed protective fencing can be made of ordinary metal poles (for supporting) and plastic orange fence as shown in **Plate F19,** which allows penetration of sunlight and rainfall. Its establishment could also raise the awareness of personnel on the presence and protection requirement of the plants.

6.6.33 In addition, since only one individual (each species) will be involved, adverse impact on the community of the species is not anticipated.

Table 6-38 Potential Ecological Impacts on Floral Species of Conservation Concern

Criteria	
Receivers	One individual of each species *Berchemia lineata* and *Aquilaria sinensis* were recorded. *Berchemia lineata* is not protected in Hong Kong but is a rare plant. *Aquilaria sinensis* is listed as Near Threatened in Mainland China. In Hong Kong, it is a common species but has been scheduled under Protection of Endangered Species of Animals and Plants Ordinance (Cap 586).
Abundance	One individual of each species
Duration	Impacted during construction period; No further impact during operational period.
Reversibility	Not reversible
Magnitude	Minor
Impact Severity before Mitigation	**Minor**
Recommended Mitigation Measure	**Avoidance: in-situ preservation of the plants** **Minimizing: Erection of protective fencing to protect the plant during construction period** **Compensation: N/A**
Impact Severity after Mitigation	**Negligible**

Fauna

6.6.34 One Burmese Python was recorded in vicinity to the proposed works area along the green alignment (Lok Ma Chau Road) in Section 2 (**Figure 6-4**). The fence removal works may cause direct impact on this species of conservation concern if it is present in vicinity to the proposed works area during construction phase. Potential impacts may include direct injury and disturbance to this species during construction. However taking into account this snake will avoid construction activities and the small scale of works to be undertaken, no unacceptable impact is anticipated with good site practice and avoid direct disturbance to this protected species.

6.6.35 As the works will only involve the removal of the boundary fence, no operational impact is expected.

Table 6-39 Potential Ecological Impacts on Fauna Species of Conservation Concern

Criteria	
Receivers	One individual of Burmese Python was recorded in riparian vegetation along the existing boundary patrol road in Section 2. This species is common in Hong Kong but is listed as "Critically Endangered" in the China Red Data Book and protected under Cap. 170 and Cap. 586
Abundance	One individual was recorded
Duration	Impacted during construction period; No further impact during operational phase.

Criteria	
Reversibility	Irreversible for direct injury
Magnitude	Moderate for direct injury but Minor for direct disturbance
Impact Severity before Mitigation	**Negligible** as the snakes will avoid the construction area
Recommended Mitigation Measure	**Avoidance: good site practice to avoid direct injury of wildlife.**

Impact on Offsite Habitats

6.6.36 As the proposed fencing works run along the long boundary, a variety of offsite habitats were included. Ecologically sensitive areas would be those sites of conservation importance including wetlands in WCA, WBA, wetlands in Hoo Hok Wai and Ta Sha Lok, Mai Po and Inner Deep Bay Ramsar Site, Mai Po Nature Reserve, Mai Po Marshes SSSI, Inner Deep Bay SSSI, Ecological Mitigation Area at Yuen Leng Chai / Nam Hang, Lok Ma Chau Mitigation Area, Lin Ma Hang Lead Mines SSSI and Lin Ma Hang Stream SSSI.

6.6.37 As an avoidance measure, all the alignments along these sites of conservation importance are proposed on the existing boundary patrol roads rather than creating new paths in these sensitive areas. All the works will be confined on the roads to avoid direct impact on these offsite habitats.

6.6.38 Impacts would include: construction impact on air and water quality of these habitats, and disturbance to species of conservation concern utilizing these habitats.

Impacts on Air and Water Quality of Offsite Habitats

6.6.39 Site of conservation importance in close proximity to the works area including Lin Ma Hang Stream SSSI is sensitive to water pollution through silt runoff or non-point source discharge to the water body and human disturbance to wildlifes of conservation concern utilizing the habitats (such as fish species of conservation concern: *Rasbora steineri, Rasborinus lineatus, Pseudorasbora parva, Channa asiatica* and *Mastacembelus armatus*). The increase in suspended sediment in the water column will affect the gill breathing fish from increasing the metabolic rate to expel the silt in excess. Further increase in sediment loading will eventually make the fish suffocate to die. The impact significant is anticipated to be low with the implementation of water quality and dust mitigation measures.

6.6.40 As the proposed works only involve construction and removal of the existing boundary fences, potential impacts on these offsite habitats would be the generation of site runoff during construction period and dust deposition on vegetation of adjacent habitats.

6.6.41 Due to the simple nature of the works of erection and removal of metal fencing, these impacts can be mitigated effectively by the strict implementation of good site practices for air and water quality detailed in *Section 2.5* and *4.7* (including avoid stockpiles adjacent to the streams and wetlands, covering of stockpiles by impervious sheeting, the control of vehicle speed to reduce spreading of dust and no discharge of silty water into the rivers, streams or drainage channels) and clear definition of works limit.

Table 6-40 Potential Ecological Impacts on Offsite Habitats

Criteria	Site Runoff and Dust Deposition
Receivers	Various types of habitats include woodland, shrubland, plantation, marsh, agricultural land, grassland, pond, hillside grassland, stream and drainage channel within sites of conservation importance. The associated species of conservation concern especially those utilizing the adjacent streams and wetlands (such as *Rasbora steineri, Rasborinus lineatus, Pseudorasbora parva, Channa asiatica* and *Mastacembelus armatus*).
Size/Abundance	All these habitats along the alignment of 21.7km; The species of conservation concern recorded are in low abundance.
Duration	During the construction period; no impact during operational period
Reversibility	Reversible
Magnitude	Minor as only fence construction and removal works are involved
Impact Severity before Mitigation	**Minor**
Recommended Mitigation Measure	**Avoidance and Minimizing:** **Good site practices for controlling the dust and water quality (avoid stockpiles adjacent to wetlands, covering the stockpiles with impervious sheeting, control of vehicle speed, no discharge of silty water to the rivers, streams and drainage channels);** **Clear definition of works limit to avoid impact on adjacent habitats.** **Compensation: N/A**
Impact Severity after Mitigation	**Negligible**

Disturbance to Species of Conservation Concern in the Assessment Area

Impacts on Mammal Species of Conservation Concern

6.6.42 Bat species of conservation concern especially those foraging around the fishponds and marshes in Section 1 and 2 and those around Pak Fu Shan and Lin Ma Hang in Section 3 may be disturbed by the construction works. However, the active period of those bat species are mainly after sunset when most of the construction works stop, and the long distance of the roosting site from the construction activities, it is anticipated that disturbance impacts to these bat species will be negligible.

Table 6-41 Potential Ecological Impacts on Offsite Disturbance to Mammals of Conservation Concern

Criteria	Disturbance Impact to Mammals of Conservation Concern
Receivers	Bat species of conservation concern foraging around the fishponds, marshes and wetland habitats adjacent to the proposed works area
Size/Abundance	Moderate abundance of bat species
Duration	During the construction period; no impact during operational period
Reversibility	Reversible
Magnitude	Negligible as the bat species are nocturnal species that active after sunset when the construction works stop at night
Impact Severity before Mitigation	**Negligible**

Criteria	Disturbance Impact to Mammals of Conservation Concern
Recommended Mitigation Measure	**None**

Impacts on Wetland-Dependent Birds, Raptors and Terrestrial Birds

6.6.43 The potential impact on the conservation concerned waterbirds would be the noise and visual disturbance arise from construction site and the associated worker and vehicles. The construction work involves mainly three phases, which are excavation, footing construction and fence installation. If without mitigation measures, the major noise disturbance would be the use of breaker during excavation phase. Continual construction noise could disturb birds from their roosting or foraging habitats.

6.6.44 A large variety of habitats in the Assessment Area are used by a high diversity of birds, of which 76 species are listed by Fellowes *et al*. (2002) as species of conservation concern. The abundance of the birds would increase in winter when a large amount of wintering population arrives. In general, no large aggregation of wintering birds was found roosting at the project area or the habitat closely nearby except at the western end of Section 1, which lies in close proximity to the Mai Po Nature Reserve. The gei wais inside the Reserve is an important habitat for migratory waterbirds, notably the globally endangered Black-faced Spoonbill, and thereby large aggregation of them is often found especially during winter. Besides, the fishponds within the WCA are also important habitat to the migratory waterbirds. Major potential impact imposes on the waterbirds roosting at the gei wais in the Mai Po Nature Reserve and the fishponds in the WCA would be the noise disturbance arises from the construction work especially during excavation phase.

6.6.45 To mitigate the potential impact on the surrounding environment, a quiet breaker (the quietest available on the construction market) will be employed for excavation works. The noise level would be further reduced by installing a movable noise barrier on the breaker. The disturbance level would be within acceptable level under the implementation of good working practices including avoidance of feeding the wildlife by the workers, switching off the powered mechanical devices whenever not in use and site confinement to minimize the construction noise, uncontrolled surface runoff and discharge as far as possible. Details of mitigation measures for noise control are presented in *Section 3 - Noise Impact* and *Section 4 –Water Quality Impact* respectively.

6.6.46 Apart from these measures, all construction works involving the use of Power Mechanical Equipments (PMEs) within Wetland Conservation Area (Section 1 and western 150m of Section 2 of the project area) should be avoided during the bird migratory season (from 15th November to 15th March) in order to further avoid the potential noise disturbance to the wintering waterbirds roosting in the wetland habitats in the Mai Po Nature Reserve and the WCA. With the implementation of all the recommended measures, potential impacts on these ecological sensitive receivers will not be significant.

6.6.47 All the species of conservation concern recorded are categorized into wetland-dependent birds, raptors or terrestrial birds according to their use of habitat for a systematic presentation of impact assessment which are listed in **Table 6-42** to **Table 6-44**.

Table 6-42 Potential disturbance Impacts to wetland-dependent birds of conservation concern in Assessment Area.

Criteria	Disturbance Impact to Water-dependent birds of Conservation Concern
Receivers	60 wetland-dependent bird species of conservation concern recorded on the fishponds, gei wai, mangrove, wet agricultural land, river and stream, including: Little Grebe ,Great Crested Grebe, Great Cormorant, Lesser White-fronted Goose, Grey Heron, Purple Heron, Great Egret, Intermediate Egret, Little Egret, Cattle Egret, Chinese Pond Heron, Striated Heron, Black-crowned Night Heron, Yellow Bittern, Cinnamon Bittern, Oriental Stork, Eurasian Spoonbill, Black-faced Spoonbill, Eurasian Wigeon, Falcated Duck, Common Teal, Mallard, Spot-billed Duck, Northern Pintail, Northern Shoveler, Tufted Duck, Eurasian Coot, Watercock, Pheasant-tailed Jacana, Greater Painted-snipe, Black-winged Stilt, Grey-headed Lapwing, Oriental Pratincole, Pied Avocet, Pacific Golden Plover, Little Ringed Plover, Kentish Plover, Greater Sand Plover, Common Redshank, Spotted Redshank, Common Greenshank, Marsh Sandpiper, Wood Sandpiper, Swinhoe's Snipe, Little Stint, Temminck's Stint, Long-toed Stint, Red-necked Stint, Curlew Sandpiper, Heuglin's Gull, Black-headed Gull, Pied Kingfisher, White-throated Kingfisher, Black-capped Kingfisher, Pallas's Grasshopper Warbler, Red-throated Pipit, Zitting Cisticola, White-cheeked Starling, White-shouldered Starling, Red-billed Starling and Collared Crow.
Size/Abundance	High abundance of some species, notably Great Cormorant, Little Egret and Red-billed Starling
Duration	Disturbance arises at construction phase of the project.
Reversibility	Construction phase disturbance would be temporary and will fade out when construction end.
Impact Severity before Mitigation	**Moderate-minor**. The major source of the impact is the noise disturbance arises from excavation phase of the construction work. Habitat with large aggregation of wintering waterbirds, mainly the Mai Po Nature Reserve and the fishponds in the WCA, would be the most sensitive area to the disturbance especially during winter when greater amount of wetland-dependent birds are present. Degree of disturbance to waterbirds at other area is relatively low because of low likelihood of large aggregation of waterbirds.
Recommended Mitigation Measure	**Avoidance and Minimizing:** **Environmental sensitive areas are avoided as far as possible in consideration of alternative alignment as described in Section 1.6;** **Good working practices at site (detailed in Section 3.8.14 of the noise assessment) include switching off unused equipment, keep minimum number of powered mechanical equipment in operation at the same period, avoidance of feeding the wildlife to cause disturbance and site confinement to minimize construction noise, uncontrolled surface runoff and discharge of silts. Installation of a movable noise barrier to the breaker to reduce the noise level during excavation phase;** **Avoidance of construction works involving the use of PMEs within the WCA during bird migratory season (15th November – 15th March).** **Compensation: N/A**
Impact Severity after	Construction phase disturbance to wetland-dependent birds is considered to

Criteria	Disturbance Impact to Water-dependent birds of Conservation Concern
Mitigation	be **minor** due to the small scale of construction works, reduced noise level after mitigation and avoidance of construction works in WCA during the bird migratory season.

Table 6-43 Potential Disturbance Impacts to raptors of conservation concern in Assessment Area.

Criteria	Disturbance Impact to Raptors of Conservation Importance
Receivers	11 raptor species of conservation importance recorded in Assessment Area, including: Osprey, Black Kite, Black-winged Kite, Crested Serpent Eagle, Greater Spotted Eagle, Imperial Eagle, Bonelli's Eagle, Eastern Marsh Harrier, Pied Harrier, White-bellied Sea Eagle and Peregrine Falcon. These species were observed using the open area at fishponds, agricultural lands and shurbland areas.
Size/Abundance	Low abundance for all raptor species
Duration	Disturbance would arise at construction phase of the project.
Reversibility	Construction phase disturbance would be temporary and will fade out when construction end.
Impact Severity before Mitigation	**Minor**. The impact to the conservation concerned species is mainly caused by noise and human disturbance which will become larger in winter when migratory species are present
Recommended Mitigation Measure	**Avoidance and Minimizing:** **Environmental sensitive areas are avoided as far as possible in consideration of alternative alignment as described in Section 1.6.** **Good working practices at site to minimize construction noise, uncontrolled surface runoff and discharge of silts. Installation of a movable noise barrier to the breaker to reduce the noise level during excavation phase.** **Compensation: N/A**
Impact Severity after Mitigation	Construction phase disturbance to raptors is considered to be **minor** due to the small scale of construction works and low abundance of conservation concerned raptors.

Table 6-44 Potential Disturbance Impacts to terrestrial birds of conservation concern in Assessment Area.

Criteria	Disturbance Impact to Terrestrial birds of Conservation Importance
Receivers	Pacific Swift, Grey Bushchat, Orange-headed Thrush and Ashy Drongo recorded in patchy shrublands
Size/Abundance	Low abundance
Duration	Disturbance confine in construction phase of the project. Disturbance would be reduced after construction work completes.
Reversibility	Construction phase disturbance would be temporary and will fade out when construction end.
Impact Severity before Mitigation	**Minor**. The impact to the conservation concerned species is mainly caused from noise and human disturbance.

Criteria	Disturbance Impact to Terrestrial birds of Conservation Importance
Recommended Mitigation Measure	**Avoidance and Minimizing:** **Environmental sensitive areas are avoided as far as possible in consideration of alternative alignment as described in Section 1.6.** **Good working practices at site to minimize construction noise, uncontrolled surface runoff and discharge of silts. Installation of a movable noise barrier to the breaker to reduce the noise level during excavation phase.** **Compensation: N/A**
Impact Severity after Mitigation	Construction phase disturbance to terrestrial birds of conservation concern is considered to be **minor** due to small scale of works and low abundance of the concerned species.

Impacts to Egretry

6.6.48 The western end of the proposed secondary boundary fence alignment at Mai Po is located within 100m from the Tam Kon Chau Egretry. Assessment of the potential impacts to this egretry is given in **Table 6-45**. Construction of the boundary fence would not cause loss of foraging grounds for breeding Chinese Pond Heron or obstruction of flight path between egretry and important foraging grounds. The only potential impact to the egretry will be the noise disturbance from working site during construction phase. However, it is predicted that the construction noise generated from the work sites will not cause severe impact or abandonment of the egretry due to the low level of noise generated and high tolerance of the egretry. The high tolerance of the egretry to noise and human disturbances can be observed from ardeid response to the activities of holiday visitors. Every public holiday, more than a hundred people visit Mai Po Nature Reserve would pass through the egretry. The disturbances caused by the visitors walking underneath and the parking of coaches in close proximity did not cause significant impact to the egretry. The breeding success of the ardeids in the past few years indicates the egretry could tolerate a moderate level of noise and human disturbances.

6.6.49 To mitigate the potential noise disturbance to the breeding ardeids, excavation works within a 150m buffer zone from the egretry (approximately the first 100m of Section 1 of the project area) should be avoided during ardeid breeding season (1st March to 31st July). The egretries in the northwest New Territories have shown high tolerance to moderate level of noise disturbance. Both Mai Po Village and Tung Shing Lei egretries subjected to a close (less than 100m distance) and continual noise disturbance arise from road traffic and railway respectively were not significantly affected. Same to these two egretries, the Tam Kong Chau egretry is used by Chinese Pond Heron and receives continual noise disturbance from human activities and traffic. The noise disturbance arise from the proposed construction works at 150m apart would unlikely impose a significant impact to the breeding Chinese Pond Heron.

6.6.50 When construction works commence within the 150m buffer zone of the egretry in August, the egretry will be inspected to ensure all the breeding ardeids have already left. Besides, AFCD's agreement should be obtained prior to the commencement of works should it be started in August.

Table 6-45 Potential Ecological Impacts to Tam Kon Chau Egretry.

Criteria	Impacts to Tam Kon Chau Egretry
Receivers	Chinese Pond Herons at Tam Kon Chau Egretry
Size/Abundance	26 pairs of Chinese Pond Heron in 2007
Duration	Impacts would be confined to the breeding season of ardeids, between March and July. Noise disturbance at the egret would be confined to the construction phase. Disturbance cease when the project finishes.
Reversibility	Abandonment of an egretry would be difficult to reverse
Impact Severity before Mitigation	**Moderate** severity of noise disturbance will occur at working site 100m apart from the egretry during excavation period.
Recommended Mitigation Measure	**Avoidance and Minimizing:** **Environmental sensitive areas are avoided as far as possible in consideration of alternative alignment as described in Section 1.6.** **Good working practices at site (detailed in Section 3.8.14 of the noise assessment) include switching off unused equipment, keep minimum number of powered mechanical equipment in operation at the same period, the use of stockpiles and other structures to form noise barriers where practicable installation of a movable noise barrier to the breaker to reduce the noise level during excavation phase.** **Restriction of excavation work within a 150m buffer zone from the egretry to ardeid non-breeding season (from August to February).** **Compensation: N/A**
Impact Severity after Mitigation	**Minor** due to minor noise disturbance after avoidance of construction work within a 150m buffer zone from the egretry during ardeid breeding season and tolerance of the egretry to moderate noise levels.

6.7 Cumulative Impact

6.7.1 There are three projects proposed to be constructed in the FCA: Liantang / Heung Yuen Wai BCP in Section 3, Advance Works in River Training in Section 3 and Proposed New Wave Wall / Modification to Existing Wave Wall in Section 2.

Liantang/Heung Yuen Wai Boundary Control Point in Section 3

6.7.2 A new BCP is proposed at Heung Yuen Wai. Civil Engineering and Development Department has been informed that the part of Section 3 not affected by the new BCP will be completed by end 2012.

Advance Works for River Training in Section 3

6.7.3 In association with the proposed BCP at Heung Yuen Wai, Drainage Service Department (DSD) will carry out advance works for the river training from Ping Yuen River to Pak Fu Shan. As advised by DSD, the works would commence in mid-2012 and its exact extent could only be confirmed after a study at the end of 2009. As DSD's advance works is at a preliminary stage during the study period of this EIA, the cumulative impact cannot at present be predicted. Instead, when the scope of the river training has been confirmed, an

impact assessment would be carried out to identify potential cumulative impact and to recommend mitigation measures if necessary.

Proposed New Wave Wall / Modification to Existing Wave Wall in Section 2

6.7.4 The works in Section 2 will have interface with DSD's proposed modification of the existing wave wall and construction of a new wave wall alongside the Shenzhen River in Section 2. As the proposed works will involve only simple works of building the wave wall and be confined within DSD's existing maintenance access, no cumulative impact is expected.

6.8 Residual Impact

6.8.1 With the implementation of the recommended mitigation measures detailed in Section 6.6, no residual ecological impacts are anticipated.

6.9 Environmental Monitoring and Audit Requirements

6.9.1 The implementation of the ecological mitigation measures stated in Section 6.6 should be checked as part of the environmental monitoring and audit procedures during the construction period as presented in the separate Environmental Monitoring and Audit Manual. No other ecology-specific measures are considered necessary.

6.10 Conclusions

6.10.1 An Ecological Impact Assessment had been conducted for the proposed project. Ecological surveys were carried out in November 2007 to October 2008 which covered both wet and dry seasons.

6.10.2 A total of 15 habitat types were identified within the Assessment Area, including woodland, shrubland, plantation, gei wai, mangrove, pond, marsh, wet agricultural land, dry agricultural land, abandoned agricultural land / low-lying grassland, hillside grassland, stream / river, drainage channel, open field and developed area.

6.10.3 Two individuals of flora species of conservation interest, *Berchemia lineata* and *Aquilaria sinensis* were recorded within the Project Area at Section 2 and Section 3 respectively. In-situ preservation and providing protective fencing during construction period are recommended to avoid potential impact on these plants.

6.10.4 The construction works at WCA without mitigation measures would have adverse impact on the ecology of the area notably the wetland-depended birds roosting in the Mai Po Nature Reserve and the surrounding fishponds. To avoid the potential disturbance to these ecological sensitive receivers, avoidance of construction works using PMEs in WCA during the wintering period (15th November – 15th March) is recommended.

6.10.5 Excavation works at Mai Po during the ardeid breeding season (from 1st March to 31st July) should not be carried out to prevent potential disturbance to the Tam Kon Chau egretry.

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7 LANDSCAPE AND VISUAL IMPACT

7.1 Introduction

7.1.1 This Chapter describes the preliminary findings of the interim draft landscape and visual impact assessment arising from the construction of the Secondary Boundary Fence and New Sections of Primary Boundary Fence and Patrol Road. In accordance with the criteria and guidelines as stated in Annex 10 and 18 of the TM and EIAO, Cap. 449, any potential landscape and visual impacts in the project resulted from both construction and operational phases will be assessed.

7.1.2 This aim of this report is to outline the landscape baseline conditions of existing landscape resources (LRs) and landscape character area (LCAs), the visual amenity, visually sensitive receivers (VSRs) and the planning and development control frameworks. Any potential impacts arsing from the proposed engineered structures will be identified in detail. Finally the report concluded by making recommendation of mitigation measures to alleviate the impact and residual effect apparent after mitigation will be discussed.

7.2 Environmental Legislation, Standards, Guidelines and Criteria

7.2.1 Legislation, Standards, Guidelines and Criteria relevant to the consideration of landscape and visual impacts in this report include the following:

- Environmental Impact Assessment Ordinance (Cap.499.S.16) and the Technical Memorandum on EIA Process (EIAO-TM), particularly Annexes 10 and 18;
- Environmental Impact Assessment Ordinance Guidance Note 8/2002;
- Town Planning Ordinance (Cap 131);
- Land Administration Office Instruction (LAOI) Section D-12 - Tree Preservation;
- HyDTC No. 10/2001 – Visibility of Directional Signs;
- WBTC No. 25/92 - Allocation of Space for Urban Street Trees;
- WBTC No. 7/2002 - Tree Planting in Public Works;
- ETWB TCW No. 2/2004 - Maintenance of Vegetation and Hard Landscape Features;
- ETWB TCW No. 29/2004 - Registration of Old and Valuable Trees, and Guidelines for their Preservation;
- ETWB No. 36/2004 - Advisory Committee on the Appearance of Bridges and Associated Structures (ACABAS);
- ETWB TCW No. 3/2006 - Tree Preservation;
- Hong Kong Planning Standards and Guidelines Chapter 4 and Chapter 10; and
- Study on Landscape Value Mapping of Hong Kong.

7.3 Assessment Methodology

7.3.1 The Project is a designated project under the EIAO and the methodology adopted for the Project conforms to the requirements of the EIAO. The methodology consists of the following tasks:

- Review of the Planning and Development Control Framework;
- Baseline study of landscape and visual resources;
- Landscape impact assessment;
- Visual impact assessment;

- Recommendation on landscape and visual mitigation measures; and
- Identification of residual impacts.

Landscape Baseline Review and Impact Assessment

7.3.2 The assessment of the potential impacts of a proposed scheme on the existing landscape comprises two distinct sections namely the baseline survey and the landscape impact assessment. Landscape Impact Assessment (LIA) Study Area is taken to include all areas within 500m of the site boundary.

7.3.3 A baseline survey of the existing landscape resources and landscape character has been undertaken based on a combination of desktop studies and site surveys. The landscape elements which contribute to the landscape character include:

- Local topography;
- Woodland extent and type;
- Other vegetation types;
- Built form (including scale and appearance);
- Patterns of settlement;
- Land use;
- Scenic spots;
- Details of local materials, styles, streetscapes, etc.;
- Prominent watercourses; and
- Cultural and religious identity.

7.3.4 The process of landscape characterisation draws on the information gathered in the desk top and site survey and provides an analysis of the way in which the elements including the identified landscape resources (LRs) interact to create the character of the landscape. The Study Area is then divided into broadly homogenous units of similar character which are called Landscape Character Areas (LCAs).

7.3.5 The sensitivity of the individual LRs and LCAs to change is rated using low, medium or high depending on the following factors:

- Condition, quality and maturity (maturity in this context refers to the age of the LR or LCA relative to its constituent components therefore a woodland containing mature trees would be considered to have a high level of maturity) of the LRs / LCAs;
- Importance and rarity of special landscape elements (rarity being of either local, regional, national or global importance) and the significance of change to these LRs / LCAs from a local and regional/ LCAs from a local and regional perspective (therefore the sensitivity of a LR or LCA which is either rare in a local or regional context is greater than one which is common place);
- Ability of the LRs / LCAs to accommodate change; and
- Statutory or regulatory requirements relating to the landscape including its resources.

7.3.6 The next stage of the assessment process is the identification of the assessment of the magnitude of change (rated as negligible, small, intermediate or large) arising from the implementation of the proposals and the principal sources of impact based on the following factors:

- Scale of the development and proposed access road;
- Compatibility of the project with the surrounding landscape;

- Duration of impacts (temporary or permanent) under construction and operational phases; and
- Reversibility of change.

7.3.7 The degree of significance of landscape impact is derived from the magnitude of change which the proposals will cause to the existing landscape context and its ability to tolerate the change, i.e. its condition / quality and sensitivity. This makes a comparison between the landscapes which would have existed in the absence of the proposals with that predicted as a result of the implementation of the proposals. The significance threshold for impacts to LRs and LCAs is rated as significant, moderate, slight or negligible. The impacts may be beneficial or adverse.

7.3.8 The significance threshold is derived from the following matrix:

Magnitude of Change caused by Proposals	**Large**	***Moderate Impact***	***Moderate / Significant Impact***	***Significant Impact***
	Intermediate	***Slight or Moderate Impact***	***Moderate Impact***	***Moderate or Significant Impact***
	Small	***Slight Impact***	***Slight or Moderate Impact***	***Moderate Impact***
	Negligible	***Negligible***	***Negligible***	***Negligible***
		Low	**Medium**	**High**
	Sensitivity of Landscape to Change			

7.3.9 The above matrix will apply in the assessment of the majority of situations, however, in certain cases a deviation from this may occur, e.g. the impact may be so major that a significant impact may occur to a LCA or LR with a low sensitivity to change.

Visual Baseline Review and Impact Assessment

7.3.10 The assessment of the potential visual impact of the scheme comprises two distinct parts:

- Baseline survey; and,
- Visual impact assessment which includes the identification of the sources of visual impact, and their magnitude, that would be generated during construction and operational phases of the proposed scheme; and, identification of the principal visual impacts primarily in consideration of the degree of change to the baseline conditions.

7.3.11 The assessment area for the Visual Impact Assessment (VIA) in accordance with the study brief, is defined by the Visual Envelope (VE) which includes all areas from which the scheme proposals can be seen, or the area forms the view shed formed by natural / manmade features such as existing ridgelines, built development and for example areas of woodland / large trees. Within the VE a number of Zones of Visual Influence (ZVIs) are identified to demonstrate the visibility of various aspects of the scheme proposals. This is achieved through a combination of detailed walkover surveys, and desk-top study of topographic maps and photographs, and preparation of cross-sections to determine visibility of the improvement works from various locations.

7.3.12 The baseline survey of all views towards the proposals is undertaken by identifying:

- The VE and ZVIs as has been described above and may contain either wholly or partially within views. This must also include indirect effects such as offsite construction activities; and
- The visually sensitive receivers (VSRs) within the visual envelope whose views will be affected by the scheme.

7.3.13 The potential receivers are considered as four groups:

- Views from residences – the most sensitive of receivers due to the high potential of intrusion on the visual amenity and quality of life;
- View from workplaces / institutional and educational buildings – less sensitive than above due to visual amenity being less important within these environments;
- Views from recreational landscapes – including all areas apart from the above, e.g., public parks, recreation grounds, footpaths, cultural sites etc. Sensitivity of this group depends on the length of stay and nature of activity, e.g. sitting in a park as opposed to an active sporting pursuit; and
- Views from public roads and railways – including vehicle travellers with transitory views.

7.3.14 The assessment of sensitivity is also based on the quality and extent of the existing view. Therefore a view from a residential property, which would normally be considered the most sensitive view, may be less so if for example it is degraded by existing development or partially screened by intervening visual obstacles such as existing vegetation. Factors affecting the sensitivity of receivers for evaluation of visual impacts:

- Value and quality of existing views;
- Availability and amenity of alternative views;
- Type of receiver population and estimated number of affected receiver population;
- Duration or frequency of view; and,
- Degree of visibility.

7.3.15 The location and direction of its view relative to the scheme also influences the sensitivity of each group. Typical viewpoints from within each of the visually sensitive groups are identified and their views described. Both present and future (planned visually sensitive receivers (PVSRs) are considered.

7.3.16 The factors affecting the magnitude of change for assessing the visual impacts include the following:

- Scale of the proposed scheme;
- Compatibility of the project with the surrounding landscape forming the view; extent of visibility (level of potential blockage of the view);
- Viewing distance;
- Duration of impacts under construction and operational phases; and
- Reversibility of change.

7.3.17 Views available to the identified VSRs are rated according to their sensitivity to change using low, medium or high. The magnitude of change to the views will be classified as follows:

- Large: e.g. major change in view;
- Intermediate: e.g. moderate change in view;
- Small: e.g. minor change in view; and

- Negligible: e.g. no discernible change in view.

7.3.18 The significance threshold for visual impact is rated in a similar fashion to the landscape impact, i.e. significant, moderate, slight and negligible. The impacts may be beneficial or adverse.

7.3.19 Therefore the impact is derived from the magnitude of change which the proposals will cause to the existing landscape context and its ability to tolerate the change, i.e. its quality and sensitivity.

7.3.20 The significance threshold is derived from the following matrix:

Magnitude of Change caused by Proposals	**Large**	***Moderate Impact***	***Moderate / Significant Impact***	***Significant Impact***
	Intermediate	***Slight / Moderate Impact***	***Moderate Impact***	***Moderate / Significant Impact***
	Small	***Slight Impact***	***Slight / Moderate Impact***	***Moderate Impact***
	Negligible	***Negligible***	***Negligible***	***Negligible***
		Low	**Medium**	**High**
	Sensitivity of View to Change			

7.3.21 The above matrix will apply in the assessment of the majority of situations, however, in certain cases a deviation from this may occur, e.g. the impact may be so major that a significant impact may occur to a view with a low sensitivity to change.

7.3.22 **Table 7-1** below provides an explanation of the degree of impact for both landscape and visual aspects of the project.

Table 7-1 Degree of Impact

Impact	Description
Significant	Adverse / beneficial impact where the proposal would cause significant deterioration or improvement in existing landscape quality or visual amenity.
Moderate	Adverse / beneficial impact where the proposal would cause a noticeable deterioration or improvement in existing landscape quality or visual amenity.
Slight	Adverse / beneficial impact where the proposal would cause a barely perceptible deterioration or improvement in the existing landscape quality or visual amenity.
Negligible	No discernible change in the existing landscape quality or visual amenity.

Identification of Potential Landscape and Visual Impact Mitigation Measures

7.3.23 The purpose of mitigation is to avoid, reduce, and where possible remedy or offset any adverse effects on the environment arising from the proposed development. The ideal strategy for identifiable adverse impacts is avoidance. If this is not possible, alternative strategies of reduction, remediation and compensation should be explored.

7.3.24 Mitigation measures may be considered under two categories:

- Primary mitigation measures that intrinsically comprise part of the development design through an iterative process. This form of mitigation is generally the most effective; and
- Secondary mitigation measures designed to specifically address the remaining (residual) adverse effects of the final development process.

7.3.25 Primary mitigation measures form integrated mainstream components of the project design focusing on the adoption of alternative designs or revisions to the basic engineering and architectural design to prevent and/or minimise adverse impacts including siting, access, layout, buildings and structures etc. The design philosophy can also describe the benefits to the design of alternative solutions, introduced to reduce potential adverse impacts, and indicate how these have been addressed.

7.3.26 Secondary mitigation measures are specifically designed to mitigate the adverse impacts of the final development and are considered in the assessment of the landscape and visual impacts. These may take the form of remedial measures such as colour and textural treatment of building features; and compensatory measures such as the implementation of landscape design measures (e.g. tree planting, creation of new open space etc) to compensate for unavoidable adverse impacts and to attempt to generate potentially beneficial long-term impacts.

7.3.27 The agencies responsible for the funding, implementation, management of the mitigation measures have been identified and their approval-in-principle will be sought

Residual Impacts

7.3.28 The Residual impacts are those, which remain after the proposed mitigation measures, have been implemented. This has been assessed both during the construction period and during the design year which is often taken to be 10 to 15 years after the proposed scheme has been opened to normal operation when the soft landscape mitigation measures are deemed to have reached a level of maturity which allows them to perform their original design objectives.

7.3.29 The level of impact is derived from the magnitude of change which the proposals will cause to the view which would have existed during this period if the proposed scheme had not been constructed and its ability to tolerate change, i.e. its quality and sensitivity taking into account the beneficial effects of the proposed mitigation. The significance threshold is derived from the matrices described separately above for the landscape and visual impacts.

7.3.30 In accordance with Annex 10 of the EIAO-TM a final conclusion is also made of the residual landscape and visual impacts attributable to the proposed scheme. The degree of residual impact is considered in accordance with the Residual Impact Significance Threshold Matrix in **Table 7.2** below.

Table 7-2 Residual Impact Significance Threshold Matrix

Residual Impact	Description
Beneficial	The project will complement the landscape and visual character of its setting, will follow the relevant planning objectives and will improve overall and visual quality.
Acceptable	There will be no significant effects on the landscape and no significant visual effects caused by the appearance of the project, or no interference with key

	views.
Acceptable with mitigation	There will be some adverse effects, but these can be eliminated, reduced or offset to a large extent by specific measures.
Unacceptable	The adverse affects are considered too excessive and are would not be reduced to an acceptable level by mitigation.
Undetermined	Significant adverse effects are likely but the extent to which they may occur or may be mitigated cannot be determined from the study. Further detailed study will be required for the specific effects in question.

Graphic Presentation of Mitigation Measures

7.3.31 In order to illustrate these landscape and visual impacts and to demonstrate the effectiveness of the proposed landscape and visual mitigation measures, photomontages at selected representative viewpoints, agreed with Planning Department at the outset of the study, have been prepared to illustrate:

- Existing conditions;
- Day 1 of Operation Phase without Landscape Mitigation Measures;
- Day 1 of Operation Phase with Landscape Mitigation Measures; and
- Year 10 of Operation Phase with Landscape Mitigation Measures.

7.3.32 It is assumed that funding, implementation, management and maintenance of the mitigation proposals can be satisfactorily resolved according to the principles in WBTC 14/2002. All mitigation proposals in this report are practical and achievable within the known parameters of funding, implementation, management and maintenance. The suggested agents for the funding and implementation (and subsequent management and maintenance, if applicable) are indicated in **Tables 7.13** and **7.14**. Approval-in-principle to the implementation, management and maintenance of the proposed mitigation measures will be sought from the appropriate authorities.

7.4 Project Description

7.4.1 The Project mainly comprises the construction of an SBF along the southern edge of the existing BPR (approximately 21.7km) from west (Pak Hok Chau) to east (Sha Tau Kok). For sections where the existing PBF runs along the southern edge of the BPR, a new fence with sensor alarm system will be constructed on the northern edge of the BPR as part of the PBF whereas the existing PBF will become the SBF. The project also includes the conversion of the existing maintenance services road along the Shenzhen River bank to the north of the Lok Ma Chau Loop and Hoo Hok Wai into a new section of the BPR with a PBF and an SBF; and construction of two new sections of the BPR with a PBF and an SBF along the Shenzhen River side to the north of Pak Fu Shan and northwest of Lin Ma Hang Village. In addition, the Project includes the construction of a checkpoint at the entrance to the Sha Tau Kok town (i.e. location of "Gate One") and replacement of the existing checkpoint at Pak Hok Chau, removal of the existing checkpoints at Lok Ma Chau, Sha Ling, Ping Che and Shek Chung Au, and removal of the existing PBF along those sections of the existing BPR which will be replaced by new sections of the BPR.

7.4.2 The height of the proposed PBF will be 4.5m and the SBF 3.5m. The approximate size of the proposed one storey checkpoints are as follows:

- The checkpoint at Gate 1 (9m long x 6.5m wide x 3.5m high);
- Sha Tau Kok (3.5m long x 3m wide x 3m high); and
- Pak Hok Chau – prefabricated type (3.5m long x 3m wide x 3m high).

7.4.3 The entire length of the Project is about 21.7km from west of Pak Hok Chau to east of Sha Tau Kok and is divided into four sections as shown in **Figure 1.1**. The project scope of each section is described below.

Section 1 – Mai Po to Lok Ma Chau Control Point

(i) To erect an SBF along the existing BPR (approximately 4.1km); and

(ii) To replace the existing checkpoint at Pak Hok Chau.

Section 2 – Lok Ma Chau Control Point to Ng Tung River

(i) To convert the maintenance services road of Drainage Services Department along the Shenzhen River bank to the north of the Lok Ma Chau Loop and Hoo Hok Wai into a new section of the BPR (approximately 5.6km);

(ii) To erect a new PBF with the sensor alarm system and an SBF respectively along the northern and southern side of the converted road;

(iii) To remove the original PBF and the sensor alarm system thereon along the existing BPR south of the Lok Ma Chau Loop and Hoo Hok Wai; and

(iv) To remove the existing checkpoint at Lok Ma Chau Road.

Section 3 – Ng Tung River to Lin Ma Hang Village

(i) To erect an SBF along the existing BPR except the sections to the north of Pak Fu Shan and northwest of Lin Ma Hang Village (approximately 7.5km);

(ii) To construct new sections of the BPR along the Shenzhen River side to the north of Pak Fu Shan and northwest of Lin Ma Hang Village without necessitating river training (approximately 4.0km);

(iii) To erect a new PBF with the sensor alarm system and an SBF along the northern and southern sides of the new sections of BPR respectively;

(iv) To remove the original PBF and the sensor alarm system thereon along the existing BPR near Pak Fu Shan and Lin Ma Hang Village; and

(v) To remove the existing checkpoints at Sha Ling and Ping Che.

Section 4 – Lin Ma Hang Village to Sha Tau Kok

(i) To erect an SBF from the entrance of the Sha Tau Kok town (i.e. the location of "Gate

One") to the Sha Tau Kok Control Point (approximately 0.5km);

(ii) To provide a new checkpoint at "Gate One"; and

(iii) To remove the existing checkpoint at Shek Chung Au.

7.5 Review of Planning and Development Control Framework

7.5.1 A review of the existing planning studies and documents has been undertaken to gain an insight into the planned role of the site, its context and to help to determine if the project fits into the wider landscape context. The assessment does not consider all of the areas zoned on the OZP but focus on only those might be affected by the proposed works or encroach to the 500M Study Area. The locations of these areas are shown on **Figure 7-1**. This review considered the following aspects of the identified planning designations:

- Zoning areas which would be physically affected by the proposals, that is where the implementation of the proposal works would lead to the actual loss of an area;
- The potential degradation of the landscape setting of an area which might effect the viability of it's landscape planning designation but not result in a loss of zoning area;
- The visual amenity enjoyed by future residents or users; and
- The general fit of the proposals into this future landscape.

7.5.2 The assessment covers areas shown on the following Outline Zoning Plans:

- S/NE-KTN/8 Kwu Tung North;
- S/YL-MP/6 Mai Po and Fairview Park;
- S/YL-NSW/8 Nam Sang Wai; and
- S/YL-ST/8 San Tin,
- S/NE-FTA/10 Fu Tei and Sha ling

7.5.3 This review has found the following impacts on identified planning designations. Areas that would only be physically affected by the implementation of the proposed secondary fence and adjustment of patrol road and removal of sections of existing boundary fence that are located at existing Border Road at Tam Kon Chau to Lo Wo and alongside of Shenzhen River where encroach to individual zoning boundaries. The majority of the proposed works will not directly affect the existing land uses within 500M Study Area, with exception of the following:

- Conservation Area (CA) zone at Mai Po Tam Kon Chau – the road embankment of existing Border Road at the peripheries of this zoning.
- Conservation Area (CA) zone at Sam Po Shue – the road embankment of existing Border Road at the peripheries of this zoning.
- Other Specified Uses (RAILWAY TERMINUS AND PUBLIC TRANSPORT TERMINUS) zone at Lok Ma Chau Railway Station - the road embankment of existing Border Road at the peripheries of this zoning.

7.5.4 Although some of zonings are encroached to the 500M Study Area as shown in **Figure 7-1**, the proposed works will not directly affected the areas within these zonings, hence are not contained in the assessment in **Table 7-4**.

7.5.5 Although there are some impacts to zoned areas, the proposed works would not degrade the overall landscape setting of the area or affect its viability or existing character. New tree

planting at selected locations along the new boundary fence alignment will also provide screening and enhance the landscape value along the patrol road as well as the interface encroaching to individual zoning areas.

7.5.6 In addition, the removal sections of existing fence between Lok Ma Chau and Lo Wu and along Lin Ma Hang Road will enhance the rural landscape and integration of landscape components within individual zonings.

7.5.7 Given the above summary and detailed review in **Table 7-3**, the proposed works largely fits into the planning and development control framework and integrates with the future outlook of the rural landscape context.

7.5.8 Since a section of the proposed excavation works will fall within the Conservation Area (CA) on the two Outline Zoning Plans (OZP) viz. the approved Mai Po and Fairview Park OZP No. S/YL-MP/6 and the approved San Tin OZP No. S/YL-ST/8 as well as the Wetland Conservation Area (WCA) on the western portion of the alignment beginning from the Pak Hok Chau Checkpoint, a planning application will be submitted for the Town Planning Board's consideration.

7.5.9 In addition, a planning study was undertaken on 2007 by Planning Department regarding to the feasibility of introducing a new cross-border facility connecting Hong Kong Lin Ma Hang and Shenzhen Liantang. Although this proposal is still under planning stage, the proposed works have been taking into account this proposal in the development of secondary boundary fence and patrol road and allow flexibility for the development of new cross-border facilities.

Table 7-3 Review of Existing Planning and Development Control Framework

Land Use Zonings	Landscape Planning, Design and Conservation Intention of Zoning	Potential Impacts/Approx. Area Affected by the Proposed Works / Total Zoning Area	Mitigation Measures and Future Outlook of the Area with the Proposed Works
Outline Zoning Plan number S/YL-MP/6 Mai Po and Fairview Park			
1. Conservation Area (CA)	This zone encompasses the fish pond areas to the north of Tam Kon Chau and Mai Po Villages to the east of Mai Po Nature Reserve. This zone is intended primarily for the conservation of the wetland and fish ponds which form the integral part of the wetland ecosystem in the Deep Bay Area and function as a substantial source of food supply for birds and as an important habitat for roosting and foraging of waterbirds. Agriculture and Nature Conservation uses always permitted to enhance the ecology value of the area.	The proposed secondary boundary fence runs parallel to the existing boundary fence alongside of the Border Road which located at the northern boundary of this "CA" zone. The proposed works requires slightly modification of the Border Road and construction of the secondary boundary fence on existing road embankment, no fish pond area will be affected. 1.5 ha/277 ha (<1%)	Given that the proposed secondary boundary fence only occupies a small portion of this zone adjacent to the existing Border Road, and largely aligns with existing fence, this fence is designed for territory security purposes; hence the proposed works are compatible to the planning intention for this Closed Area. Given the limitation of land acquisition to minimise impact to fish ponds and scattered village houses in this area, and clearance requirement along Border Road between existing and proposed fences, new tree planting is proposed at selected areas where space is allowed, this planting proposal will make a better integration to the rural landscapes.

Land Use Zonings	Landscape Planning, Design and Conservation Intention of Zoning	Potential Impacts/Approx. Area Affected by the Proposed Works / Total Zoning Area	Mitigation Measures and Future Outlook of the Area with the Proposed Works
Outline Zoning Plan number S/YL-ST/8 San Tin			
2. Conservation Area (CA)	This zone encompasses the fish pond areas at Sam Po Shue to the north of San Tin Villages and to the east of Lok Ma Chau Railway Station. This zone is intended primarily for the conservation of the wetland and fish ponds which form the integral part of the wetland ecosystem in the Deep Bay Area and function as a substantial source of food supply for birds and as an important habitat for roosting and foraging of water birds. Agriculture and Nature Conservation uses always permitted to enhance the ecology value of the area.	The proposed secondary boundary fence runs parallel to the existing boundary fence alongsides of the Border Road which located at the northern boundary of this "CA" zone. The proposed works requires slightly modification of the Border Road and construction of the secondary boundary fence on existing road embankment, no fish pond area will be affected. Besides the existing boundary fence section between Lok Ma Chau Village and Lo Wu Tak Yuet Lau along Border Road is proposed to be removed and reprovision of new boundary fence and patrol road alignment to the further north, this proposal will enhance the rural landscape along existing border road by removal on engineering structures in this zone. 1.4ha/182 ha (<1%)	Given that the proposed secondary boundary fence only occupies a small portion of this zone adjacent to the existing Border Road, and largely aligns with existing fence, this fence is designed for territory security purposes; hence the proposed works are compatible to the planning intention for this Closed Area. Given the limitation of land acquisition to minimise impact to fish ponds and scattered village houses in this area, and clearance requirement along Border Road between existing and proposed fences, new tree planting is proposed at selected areas where space is allowed, this planting proposal will make a better integration to the rural landscapes.
3. Other Specified Uses (RAILWAY TERMINUS AND PUBLIC TRANSPORT TERMINUS)	This zone encompasses the cross-border infrastructure facilities including the Lok Ma Chau Railway Terminal and public transport interchange. This zone is reserved for cross-border infrastructure facility uses.	The proposed secondary boundary fence runs parallel to the existing boundary fence alongside of the Border Road which located at the northern boundary of this "OU" zone. The proposed works requires slightly modification of the Border Road and construction of the secondary	Given that the proposed secondary boundary fence only occupies a small portion of this zone along existing Border Road, and largely aligns with existing fence, this fence is designed for territory security purposes; hence the proposed works are compatible to the planning intention for the cross-border facilities. Given the

Land Use Zonings	Landscape Planning, Design and Conservation Intention of Zoning	Potential Impacts/Approx. Area Affected by the Proposed Works / Total Zoning Area	Mitigation Measures and Future Outlook of the Area with the Proposed Works
		boundary fence on existing road embankment, only limited to the western portion of this zone, no existing cross-border infrastructure facilities will be affected. The new compensatory wetland area located to the eastern portion of this zone will not be affected. 0.12ha/6.3 ha (<1%)	proposed works do not encroach to the railway station and cross border facilities for security and operation reasons, the infrastructure landscape will remain unchanged.

7.6 Landscape and Visual Baseline Study

Baseline Conditions

7.6.1 This section describes the baseline study which reviews of the existing landscape establishes broad characteristics, identifies landscape resources, landscape character and visual amenity of Study Area. Any changes which are raised by the construction works during the construction and operational phase will be assessed.

7.6.2 The baseline **Figure 7-2A** shows the existing LRs found within the 500m Study Area, **Figures 7-2B to H** provide provide a photographic record of the typical LRs found within the Study Area. In terms of landscape character **Figures 7-3A to D** show the extent of identified LCAs and **Figures 7-4A to F** demonstrate the quality of LCAs with site photographs.

Existing Trees

7.6.3 The proposed works will where possible avoid disturbance to the existing trees as far as practicable within the works areas. A full tree survey and felling application will be undertaken and submitted for approval by the relevant government departments in accordance with ETWB TCW No. 3/2006, 'Tree Preservation' during the detailed design phase of the project.

Landscape Resources (LRs)

7.6.4 The important determinants of the landscape character within the Study Area include a combination of fishponds, agricultural fields, village settlements and open storage intersected by road corridors and remnants of natural upland landscapes. These landscape resources (LRs) are shown on **Figure 7-2**. The following LRs are identified within the Study Area:

LR1 Cross Border Infrastructure and Facilities

7.6.5 The Cross Border Infrastructure and Facilitates include the border crossings at Lok Ma Chau, Lo Wu and Man Kam To and characterised by the extensive concrete apron areas and their associated security and immigration structures. Lok Ma Chau and Lo Wu also include the structures associated with the rail crossings for the MTCR East Rail lines. These areas are heavily modified by human activity and so are considered to have a low sensitivity to further change.

LR2 Village Settlements

7.6.6 There are six main concentrations of village settlements located at Tam Kan Chau, Shun Yee San Tsuen, Lui Pok, Ta Kwu Ling Village / Kan Tau Wai / Ka Liu Village Lin Ma Hang and Sha Tau Kok Tsuen. The village settlements are scattered alongside of the road corridors and the adjacent lowland rural landscape. They are characterized as extensive groups of 3-storey town houses which form the settlement pattern within the lowland landscape. The existing building forms include a combination of traditional dwellings although the majority of the buildings consist of newer type developments connected by narrow lanes and footpaths. This LR is considered to have a relatively low value and

sensitivity to further development.

LR3 Mixed Woodland

7.6.7 The majority of the woodlands within the Assessment Area are secondary woodland, with a small number of *Fung Shui* woodlands being located adjacent to the existing rural village settlements. In addition several of the secondary woodlands located alongside the existing patrol roads, which include woodlands near Liu Pok, Man Kam To Boundary Crossing and Pak Fu Shan. Five Fung Shui woodlands are located within the Study Area and these are woodlands preserved by the villagers for traditional Fung Shui beliefs. These *Fung Shui* woodlands are situated behind the rural villages of Kan Tau Wai, Tsung Yuen Ha, Sheung Tam Shui Hang, Shan Tsui and Lin Ma Hang. For the large part these Fung Shui woodlands are located at some distance from the proposed alignment (typically at least 200m) although the woodland at Shan Tsui fung shui wood is located at a distance of about 150m. The dominant species within these areas are native tree and shrub species such as *Aquilaria sinensis, Aporusa dioica, Celtis sinensis, Cinnamomum camphora, Cratoxylum cochinchinense, Mallotus paniculatus, Schefflera heptaphylla, Schima superba, Psychotria asiatica and Uvaria macrophylla.* Due to the unique nature of the woodlands which form this resource they are thought to be locally significant and hence their sensitivity to change is considered to be high.

LR4 Plantation Woodland

7.6.8 Plantation Woodlands are largely located with sections 1-3 of the proposed scheme are typically associated with the major infrastructural developments including the border crossing at Lok Ma Chau and Man Kam To, and in buffer areas between Ta Sha Lok and Sheung Ma Lei Yue, on the hill slopes to the northeast of Sandy Ridge, and in a number of extensive plantations to the north of the border at Chuk Yuen, to the northwest of Pau Fu Shan and north of Wen Lek. The main value of these resources is in their contribution to the landscape as a group not as individual trees due to majority of the tree species being fast growing non-native species, commonly found in plantation woodlands in Hong Kong and across the border. The plantations are normally planted at close planting distances in rows to create an instant effect. Plantation is forest dominated by planted species for either reforestation, landscape or fruit production purposes and include species such as ***A****cacia auriculiformis, Acacia confusa, Lophostemon confertus, Casuarina equisetifolia, Clausena lansium, Dimocarpus longan, Litchi chinensis* and *Syzygium jambos*. It is considered that this resource has less ecological and landscape value than the mixed woodland and is reasonably tolerate to change, hence it is considered to have a *medium* sensitivity to change.

LR5 Shrubland

7.6.9 The Study Area contains six main concentrations of Shrubland located on the lower hill slopes to the west and north of Tai Shek Mo, to the north of Sandy Ridge, to the north of Lo Shue Ling, and a more extensive area to the north of Pau Fu Shan. This resource forms a succession stage of grassland as it becomes colonised by tree and shrub species and within the Study Area is typically located on lower hill slopes. The common shrub spcies found within these areas include *Rhodomyrtus tomentosa, Melastoma candidum, Melastoma sanguineum*, *Ficus hirta, Litsea rotundifolia, Ilex asprella, Phyllanthus reticulates* and *Desmos chinensis.* This resource has a relatively low significance within this landscape

context and reasonably tolerant to changes regarding to their immature nature, hence it is considered to have a *medium* sensitivity to change.

LR6 Grassland

7.6.10 The Study Area contains an extensive coverage of grassland, which is the dominant landscape resource on the hill slopes to the south and within the meander formed by the Sham Chun River to the north of Lok Ma Chau. The hill slopes include the northern sides of Fung Kong Shan, Tai Shek Mo, Sandy Ridge, Lo Shue Ling, Wong Mau Shan, and the hillside slopes to the west of Sha Tau Kok. This resource forms the green backdrop to many of the views available in locations within the Study Area to the north and south of the border. These areas are the dominant habitat on the hill ranges along the southern edge of the Study Area and are maintained by frequent hill fires and can be rapidly replaced by shrubs when fires are prevented. Common grass species include *Arundinella* sp, *Eulalia* sp and *Ischaemum* sp. These areas are considered to have a medium sensitivity to change.

LR7 Agricultural Fields

7.6.11 The Study Area contains extensive pockets of wet and dry agricultural fields particularly associated with adjacent village settlements. The remnant field areas are covered by a combination of grass and shrub areas with intermittent tree growth. The main concentration of wet agricultural land is at Lok Ma Chau Village with the main crop species being *Ipomoea aquatica* and *Nasturtium officinale*. The dry agricultural areas largely utilised for crop production, occur in small patches near the rural villages within the Study Area and are characterised by cultivated species such as *Lactuca sativa, Brassica parachinensis, Brassica chinensis, Colocasia esculenta, Apium graveolens* and *Daucus carota*. There are also a number of areas of abandoned agricultural fields particularly in the areas between Ma Tso Lung and Sha Tau Kok via Man Kam To, Ta Kwu Leng and Lin Ma Hang. The common plant species in these areas include *Ipomoea cairica, Brachiaria mutica, Conyza bonariensis, Bidens alba, Amaranthus viridis, Ipomoea triloba, Emilia sonchifolia, Youngia japonica, Mikania micrantha, Mimosa pudica, Polygonum chinense, Scoparia dulcis, Solanum nigrum, Panicum maximum* and *Cynodon dactylon*. These areas are important to the landscape setting of the existing village settlements and so the ability of this resource to accommodate change is considered to be medium.

LR8 Fishponds

7.6.12 The Study Area contains an extensive coverage of fishponds including areas at Mai Po, San Tin, Lok Ma Chau and Hoo Hok Wai. The majority of fishponds extending from the Deep Bay coastal plain and extend into the rural landscape to the south and east. The fishponds are characterised by their rectilinear shapes and are considered to be a regionally significant landscape resource and a distinctive feature within the Study Area. The main species composition of these areas includes *Brachiaria mutica, Phragmites australis, Panicum maximum* and *Cynodon dactylon*. This resource is considered to be important both to the landscape setting of the NWNT and is important in views from areas to the north of the border, it is susceptible to small changes and hence is considered to have a *high* sensitivity to change.

LR9 Natural Watercourses

7.6.13 The most extensive section of natural watercourse river within the Study Area is the unchannelised section of the upper course of the Shenzhen River and the Lin Ma Hang Stream is an ecologically important tributary. Other natural watercourses include the drainage ditches within the fishpond areas at San Tin. These are important landscape resources in setting the character for the Study Area and the dominant plant species along the streams and ditches are common riparian vegetation types such as *Brachiaria mutica, Commelina diffusa, Pennisetum purpureum, Alocasia odora* and *Rumex trisetifer.* Given the channelised nature of many of the watercourses within the Study Area this resource is considered to be valuable to its landscape and visual amenity and hence have a high sensitivity to further change.

LR10 Modified Watercourse

7.6.14 The majority of the significant watercourses within the Study Area have been modified by man and include channelised Shenzhen River, and the lower courses of the Ng Tung River and Ping Yuen River. These water course have been widened or modified in phases for drainage improvement of coastal plain and lowland areas in NWNT since 1990s to resolve the flooding problem in these areas. The resources are characterised by their engineered nature and straightening of their banks with concrete banks and their associated access and maintenance roads. The common riparian plants found on the concrete banks include *Brachiaria mutica, Commelina diffusa, Phragmites australis* and *Sesbania javanica.* Although these watercourses are largely disturbed by engineering works, they are still scenic elements in the local landscape context. They are reasonably tolerant to changes, hence are considered to have a *medium* sensitivity to change.

LR11 Mangrove

7.6.15 There are two main concentrations of mangrove located in *Gei-Wai,* which is an inter-tidal pond traditionally for used shrimp production, at Mai Po Nature Reserve and another smaller area to the west of Sha Tau Kok. These resources are important in forming part of the transition from the maritime landscapes of Deep Bay and Starling Inlet and the agricultural landscapes of the hinterland. The dominant mangrove species include *Kandelia obovata, Avicennia marina, Aegiceras corniculatum* while *Phragmites australis* and *Brachiaria mutica* are common species along the banks of the *Gei-Wai*. These areas form important landscape resources and hence are considered to have a high sensitivity to change.

LR12 Marshland

7.6.16 The main areas of marshland can be found on Hoo Hok Wai to the north of Ma Tso Lung. These marshes are largely areas of former fishponds or agricultural lands which have become disused with time and colonised by natural plant species. The dominant wetland plant species include *Colocasia esculenta, Ludwigia octovalvis, Phragmites australis, Brachiaria mutica, Commelina diffusa* and *Cyclosorus interruptus*. Although not very mature and found in piecemeal pattern, these resources are regionally important and distinctive a landscape resource in Hong Kong. Therefore marshlands are considered to have a *high* sensitivity to change.

LR13 Developed Area

7.6.17 Open storage is one of major urban intrusions within the NWNT, regarding to the rapid development of transportation and trading between Hong Kong and China, there is an increasing demand on container storage areas since 1980s. New storage locations within the urban area are limited hence some abandoned agricultural fields adjacent to village settlements in NT were reclaimed with concrete platforms for open container storage due to their location and proximity to cross-boarder road corridors. This urban intrusion is visually not compatible with the rural landscapes and these open storage developments in NT have been controlled since the 1990s. This resource is able to accommodate extensive change, hence, is considered to have a *low* sensitivity to change.

7.6.18 For the purposes of this assessment the landscape resources are represented by the existing land coverage. The condition of these landscape resources is also important in determining the landscape quality of the Study Area and its sensitivity to change as described above. Therefore the preservation and enhancement of the existing landscape resources is important to the successful integration of the proposals into the landscape context of the Study Area. The following describes the impact on landscape resources due to the proposed works. **Table 7-4** provides an assessment of the sensitivity of the identified LRs and their sensitivity to change.

Table 7-4 Landscape Resources and their Sensitivity to Change

ID. No.	Landscape Resource / Area (Ha)	Quality of Landscape Resource (High / Medium / Low)	Importance and Rarity (High / Medium / Low)	Ability to accommodate Change (High / Medium / Low)	Local Significance of Potential Change (High / Medium / Low)	Regional Significance of Potential Change (High / Medium / Low)	Maturity (High / Medium / Low)	Sensitivity to Change (High / Medium / Low)
LR 1	**Cross border Infrastructure and Facilities** (85Ha)	Low	Low	High	Low	Low	Medium	Low
LR2	**Village Settlements** (65Ha)	Medium	Low	High	Low	Low	Medium	Low
LR3	**Mixed Woodland** (79Ha)	High	High	Low	High	High	High	High
LR4	**Plantation Woodland** (92Ha)	Medium	Medium	Medium	Medium	Medium	Medium	Medium
LR5	**Shrubland** (45Ha)	Medium	Medium	Medium	Medium	Medium	Medium	Medium
LR6	**Grassland** (618Ha)	Medium	Medium	Medium	Medium	Medium	Medium	Medium
LR7	**Agricultural Fields** (36Ha)	Medium	Medium	Medium	Medium	Medium	Medium	Medium
LR8	**Fishponds** (389Ha)	High	High	Low	High	High	Medium	High
LR9	**Natural Stream Courses** (38Ha)	High	High	Low	High	High	High	High
LR10	**Modified Watercourse** (140Ha)	Medium to Low	Low	Medium	Low	Low	Low	Medium
LR11	**Mangrove** (3.3Ha)	High	High	Low	High	High	High	High

ID. No.	**Landscape Resource / Area** (Ha)	**Quality of Landscape Resource** (High / Medium / Low)	**Importance and Rarity** (High / Medium / Low)	**Ability to accommodate Change** (High / Medium / Low)	**Local Significance of Potential Change** (High / Medium / Low)	**Regional Significance of Potential Change** (High / Medium / Low)	**Maturity** (High / Medium / Low)	**Sensitivity to Change** (High / Medium / Low)
LR12	**Marsh** (104Ha)	High	High	Low	High	High	High	High
LR13	**Developed Area** (800Ha)	Low	Low	High	Low	Low	Low	Low

Landscape Character Areas (LCAs)

7.6.19 The landscape of the Study Area is characterized by a combination of the lowland village landscape with surrounded by both active and inactive agricultural fields, extensive fishpond areas to the south west of the Study Area, bounded by extensive upland areas with wooded hill slopes giving way to shrub and coarse grassland. The course of the Shenzhen River forms the main spine which links sections 1 to 3 of the Study Area for the proposed scheme and the extensive high-rise development to the north of the border forms a significant determinant of character for areas in which it is visible. The main lowland landscape areas are situated in the western part of the Study Area. This lowland landscape gradually gives way to a more undulating and hill landscape to the south and east including the upland areas of the Lam Tsuen Country Park and Kwun Yam Shan to the west and Robin's Nest to the east. The main village settlements are located within the lowland areas situated throughout the Study Area.

7.6.20 The rural landscape of the Study Area is largely intact although some degradation has occurred due to the introduction of major infrastructure such as the existing border crossings and the channelization of the Shenzhen River. Fishponds, agricultural fields and scattered traditional village settlement patterns backed by the naturalistic upland areas are important in forming the character of the Study Area. **Figures 7-3A to D** show the location of the LCAs which form the Study Area, and **Figures 7-4A to F** demonstrate how these various characters fit together and form the landscape context for the Study Area. The identified LCAs are briefly described below.

LCA1 Tam Kon Chau Lowland Rural Landscape

7.6.21 This LCA is located to the south west of the Study Area and is characterised by the remnant fishponds to the south of the Shenzhen River with their largely rectilinear form separated by earth bunds and access tracks. Some of the fishponds have been abandoned over the passing of time and have reverted to marshland areas whilst there are also some limited areas of mangrove with the typical mangrove vegetation of small shrub like trees and intertidal mud banks. This LCA is an important landscape within Hong Kong and in forming the landscape setting for the dense urban development to the north of the Shenzhen River. Given its importance to the landscape of the region it is considered to have a high sensitivity to change.

LCA2 Mai Po Lowland Rural Landscape

7.6.22 This LCA is located to the south west of the Study Area, again it is characterised by the remnant fishponds to the south of the Shenzhen River and contains the important Mai Po Nature Reserve. This LCA is an important landscape within Hong Kong and as with LCA 1 is important in forming the landscape setting for the dense urban development to the north of the Shenzhen River. Given its importance to the landscape of the region it is considered to have a high sensitivity to change.

LCA3 Lok Ma Chau Cross-border Infrastructure and Facilities Landscape

7.6.23 The Lok Ma Chau area is dominated by the structures associated with the border crossing including the vehicular crossing and the buildings and viaduct associated with the more

recent East Rail Spur Line. The vehicular crossing is characterised by the extensive apron for waiting vehicles bounded by plantation woodland. The more modern railway crossing is characterised by the modernity of the building and the preserved and enhanced wetland areas (fishponds) to the south and west. This LCA is important as gateway to Hong Kong although the landscape quality of the vehicular crossing is degraded by its functional requirements. The railway crossing has given greater consideration to the landscape character of the area although the structures are still dominant within the LCA. Given the level of existing development within this LCA it is considered to have a relatively low sensitivity to change.

LCA4 Lok Ma Chau Lowland Rural Landscape

7.6.24 The landscape character of this area is shaped by a combination of the wooded hill slopes of the Lok Mau Chau ridgeline, the village settlement of Lok Ma Chau at the base of the ridgeline and its network of associated agricultural fields and fishpond areas; and the large expanse of the grassland formed within the abandoned meander of the Shenzhen River. In a sense this area forms a representation of the landscape of the rural NWNT in microcosm. Given the nature of the rural landscape in this area together with the relative degradation formed by the reclamation of the fishponds within the reclaimed area it is considered to have a medium sensitivity to further change.

LCA5 Sam Po Shue Lowland Rural Landscape

7.6.25 This LCA is characterised by a combination of the lower hill slopes Tai Shek Mo with the grassland of the higher elevations giving way to shrubland and wooded lower hill slopes; the village settlement of Shun Yee San Tsuen located in a valley; and the extensive active and abandoned fishponds to the north and west. The fishponds in this LCA are more organically shaped than those of the previous areas described above. The main concentrations of abandoned fishponds are located through the central portion of the LCA and these have reverted to grassland with the active areas located around the periphery. There is also a relatively large area of plantation woodland to the east of the LCA to the north of the village settlement of Liu Pok. Despite the abandonment of some of the fishpond areas this LCA is considered to have a high sensitivity to further change.

LCA6 Lo Wu Cross-border Infrastructure and Facilities Landscape

7.6.26 The landscape character of this area is formed by a combination of the wooded hill slopes of the Tai Shek Mo and the knoll of Seung Ma Lei Yue to the south and west; the flat agricultural land on the valley floor on the western bank of the Ng Tung River; and the channelized river course lined to the east by the infrastructure associated with the East Rail Line and the crossing facilities at Lo Wu. It is landscape characterised by the contrast between the naturalistic landscape to the west and the man-made landscapes to the east. Given the level of existing development on the valley floor this LCA is considered to have a low sensitivity to further change.

LCA7 Sandy Range Hillside Landscape

7.6.27 This LCA is largely formed by the main northeast - southwest orientation of the Sandy Ridge upland area with its combination of plantation and secondary woodland to the east

and west and the more upland nature of the central portion of the uplands. The uplands bound the southern bank of the channelized Shenzhen River with some reclaimed grassland areas forming the former footprint of the natural river course in the central and eastern portions of the river frontage. This LCA is considered to have a high sensitivity to change.

LCA8 Man Kam To Cross-border Infrastructure and Facilities Landscape

7.6.28 The landscape of this area, located between Man Kam To Road and the Ta Kwu Ling Village, is one characterised by the level of human disturbance with the lower, wooded hill slopes of Lo Shue Ling giving way to the extensive development associated with the border crossing bounded by plantation woodland; a central portion containing the village settlements of Muk Wu and Muk Wu Nga Yiu; and the eastern portion with the security development flanked by extensive areas of plantation and secondary woodland. The area is bounded to the north by the channelized course of the Shenzhen River. The western portion of the LCA is dominated by the development including the buildings and large concrete apron of the Man Kam To border crossing with some agricultural fields to the east associated with the village of Muk Wu. To the east the existing development is located within the woodland and largely screened from the adjacent landscape although it is visible from the upland area to the south. Given the level of development in this LCA it is considered to have a low sensitivity to change.

LCA9 North Ta Kwu Ling Lowland Rural Landscape

7.6.29 This LCA is characterised by a combination of the relatively open hill slopes of Lo Shue Ling to the east and the uplands Ta Kwo Ling to the west bisected by the valley of the now channelized Ping Yuen River and its tributaries. This landscape gives way to the north to a landscape characterised by the village settlements of Ta Kwu Ling Village, Kan Tau Wai and Kaw Liu Village on the lower hill lopes and narrow flat plain on the southern bank of the Shenzhen River. The upper reaches of the river retain their natural form with series of meanders and organically shaped river banks. Small pockets of plantation and secondary woodland are located on the hill slopes in the western and eastern sections of the LCA. This LCA is considered to have a medium sensitivity to change.

LCA10 Lin Ma Hang Hillside Landscape

7.6.30 The landscape of this area is characterised by a lowland landscape with the hills to the south of village of Tsung Yuen Ho in the western portion and the more extensive area of the lower hill slopes of the Lin Ma Hang mountain range in the eastern portion. In the central portion of the LCA is dominated by the grass and shrubland covered knoll of Pau Fu Shan. The area is crossed by the east – west orientated Lin Ma Hang Road. The main concentration of secondary mixed woodland is located to the west of Kaw Liu Village with an area of shrubland to the east of Pau Fu Shan. The remainder of the area is covered with coarse grassland with areas of agricultural fields associated with the village settlements of Ha Heung Yuen, Heung Yuen Wai to the west and Lin Ma Hang to the east. To ht eorth of the LCA a narrow river plain is bounded by the natural course of the Shenzhen River. Given the relatively undeveloped character of this area it is considered to have a medium sensitivity to change.

LCA11 Shenzhen Liantang High-rise Residential Landscape

7.6.31 This LCA located to the north of the Shenzhen River has three main zones the eastern portion is characterised by a combination of the regimented rows of high and medium-rise, east – west orientated residential development flanked to the east by a scarred landscape of quarrying and major road development. The central portion of the LCA contains a light industrial area bounded to the north west by wooded hill slopes and the western portion is formed by a combination of a village settlement again bounded to the northwest by wooded hill sides and a large sewage treatment works which occupies the main flat are to the south of the village. This landscape is characterised by both modern and more traditional urban development and the extent of the infrastructure and utility works. Given the developed nature of this LCA it is considered to have a low sensitivity to change.

LCA12 Shenzhen Wenjandu Port Infrastructure and Facilities Landscape

7.6.32 The landscape of this area is dominated by the infrastructural development of the Shenzhen Wenjandu Port, the counterpart to the crossing facilities at Man Kam To. This includes an extensive road network which passes through the LCA on a northeast – southwest orientation, the rectilinear form of an industrial area in the eastern portion, large areas of hard standing and storage facilities in the central portion and pockets of high-rise commercial development to the west. The main concentrations of existing vegetation include a landscape buffer of amenity tree and shrub planting on the southern side of the main east –west road and a semi-circular park to the south of the LCA. The area is bounded to the south by the meandering form of the Shenzhen River and to the north by the dense urban development of metropolitan Shenzhen. Given the level of development within this LCA it is considered to have a low sensitivity to change.

LCA13 Shenzhen Lo Wu Cross-border Infrastructure and Facilities

7.6.33 This LCA is characterised by a landscape of high-rise residential and commercial development in the eastern portion; the development associated with the Shenzhen Lo Wu border crossing in the central portion with its extensive infrastructure, apron for approaching vehicles and associated government buildings and an organically shaped residential settlement in the western portion. The main concentrations of vegetation are located on the banks of the Shenzhen River in the central portion and the wooded hill slopes of knoll which separates the border crossing facilities from the adjacent residential area. The LCA is again bounded to the south by the Shenzhen River and to the north by a combination of high and medium rise residential development and areas of high-rise commercial development. Given the developed nature of this LCA it is considered to have a low sensitivity to change.

LCA14 Shenzhen Huanggang Cross-border Infrastructure and Facilities Landscape

7.6.34 The landscape of this area has two distinct characters. The first to the northeast is dominated by high-rise residential development which extends in a grid-like form to the banks of the channelized banks of the Shenzhen River. The second character is that of the facilities associated with the Shenzhen Huanggang, the counterpart to the Lok Mau Chau crossing, with its road development and extensive apron areas for the processing of cross border traffic. To the west the crossing is flanked by a small parcel of high-rise residential development designed on spiral layout. The main concentrations of vegetation include

amenity tree and shrub planting lining the riverfront adjacent to the residential area in the eastern portion of the LCA and a landscape buffer from tree and shrub planting adjacent to the hard standing and major infrastructure development associated with the border crossing. Given the level of development within this LCA it is considered to have a low sensitivity to change.

LCA15 Shenzhen Futian Industrial Landscape

7.6.35 This LCA is dominated by the grid-like form of the Shenzhen Futian Industrial Area with its large rectilinear industrial buildings extending to the road on the river frontage. The shape of the industrial area mirrors that of the curing form of the channelised Shenzhen River to the south and extends north to the remainder of the industrial area and beyond to medium-rise residential development. This is characterised by its lack of vegetation although there are some street trees at the central portion of the river frontage and lining the intersecting road to the north. Given the level of industrial development within this LCA and its lack of landscape resources it is considered to have a low sensitivity to change.

LCA16 Sha Tau Kok Rural Landscape

7.6.36 The landscape of this area is one formed by three distinct areas. The first is the coastal landscape of Starlet Inlet although in this portion of the LCA it is dominated by the structures associated with the sewage treatment works. The second area located to the east is the medium-rise residential development of Sha Tau Kok Tsuen and Shun Lung Street. The third area, located to the west of Sha Tau Kok Road – Sha Mo Road are the lower, wooded slopes of the foothills of the natural uplands of the Robin's Nest – Hung Fa Chai range of mountains. The main concentrations of vegetation in LCA are the mixed woodland, shrub and grassland of the foothills to the west and the open spaces and waterfront promenade associated with the residential areas to the east. Despite the location of the sewage treatment works this LCA is considered to a medium level of sensitivity to change.

7.6.37 **Table 7-5** provides an assessment of the sensitivity of the identified LCAs to change.

Table 7-5 Landscape Character Areas and their Sensitivity to Change

ID. No.	Landscape Character Area (LCA)	Quality of Landscape Character (High / Medium / Low)	Importance and Rarity (High / Medium / Low)	Ability to accommodate Change (High / Medium / Low)	Local Significance of Potential Change (High / Medium / Low)	Regional Significance of Potential Change (High / Medium / Low)	Sensitivity to Change (High / Medium / Low)
LCA1	**Tam Kon Chau Lowland Rural Landscape**	High	High	Low	High	High	High
LCA2	**Mai Po Lowland Rural Landscape**	High	High	Low	High	High	High
LCA3	**Lok Ma Chau Cross-border Infrastructure and Facilities Landscape**	Low	Low	High	Low	Low	Low
LCA4	**Lok Ma Chau Lowland Rural Landscape**	Medium	Medium	Medium	Medium	Medium	Medium
LCA5	**Sam Po Shue Lowland Rural Landscape**	High	Medium	High	High	Medium	High
LCA6	**Lo Wu Cross-border Infrastructure and Facilities Landscape**	Low	Low	High	Low	Low	Low
LCA7	**Sandy Range Hillside Landscape**	High	High	Low	High	Medium	High
LCA8	**Man Kam To Cross-border Infrastructure and Facilities Landscape**	Low	Low	High	Low	Low	Low

ID. No.	Landscape Character Area (LCA)	Quality of Landscape Character (High / Medium / Low)	Importance and Rarity (High / Medium / Low)	Ability to accommodate Change (High / Medium / Low)	Local Significance of Potential Change (High / Medium / Low)	Regional Significance of Potential Change (High / Medium / Low)	Sensitivity to Change (High / Medium / Low)
LCA9	**North Ta Kwu Ling Lowland Rural Landscape**	Medium	Medium	Medium	High	Medium	Medium
LCA10	**Lin Ma Hang Hillside Landscape**	High	High	Low	High	Medium	Medium
LCA11	**Shenzhen Liantang High-rise Residential Landscape**	Low	Low	High	Low	Low	Low
LCA12	**Shenzhen Wenjandu Port Infrastructure and Facilities Landscape**	Low	Low	High	Low	Low	Low
LCA13	**Shenzhen Lo Wu Cross-border Infrastructure and Facilities Landscape**	Low	Low	High	Low	Low	Low
LCA14	**Shenzhen Huanggang Cross-border Infrastructure and Facilities Landscape**	Low	Low	High	Low	Low	Low
LCA15	**Shenzhen Futian Industrial Landscape**	Low	Low	High	Low	Low	Low
LCA16	**Sha Tau Kok Rural Landscape**	Medium	Medium	Medium	Medium	Medium	Medium

7.7 Existing Visual Context

Visual Envelope

7.7.1 The Visual Envelope (VE), the area from which the proposed works associated with the Secondary Boundary Fence would be visible is largely limited to a relatively narrow corridor following the alignment of the fence with the exception of the flat expanse of the fishponds located between the Ha Wan Tsuen in the west and Liu Pok in the east. The VE is described according to each f the four sections of the proposed scheme.

Section 1 – Mai Po to Lok Ma Chau Control Point

7.7.2 The VE for this section is largely limited to a relatively narrow corridor following the alignment of the fence through the fishponds adjacent to Mai Po and Sam Po Shue. Visibility is restricted due to the existing vegetation on the bunds between the fishponds and wetland areas and the flat nature of the topography.

Section 2 – Lok Ma Chau Control Point to Ng Tung River

7.7.3 The VE for this section extends to the uplands of the Fung Kong Shan - Tai Shek Mo range of mountains, Sandy Ridge and Lo Shue Ling with visibility extending inland through the valleys which bisect the upland areas including that at Lok Ma Chau, the Ng Tung River valley. There are panoramic views across the flat expanse of the fishponds which are he main landscape feature of this area although pockets of tree planting and tall grass / reed growth on the bunds between the fishponds limit views in some locations. The VE extends to the high-rise development on the north western bank of the Shenzhen River.

Section 3 – Ng Tung River to Lin Ma Hang Village

7.7.4 The VE for this section of the proposed SBF again forms a narrow corridor on either side of the alignment. It extends south east to the combined form of the uplands of the and the foothills of Wong Mau Hang Shan and includes the agricultural areas of Man Kam To and the Ping Yuen River valley are largely screened beyond the flat agricultural plain by the intervening vegetation and village development. Views are screened in some locations by existing tree growth particularly around the village settlements and the existing topography such as the knoll at Pok Fu Shan. Views from Shenzhen to the north are largely limited to the development immediately adjacent to the northern bank of the Shenzhen River.

Section 4 – Lin Ma Hang Village to Sha Tau Kok

7.7.5 The VE for the Section 4 of the proposals at Sha Tau Kok are largely limited by the village developments and the intervening vegetation associated with Hai Tam Shui Hang and Shan Tsui to the north and by the development lining Sha Tau Kok Road to the east.

7.7.6 The extent of the visual envelope and the locations of the identified VSRs is indicated on **Figures 7-6A to B** and **Figures 7-6C to G** provide an indication of the visual context.

Visual Sensitive Receivers

7.7.7 VSRs identified within the VE are grouped by according to village settlements, residential and industrial developments, vehicle travellers and staff of the border crossing facilities whom have a view of the proposed works associated with the Secondary Boundary Fence. Despite the relatively long length of the proposals the Study Area has a relatively low level of development due to security consideration and so the identified VSRs are limited to existing village settlements, the residents of high-rise developments lining the Shenzhen River and the main road and rail infrastructure at the border crossing points. Views from the north are limited due to a combination of the scale of the proposals and the viewing distances involved. The selected VSRs are representative of the views available to people at each location for the four sections of the proposals and include the following:

Section 1 – Mai Po to Lok Ma Chau Control Point

VSR1:	Residents of Tam Kon Chau Village Settlement
VSR2:	Residents of Sam Po Shue Village Settlement / Planned Development on OU (Comprehensive Development and Wetland Enhancement Area)
VSR3:	Travellers and Staff at Lo Ma Chau Cross-border Infrastructure Facilities
VSR4:	Residents of Ha Wan Tseun Village Settlement

Section 2 – Lok Ma Chau Control Point to Ng Tung River

VSR5:	Residents of Lok Ma Chau Village Settlement
VSR6:	Residents of Shun Yee San Tsuen Village Settlement
VSR7:	Residents of Tak Yuet Lau Tsuen Village Settlement
VSR8:	Travellers and Staff at Lo Wo Cross-border Infrastructure Facilities
OVSR19:	Staff working in Shenzhen Futian Industrial Area
PVSR 20:	Staff working in the future Development at the Lok Ma Chau Loop

Section 3 – Ng Tung River to Lin Ma Hang Village

VSR9:	Residents of Lo Wo Village Settlement
VSR10:	Travellers and Staff at Man Kam To Cross-border Infrastructure Facilities
VSR11:	Residents of Ta Kwu Ling Village Settlement
VSR12:	Residents of Kaw Liu Village Settlement
VSR13:	Residents of Village Settlement along Lin Ma Hang Road
VSR14:	Residents of Lin Ma Hang Village Settlement
OVSR18:	Residents of Shenzhen Liantang High-rise Development
PVSR 20:	Staff working in the future Development at the Lok Ma Chau Loop
VSR 21:	Residents of Chuk Yuen
VSR 22:	Residents of Tsung Yuen Ha

Section 4 – Lin Ma Hang Village to Sha Tau Kok

VSR15:	Residents of Sha Tau Kok Tsuen Village Settlement
VSR16:	Residents of Tam Shui Hang Village Settlement
VSR17:	Residents of Shan Tsui Village Settlement
VSR 23:	Residents of Kong Ha

7.7.8 **Table 7-6** below determines the sensitivity of selected VSRs within the VE to accommodate change.

Table 7-6 Visually Sensitive Receivers (VSRs) and their Sensitivity to Change

ID. No.	Key Visually Sensitive Receivers (VSRs) / Viewing Distance	Type of VSRs	Population of Viewers (Large / Intermediate / Few / Very Few)	Quality of Existing View (Good / Fair / Poor)	Amenity of Alternative Views (Good / Fair / Poor)	Direction of Main Views / Availability of Alternative Views (Yes/ No)	Degree of Visibility (Full / Partial / Glimpsed)	Frequency of View (Very Frequent/ Frequent/ Occasional / Rare)	Sensitivity to Change (Low / Medium / High)
Section 1 – Mai Po to Lok Ma Chau Control Point									
VSR 1	**Residents of Tam Kon Chau Village Settlement** / 15m	Residential	Few	Good to fair	Good	Northeast / Yes	Partial	Frequent	High
VSR 2	**Residents of Sam Po Shue Village Settlement / Planned Development on OU (Comprehensive Development and Wetland Enhancement Area)** / 50m	Residential	Few	Good to fair	Good	Northwest / Yes	Partial	Frequent	High
VSR 3	**Travellers and Staff at Lok Ma Chau Cross-border Infrastructure Facilities** / 20m	Vehicle travellers and Staff	Large	Poor	Fair	North and south / Yes	Partial	Frequent	Low
VSR 4	**Residents of Ha Wan Tseun Village Settlement** / 20m	Residential	Few	Good to fair	Fair	East to Northeast / Yes	Partial	Frequent	High
Section 2 – Lok Ma Chau Control Point to Ng Tung River									
VSR 5	**Residents of Lok Ma Chau Village Settlement** / 80m	Residential	Few	Good to fair	Good	North to Northeast / Yes	Partial	Frequent	High
VSR 6	**Residents of Shun Yee San Tsuen Village Settlement** /	Residential	Few	Good to fair	Good	Northeast / Yes	Full	Frequent	High

ID. No.	Key Visually Sensitive Receivers (VSRs) / Viewing Distance	Type of VSRs	Population of Viewers (Large / Intermediate / Few / Very Few)	Quality of Existing View (Good / Fair / Poor)	Amenity of Alternative Views (Good / Fair / Poor)	Direction of Main Views / Availability of Alternative Views (Yes/ No)	Degree of Visibility (Full / Partial / Glimpsed)	Frequency of View (Very Frequent/ Frequent/ Occasional / Rare)	Sensitivity to Change (Low / Medium / High)
	30m								
VSR 7	**Residents of Tak Yuet Lau Tsuen Village Settlement /** 20m	Residential	Few	Good to fair	Good	North / Yes	Full	Frequent	High
VSR 8	**Travellers and Staff at Lo Wo Cross-border Infrastructure Facilities /** 20m	Vehicle travellers and Staff	Large	Poor	Fair to poor	North and south / Yes	Partial	Frequent	Low
OVSR 19	**Staff working in Shenzhen Futian Industrial Area /** 200m to new fence	Factory workers	Intermediate	Good to Fair	Fair	South / Yes	Partial	Frequent	Medium
PVSR20	**Staff working in the future Development at the Lok Ma Chau Loop /** 50m to new fence	Staff and Factory workers	Intermediate	Fair	Fair	North west / Yes	Partial	Frequent	Medium
Section 3 – Ng Tung River to Lin Ma Hang Village									
VSR 9	**Residents of Lo Wo Village Settlement** / 20m	Residential	Few	Good to fair	Good to fair	North / Yes	Partial	Frequent	High
VSR 10	**Travellers and Staff at Man Kam To Cross-border Infrastructure Facilities /** 130m	Vehicle travellers and Staff	Large	Poor	Poor	North and south / Yes	Partial	Frequent	Low

ID. No.	Key Visually Sensitive Receivers (VSRs) / Viewing Distance	Type of VSRs	Population of Viewers (Large / Intermediate / Few / Very Few)	Quality of Existing View (Good / Fair / Poor)	Amenity of Alternative Views (Good / Fair / Poor)	Direction of Main Views / Availability of Alternative Views (Yes/ No)	Degree of Visibility (Full / Partial / Glimpsed)	Frequency of View (Very Frequent/ Frequent/ Occasional / Rare)	Sensitivity to Change (Low / Medium / High)
VSR 11	**Residents of Ta Kwu Ling Village Settlement /** 20m	Residential	Few	Good to fair	Good to fair	Northwest / Yes	Partial	Frequent	High
VSR 12	**Residents of Kaw Liu Village Settlement /** 20m	Residential	Few	Good to fair	Good to fair	West / Yes	Partial	Frequent	High
VSR 13	**Residents of Village Settlement along Lin Ma Hang Road** / 250m	Residential	Few	Good to fair	Good to fair	Northeast / Yes	Partial	Frequent	High
VSR 14	**Residents of Lin Ma Hang Village Settlement** / 20m to removal of existing fence / 150m to new fence	Residential	Few	Good to fair	Good to fair	North / Yes	Partial	Frequent	High
OVSR 18	**Residents of Shenzhen Liantang High-rise Development /** 100m to new fence	Residential	Large	Good to fair	Good to fair	South / Yes	Partial	Frequent	High
VSR 21	**Residents of Chuk Yuen /** 150m to new fence	Residential	Few	Good to fair	Good	Northwest / Yes	Partial	Frequent	High
VSR 22	**Residents of Tsung Yuen Ha /** 200m to new fence	Residential	Few	Good to fair	Good	Northwest / Yes	Partial	Frequent	High
Section 4 – Lin Ma Hang Village to Sha Tau Kok									

ID. No.	Key Visually Sensitive Receivers (VSRs) / Viewing Distance	Type of VSRs	Population of Viewers (Large / Intermediate / Few / Very Few)	Quality of Existing View (Good / Fair / Poor)	Amenity of Alternative Views (Good / Fair / Poor)	Direction of Main Views / Availability of Alternative Views (Yes/ No)	Degree of Visibility (Full / Partial / Glimpsed)	Frequency of View (Very Frequent/ Frequent/ Occasional / Rare)	Sensitivity to Change (Low / Medium / High)
VSR 15	**Residents of Sha Tau Kok Tsuen Village Settlement** / 90m to new fence	Residential	Few	Good to fair	Good to fair	West / Yes	Partial	Frequent	High
VSR 16	**Residents of Tam Shui Hang Village Settlement** / 50m to new fence	Residential	Few	Good to fair	Good to fair	East / Yes	Partial	Frequent	High
VSR 17	**Residents of Shan Tsui Village Settlement** / 130m to new fence	Residential	Large	Good to fair	Good to fair	South / Yes	Partial	Frequent	High
VSR 23	**Residents of Kong Ha** / 100m to new fence	Residential	Few	Good to fair	Good to fair	West / Yes	Full	Frequent	High

7.8 Landscape Impact Assessment

Sources of Landscape Impacts

7.8.1 The main landscape and visual impacts will be limited to the Boundary Fence corridor and will involve the loss of existing trees and some limited loss of landscape resources and a limited impact on the existing landscape character of the Study Area. Therefore it is considered that the proposed works with the successful implementation of the landscape mitigation measures will be relatively integrated with the local landscape character. Hence, there is no significant adverse impact to the existing landscape resources, character and amenity.

Construction Phase

7.8.2 During the construction phase, works will be limited to works boundary adjacent to the proposed alignment of the boundary fence. The proposed scheme will involve the erection of a new fence and construction of new boundary patrol road with the associated structures largely in the immediate vicinity of the existing fence alignment. The areas impacted by the proposals include:

Section 1 – Mai Po to Lok Ma Chau Control Point

(i) The erection of the SBF along the existing BPR (approximately 4.1km); and

(ii) The replacement of the existing checkpoint at Pak Hok Chau.

Section 2 – Lok Ma Chau Control Point to Ng Tung River

(i) The conversion of the existing Drainage Services Department maintenance services road along the Shenzhen River bank to the north of the Lok Ma Chau Loop and Hoo Hok Wai into a new section of the BPR (approximately 5.6km);

(ii) The erection of the new PBF with the sensor alarm system and an SBF respectively along the northern and southern side of the converted road;

(iii) The removal of the original PBF and the sensor alarm system thereon along the existing BPR south of the Lok Ma Chau Loop and Hoo Hok Wai; and

(iv) The removal of the existing checkpoint at Lok Ma Chau Road.

Section 3 – Ng Tung River to Lin Ma Hang Village

(i) The erection of an SBF along the existing BPR except the sections to the north of Pak Fu Shan and northwest of Lin Ma Hang Village (approximately 7.5km);

(ii) The construction of new sections of the BPR along the Shenzhen River side to the north of Pak Fu Shan and northwest of Lin Ma Hang Village without necessitating river training (approximately 4.0km);

(iii) The erection of a new PBF with the sensor alarm system and an SBF along the northern and southern sides of the new sections of BPR respectively;

(iv) The removal of the original PBF and the sensor alarm system thereon along the existing BPR near Pak Fu Shan and Lin Ma Hang Village; and

(v) The removal of the existing checkpoints at Sha Ling and Ping Che.

Section 4 – Lin Ma Hang Village to Sha Tau Kok

(i) The erection of an SBF from the entrance of the Sha Tau Kok town (i.e. the location of "Gate One") to the Sha Tau Kok Control Point (approximately 0.5km);

(ii) The provision of a new checkpoint at "Gate One"; and

(iii) The removal of the existing checkpoint at Shek Chung Au.

7.8.3 Many of the potential impacts will arise from the visual intrusion caused by the actual work activities e.g. change of landscape amenity, exposure of earthworks for the new PBR and PBF, demolition works for some of the existing structures including the proposed checkpoint replacements, erection works for the new lengths of boundary fence superstructure and works traffic; and the construction activity associated with the replacement of existing checkpoints. Limited areas surrounding these proposed works will be also disturbed due to the temporary works areas and contractor's compounds.

Operational Phase

7.8.4 The main impacts during the operational phase will be limited to the introduction of the new fence structures and the proposed lengths of PBR and BBR, and the replacement of check points. However given that the area already contains the boundary fence the potential impacts on the landscape resources and character of the Study Area are not considered to be significant.

Table 7-7 Magnitude of Change for Landscape Resources

ID. No.	Landscape Resources (Area affected)	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Compatibility of the Project with Landscape Resource (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
							Construction	Operational
LR 1	**Cross border Infrastructure and Facilities** (14Ha)	Construction work will involve the new alignment for the PBR and PBF, and the replacement of some Check Points and associated facilities	Small	High	Construction stage- short Operation stage- Nil	Not Applicable	Small	Small
LR2	**Village Settlements** (0.16Ha	Area at the northern peripheries of Lo Wu Village and Kwu Liu Village	Small	Medium	Construction stage- nil Operation stage-nil	Not Applicable	Small	Small
LR3	**Mixed Woodland** (0Ha)	No direct impact	Small	Low	Construction stage-nil Operation stage-nil	Not Applicable	Negligible	Negligible
LR4	**Plantation Woodland** (3.2Ha)	Plantation woodland at embankment of existing border road at Tam Kon Chau and Sham Po Shue fishpond areas, and area to west of Chuk Yuen.	Small	Low	Construction stage-nil Operation stage-Nil	Not Applicable	Small	Small
LR5	**Shrubland** (0.02Ha)	Shrubland affected along existing boundary road and fence near Shun Yee San Tsuen .	Small	Low	Construction stage-nil Operation stage-Nil	Not Applicable	Small	Small

ID. No.	Landscape Resources (Area affected)	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Compatibility of the Project with Landscape Resource (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
							Construction	Operational
LR6	**Grassland** (4.6Ha)	Grassland located near and around Lo Wu, Man Kam To, Ta Kwu Ling village, Pau Fu Shan Lin Ma Heung village.	Small	Low	Construction stage- nil Operation stage- Nil	Not Applicable	Small	Small
LR7	**Agricultural Fields** (0.015Ha)	Land affected at Shun Yee San Tsuen.	Small	Low	Construction stage- nil Operation stage- nil	Not Applicable	Small	Small
LR8	**Fishponds** (0.1Ha)	Small area affected adjacent to existing border road Tam Kon Chau. No direct impact as the proposals will utilise existing DSD access roads and bunds and will not lead to the loss of fishponds.	Small	Low	Construction stage- nil Operation stage- nil	Not Applicable	Small	Small
LR9	**Natural Stream Courses** (0Ha)	No direct impact	Small	Low	Construction stage- nil Operation stage- nil	Not Applicable	Negligible	Negligible
LR10	**Modified Watercourse** (0.4Ha)	Small area of embankment affected of the Shenzhen River near Yuen Ling Chai. For other areas no direct impact although part of the SBF will be relocated to follow the course of the river in the central section.	Small	Low	Construction stage- nil Operation stage- nil	Not Applicable	Small	Small

ID. No.	Landscape Resources (Area affected)	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Compatibility of the Project with Landscape Resource (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
							Construction	Operational
LR11	**Mangrove** (0Ha)	No direct impact	Small	Low	Construction stage- nil Operation stage- nil	Not Applicable	Negligible	Negligible
LR12	**Marsh** (0Ha)	No direct impact	Small	Low	Construction stage- nil Operation stage- nil	Not Applicable	Negligible	Negligible
LR13	**Developed Area** (0.6Ha)	Carpark adjacent to Shau Tau Kok Road	Small	Medium	Construction stage- nil Operation stage- nil	Not Applicable	Small	Small

Table 7-8 Magnitude of Change for Landscape Character Areas

ID. No.	Landscape Character Areas	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Compatibility of the Project with Landscape Character Area (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
							Construction	Operational
LCA1	Tam Kon Chau Lowland Rural Landscape	Erection of new check point. Proposed SBF to follow the alignment of existing PBF.	Small	High	Construction stage- Short Operation stage- Nil	Yes	Small	Small
LCA2	Mai Po Lowland Rural Landscape	Proposed SBF to follow the alignment of existing PBF.	Medium	High	Construction stage- short Operation stage- long	Yes	Small	Small
LCA3	Lok Ma Chau Cross-border Infrastructure and Facilities Landscape	Proposed SBF to follow the alignment of existing PBF.	Small	High	Construction stage- short Operation stage- long	Yes	Small	Small

ID. No.	Landscape Character Areas	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Compatibility of the Project with Landscape Character Area (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
							Construction	Operational
LCA4	Lok Ma Chau Lowland Rural Landscape	Proposed SBF to follow new alignment on the banks of the Shenzhen River and utilise existing DSD road for the BPR. Proposal balanced against enhancements arising from the removal of the existing fence alignment (Green Route)	Small	Medium	Construction stage- short Operation stage- long	Yes	Small	Small
LCA5	Sam Po Shue Lowland Rural Landscape	Proposed SBF to follow new alignment on the banks of the Shenzhen River and utilise existing DSD road for the BPR. Proposal balanced against enhancements arising from the removal of the existing fence alignment (Green Route) . It is likely that the relocation of the fence will have a beneficial effect on the landscape character of this area.	Small	Medium	Construction stage- short Operation stage- long	Yes	Small	Small

ID. No.	Landscape Character Areas	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Compatibility of the Project with Landscape Character Area (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
							Construction	Operational
LCA6	Lo Wu Cross-border Infrastructure and Facilities Landscape	Proposed SBF to follow new alignment on the banks of the Shenzhen River and utilise existing DSD road for the BPR. Proposal balanced against enhancements arising from the removal of the existing fence alignment (Green Route)	Small	High	Construction stage- short Operation stage- long	Yes	Small	Small
LCA7	Sandy Range Hillside Landscape	Construction of the SBR immediately adjacent to the PBF.	Small	Medium	Construction stage- short Operation stage- long	Yes	Small	Small
LCA8	Man Kam To Cross-border Infrastructure and Facilities Landscape	Construction of the SBR immediately adjacent to the PBF.	Small	High	Construction stage- short Operation stage- long	Yes	Small	Small
LCA9	North Ta Kwu Ling Lowland Rural Landscape	Construction of the SBR immediately adjacent to the PBF.	Small	Medium	Construction stage- short Operation stage- long	Yes	Small	Small

ID. No.	Landscape Character Areas	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Compatibility of the Project with Landscape Character Area (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
							Construction	Operational
LCA10	Lin Ma Hang Hillside Landscape	Proposed SBF to follow new alignment for two sections on the banks of the Shenzhen River and utilise existing DSD road for the BPR. Proposal balanced against enhancements arising from the removal of the existing fence alignment (Green Route). Remaining sections of the SBR fence follow the same alignment as PBF.	Small	Medium	Construction stage- short Operation stage- long	Yes	Small	Small
LCA11	Shenzhen Liantang High-rise Residential Landscape	No direct impact	Small	High	Construction stage- Nil Operation stage- Nil	Yes	Small	Small
LCA12	Shenzhen Wenjandu Port Infrastructure and Facilities Landscape	No direct impact	Small	High	Construction stage- Nil Operation stage- Nil	Yes	Small	Small

ID. No.	Landscape Character Areas	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Compatibility of the Project with Landscape Character Area (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
							Construction	Operational
LCA13	Shenzhen Lo Wu Cross-border Infrastructure and Facilities Landscape	No direct impact	Small	High	Construction stage- Nil Operation stage- Nil	Yes	Negligible	Negligible
LCA14	Shenzhen Huanggang Cross-border Infrastructure and Facilities Landscape	No direct impact	Small	High	Construction stage- Nil Operation stage- Nil	Yes	Negligible	Negligible
LCA15	Shenzhen Futian Industrial Landscape	No direct impact	Small	High	Construction stage- Nil Operation stage- Nil	Yes	Negligible	Negligible

ID. No.	Landscape Character Areas	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Compatibility of the Project with Landscape Character Area (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
							Construction	Operational
LCA16	Sha Tau Kok Rural Landscape	Erection of SBF from the entrance of the Sha Tau Kok town (i.e. the location of "Gate One") to the Sha Tau Kok Control Point (approximately 0.5km) following existing alignment. Replacement of Checkpoint at Shek Chung Au.	Small	Medium	Construction stage- Short Operation stage- Long	Yes	Small	Small

Table 7-9 Significance of Impacts on Landscape Resources in the Construction and Operational Phases

ID. No.	Landscape Resources	Sensitivity (Nil / Small / Medium / Large)	Magnitude of Change (Large/ Intermediate/ Small/ Negligible)		Significance Threshold (Unmitigated) (Negligible, Slight, Moderate and Significant)		Mitigation Measures (Refer to Tables 7-13 and 7-14)	Significance Threshold (Mitigated) (Negligible, Slight, Moderate and Significant)	
			Construc -tion	Opera- tional	Construction	Operational		Construction	Operational
LR 1	**Cross border Infrastructure and Facilities**	Low	Small	Small	Slight adverse	Slight adverse	CP1 to CP5 and OP1to OP4	Slight adverse	Negligible
LR2	**Village Settlements**	Low	Small	Small	Slight adverse	Slight adverse	CP1 to CP5 and OP1to OP4	Slight adverse	Negligible
LR3	**Mixed Woodland**	High	Negligible	Negligible	Negligible	Negligible	CP1 to CP5 and OP1to OP4	Negligible	Negligible
LR4	**Plantation Woodland**	Medium	Small	Small	Slight adverse	Slight adverse	CP1 to CP5 and OP1to OP4	Slight adverse	Negligible
LR5	**Shrubland**	Medium	Small	Small	Slight adverse	Slight adverse	CP1 to CP5 and OP1to OP4	Slight adverse	Negligible
LR6	**Grassland**	Medium	Small	Small	Slight adverse	Slight adverse	CP1 to CP5 and OP1to OP4	Slight adverse	Negligible
LR7	**Agricultural Fields**	Medium	Small	Small	Slight adverse	Slight adverse	CP1 to CP5 and OP1to OP4	Slight adverse	Negligible
LR8	**Fishponds**	High	Small	Small	Moderate adverse	Moderate adverse	CP1 to CP5 and OP1to OP4	Moderate adverse	Slight adverse

ID. No.	Landscape Resources	Sensitivity (Nil / Small / Medium / Large)	Magnitude of Change (Large/ Intermediate/ Small/ Negligible)		Significance Threshold (Unmitigated) (Negligible, Slight, Moderate and Significant)		Mitigation Measures (Refer to Tables 7-13 and 7-14)	Significance Threshold (Mitigated) (Negligible, Slight, Moderate and Significant)	
			Construc -tion	**Opera- tional**	**Construction**	**Operational**		**Construction**	**Operational**
LR9	**Natural Stream Courses**	High	Negligible	Negligible	Negligible	Negligible	CP1 to CP5 and OP1to OP4	Negligible	Negligible
LR10	**Modified Watercourse**	Medium	Small	Small	Slight adverse	Slight adverse	CP1 to CP5 and OP1to OP4	Slight adverse	Negligible
LR11	**Mangrove**	High	Negligible	Negligible	Negligible	Negligible	CP1 to CP5 and OP1to OP4	Negligible	Negligible
LR12	**Marsh**	High	Negligible	Negligible	Negligible	Negligible	CP1 to CP5 and OP1to OP4	Negligible	Negligible
LR13	**Developed Area**	Low	Small	Small	Slight adverse	Slight adverse	CP1 to CP5 and OP1to OP4	Slight adverse	Negligible

Table 7-10 Significance of Impacts on Landscape Character Areas in the Construction and Operational Phases

ID. No.	Landscape Character Areas	Sensitivity (Nil / Small / Medium / High)	Magnitude of Change (Large / Intermediate / Small / Negligible)		Significance Threshold (Unmitigated) (Negligible / Slight / Moderate / Significant)		Mitigation Measures (Refer to Tables 7-13 and 7-14)	Significance Threshold (Mitigated) (Negligible / Slight / Moderate / Significant)	
			Construction	Operational	Construction	Operational		Construction	Operational
LCA1	**Tam Kon Chau Lowland Rural Landscape**	High	Small	Small	Moderate	Moderate	CP1 to CP5 and OP1to OP4	Moderate	Slight
LCA2	**Mai Po Lowland Rural Landscape**	High	Small	Small	Moderate	Moderate	CP1 to CP5 and OP1to OP4	Moderate	Slight
LCA3	**Lok Ma Chau Cross-border Infrastructure and Facilities Landscape**	Low	Small	Small	Slight	Slight	CP1 to CP5 and OP1to OP4	Slight	Negligible
LCA4	**Lok Ma Chau Lowland Rural Landscape**	Medium	Small	Small	Slight	Slight	CP1 to CP5 and OP1to OP4	Slight	Negligible
LCA5	**Sam Po Shue Lowland Rural Landscape**	High	Small	Small	Moderate	Moderate	CP1 to CP5 and OP1to OP4	Moderate	Slight
LCA6	**Lo Wu Cross-border Infrastructure and Facilities Landscape**	Low	Small	Small	Slight	Slight	CP1 to CP5 and OP1to OP4	Slight	Negligible
LCA7	**Sandy Range Hillside Landscape**	High	Small	Small	Moderate	Moderate	CP1 to CP5 and OP1to OP4	Moderate	Slight
LCA8	**Man Kam To Cross-border Infrastructure and Facilities Landscape**	Low	Small	Small	Slight	Slight	CP1 to CP5 and OP1to OP4	Slight	Negligible
LCA9	**North Ta Kwu Ling Lowland Rural Landscape**	Medium	Small	Small	Slight	Slight	CP1 to CP5 and OP1to OP4	Slight	Negligible

ID. No.	Landscape Character Areas	Sensitivity (Nil / Small / Medium / High)	Magnitude of Change (Large / Intermediate / Small / Negligible)		Significance Threshold (Unmitigated) (Negligible / Slight / Moderate / Significant)		Mitigation Measures (Refer to Tables 7-13 and 7-14)	Significance Threshold (Mitigated) (Negligible / Slight / Moderate / Significant)	
			Construction	Operational	Construction	Operational		Construction	Operational
LCA10	**Lin Ma Hang Hillside Landscape**	Medium	Small	Small	Slight	Slight	CP1 to CP5 and OP1to OP4	Slight	Negligible
LCA11	**Shenzhen Liantang High-rise Residential Landscape**	Low	Small	Small	Negligible	Negligible	OP1 and OP2	Negligible	Negligible
LCA12	**Shenzhen Wenjandu Port Infrastructure and Facilities Landscape**	Low	Small	Small	Negligible	Negligible	OP1 and OP2	Negligible	Negligible
LCA13	**Shenzhen Lo Wu Cross-border Infrastructure and Facilities Landscape**	Low	Negligible	Negligible	Negligible	Negligible	OP1 and OP2	Negligible	Negligible
LCA14	**Shenzhen Huanggang Cross-border Infrastructure and Facilities Landscape**	Low	Negligible	Negligible	Negligible	Negligible	OP1 and OP2	Negligible	Negligible
LCA15	**Shenzhen Futian Industrial Landscape**	Low	Negligible	Negligible	Negligible	Negligible	OP1 and OP2	Negligible	Negligible
LCA16	**Sha Tau Kok Rural Landscape**	Medium	Small	Small	Slight	Slight	CP1 to CP5 and OP1to OP4	Slight	Negligible

7.9 Visual Impact Assessment

Source of Visual Impact

Construction Phase

7.9.1 Despite the relatively open nature of the landscape views towards the proposals are in many cases partially screened by the existing topography, vegetation and existing development, the presence of the existing fence and access road structures. More open views are available from elevated locations and from areas to the north and west of the Shenzhen River although due to the viewing distances involved the proposed works will form a relatively minor component within the visual context of the identified VSRs. The potential impacts will be mitigated to an extent with the immediate reinstatement of works area and the new tree and shrub planting which will be located along the proposed alignment. Generally it is predicted that there will not be a significant adverse impact on the visual quality or amenity available to the identified VSRs.

7.9.2 There will be some low level views towards the works from the adjacent village settlements and residential developments although due to the flat nature of the landscape and the relative density of the development views will largely be limited to the properties on the edge of each settlement. The views from properties within each development will be limited to an extent by the form of the neighbouring houses on the periphery.

7.9.3 During the construction phase, works will be limited to a works boundary adjacent to the proposed alignment of the boundary fence. The proposed scheme will involve the erection of a new fence and construction of new boundary patrol road with the associated structures largely in the immediate vicinity of the existing fence alignment. The VSRs impacted by the proposals will include:

Section 1 – Mai Po to Lok Ma Chau Control Point

7.9.4 The main impacts will arise from the construction activity associated with the erection of the SBF along the existing BPR (approximately 4.1km). The replacement of the existing checkpoint at Pak Hok Chau will involve the replacement with a similarly sized structure. The main impacts will be apparent for residents of Tam Kon Chau (VSR 1), Residents of Sam Po Shue and the planned development on the adjacent area zoned OU (VSR 2), and residents of Ha Wan Tsuen (VSR 4) who will be subject to moderate adverse visual impacts during the construction phase due to the proximity of the works including the domilition of a section of the fence and its relocation to the north. Vehicle travellers and staff at the Lok Ma Chau border crossing (VSR 3) will be subject to slight adverse visual impacts due to the more restricted nature of the available views and the level of visual disturbance caused by the existing boundary and security facilities.

Section 2 – Lok Ma Chau Control Point to Ng Tung River

7.9.5 The main impacts will arise from the construction activity associated with the conversion of the existing Drainage Services Department maintenance services road along the Shenzhen River bank to the north of the Lok Ma Chau Loop and Hoo Hok Wai into a new section of the BPR (approximately 5.6km), and the erection of the new PBF and SBF respectively

along the northern and southern side of the converted road. During the construction phase the residents of Lok Ma Chau (VSR 5), Shun Yee San Tsuen (VSR 6) and Tak Yuet Lau Tsuen (VSR 7) would be subject to moderate adverse impacts due to the relative proximity of the proposed construction works involved in the removal of the existing fence alignment. Vehicle travellers and staff at the Lo Wo border crossing (VSR 8) will be subject to slight adverse visual impacts due to the more restricted nature of the available views and the level of visual disturbance caused by the existing boundary and security facilities. Staff of the Shenzhen Futian Industrial Area (OVSR19) would experience a moderate adverse impact due to the construction of the proposed new closer fence alignment along the bank of the Shenzhen River which would disturb what is essentially a rural view. It is assumed that the development of the Lok Ma Chau Loop (PVSR 20) will take place following the construction of the works and so there will not be any construction phase impacts for this VSR.

Section 3 – Ng Tung River to Lin Ma Hang Village

7.9.6 The main impacts will arise from the construction activity associated with the erection of an SBF along the existing BPR except the sections to the north of Pak Fu Shan and northwest of Lin Ma Hang Village (approximately 7.5km) and the construction of new sections of the BPR along the Shenzhen River side to the north of Pak Fu Shan and northwest of Lin Ma Hang Village without necessitating river training (approximately 4.0km). Other lesser impacts will arise from the removal of the original PBF along the existing BPR near Pak Fu Shan and Lin Ma Hang Village and the removal of the existing checkpoints at Sha Ling and Ping Che. Due to the proximity of the proposed works to the existing village settlements on the valley floor the residents of Lo Wo Village (VSR9), Ta Kwu Ling Village (VSR11), Kaw Lui Village (VSR12), the settlement along Lin Ma Hang Road (VSR 13), the residents of Lin Ma Hang Village (VSR14), Chuk Yuen (VSR21) and Tsung Yuen Ha (VSR22) would be subject to a moderate adverse visual impact. The residents of the high-rise development in Shenzhen Liantang (OVSR18) would also be subject to a moderate adverse due in part to the proximity of the proposed works and the elevated nature of the viewing position. Vehicle travellers and staff at the Man Kam To border crossing (VSR 10) will be subject to slight adverse visual impacts due to the more restricted nature of the available views and the level of visual disturbance caused by the existing boundary and security facilities.

Section 4 – Lin Ma Hang Village to Sha Tau Kok

7.9.7 The main impacts will arise from the construction activity associated with the erection of an SBF from the entrance of the Sha Tau Kok town (i.e. the location of "Gate One") to the Sha Tau Kok Control Point (approximately 0.5km), the provision of a new checkpoint at "Gate One" and to a lesser extent the removal of the existing checkpoint at Shek Chung Au. However due to the proximity of the proposed works the construction impacts for the residents of Sha Tau Kok Tsuen (VSR15) and Tam Shui Hang Village Settlement (VSR16) are likely to be moderate adverse. Whereas due to the presence of the existing fence structure and the limited visibility of the proposed works due to the adjacent development and intervening vegetation the predicted impacts for the residents of Shan Tsui Village (VSR17) and Kong Ha (VSR23) will be slight adverse.

7.9.8 Many of the potential impacts will arise from the visual intrusion caused by the actual work activities e.g. change of landscape amenity, exposure of earthworks for the new PBR and PBF, demolition works for some of the existing structures including the proposed checkpoint replacements, erection works for the new lengths of boundary fence superstructure and works traffic; and the construction activity associated with the replacement of existing checkpoints. Limited areas surrounding these proposed works will be also disturbed due to the temporary works areas and contractor's compounds.

7.9.9 The assessment contained in **Table 7.12** concludes that for most VSRs the impacts will be limited to a moderate to slight adverse impact on visual amenity. The most significant impacts will be experienced by VSRs in close proximity to the proposed construction works including residents of the adjacent villages although for vehicle travellers and staff at the border crossings the views are restricted and characterised to an extent by the existing security structures. With the proposed mitigation measures including construction works control and the preservation of existing trees along the roadside it is anticipated that many of these impacts can be successfully mitigated during the construction period.

7.9.10 The recommended landscape mitigation measures and residual impact on these VSRs is further discussed in **Table 7.12** and **7.13**.

Operational Phase

7.9.11 Through a combination of the proposed realignment of sections of the PBR, PBF and SBF, and the planting of new trees and shrubs to break up the horizontal emphasis of the fence line the potential visual impact it is considered that the proposals will not have a significant impact on the existing visual amenity of the Study Area. The main impacts on the identified VSRs during the operational stage of the project are described below.

Section 1 – Mai Po to Lok Ma Chau Control Point

7.9.12 The main impacts will arise from the construction the presence of the SBF along the existing BPR (approximately 4.1km). The replacement of the existing checkpoint at Pak Hok Chau will involve the replacement with a similarly sized structure. The main impacts will be apparent for residents of Tam Kon Chau (VSR1) where the moderate adverse visual impact will persist into the operational phase of the project due to proximity of the proposals to the settlement and the lack of opportunities for mitigation measures. For residents of Sam Po Shue and the planned development on the adjacent area zoned OU (VSR2) the operational impacts will be slight adverse due to the effect of the proposed planting of trees and shrubs along the fence alignment. With the relocation of the fence alignment to the north the residents of Ha Wan Tsuen (VSR4) will be subject to more open views of the landscape to the north east and will therefore experience a moderate beneficial impact. Vehicle travellers and staff at the Lok Ma Chau border crossing (VSR3) will be subject to negligible level of impact due to the restricted nature of the existing views and the fact that the proposed scheme will be seen against backdrop of the existing fence alignment and security structures.

Section 2 – Lok Ma Chau Control Point to Ng Tung River

7.9.13 The main impacts will arise from the relocation of the fence line to the river bank to the north of the Lok Ma Chau Loop and Hoo Hok Wai and the presence of the new PBF and SBF respectively along the northern and southern side of the converted road. The proposed realignment of the PBF and SBF would allow more open views of the surrounding landscape for the residents of Lok Ma Chau (VSR 5) and Shun Yee San Tsuen (VSR 6) who would be subject to a moderate beneficial impact during the operational stage of the project. These villages were located immediately adjacent to the existing alignment and so the proposals would realise a significant enhancement of existing views. The moderate adverse impact predicted during the construction phase for the staff of the Shenzhen Futian Industrial Area (OVSR19) would persist into the operational phase due to the visual intrusion caused by the new structure. The residents of Tak Yuet Lau Tsuen (VSR 7) would be subject to a slight adverse impact due to the proximity of the proposed fence alignment mitigated to ane extent by the proposed tree and shrub planting propodrf for the area to the south of the fence alignment. The potential impacts experienced by VSR 7 should be balanced to an extent by the enhancements realised through removal of the existing fence alignment in views to the south. Vehicle travellers and staff at the Lo Wo border crossing (VSR 8) will be subject to negligible residual impacts due to the more restricted nature of the available views and the level of visual disturbance caused by the existing boundary and security facilities. For the future workers and staff within the development of the Lok Ma Chau Loop (PVSR 21) the potential impacts arising from the proposed PBF and SBF alignment could be mitigated to an extent through the use of tree and shrub planting along the northern periphery of the development zone resulting in a light adverse level of impact.

Section 3 – Ng Tung River to Lin Ma Hang Village

7.9.14 The main impacts will arise from the presence of the SBF along the existing BPR except the sections to the north of Pak Fu Shan and northwest of Lin Ma Hang Village (approximately 7.5km) and the new sections of the BPR along the Shenzhen River side to the north of Pak Fu Shan and northwest of Lin Ma Hang Village (approximately 4.0km). Other lesser impacts will arise from the removal of the original PBF along the existing BPR near Pak Fu Shan and Lin Ma Hang Village and the removal of the existing checkpoints at Sha Ling and Ping Che. Due to the proximity of the proposed works to the existing village settlements on the valley floor the residents of Lo Wo Village (VSR9), Ta Kwu Ling Village (VSR11), Kaw Lui Village (VSR12), Lin Ma Hang Village (VSR14), Chuk Yuen (VSR21) and Tsung Yuen Ha (VSR22) would be subject to a slight adverse residual impact mitigated to an extent through the planting of trees and shrubs along the proposed alignment. Vehicle travellers and staff at the Man Kam To border crossing (VSR 10) will be subject to a negligible impact due to the more restricted nature of the available views and the level of visual disturbance caused by the existing boundary and security facilities. The moderate adverse impact predicted for the residents of the high-rise development in Shenzhen Liantang (OVSR18) would persist into the operational phase of the project due in part to the proximity of the proposed works and the elevated nature of the viewing position. With the proposed realignment of the PBF and SBF to the north and west, and the opening up of new views the residents of the settlement along Lin Ma Hang Road (VSR 13) would be subject to a moderate beneficial impact and Tsung Yuen Ha (VSR22) a slight beneficial impact.

Section 4 – Lin Ma Hang Village to Sha Tau Kok

7.9.15 The main impacts will arise from the presence of the SBF from the entrance of the Sha Tau Kok town (i.e. the location of "Gate One") to the Sha Tau Kok Control Point (approximately 0.5km), and the provision of a new checkpoint at "Gate One". With the completion of the construction works and the growth proposed tree and shrub planting the predicted residual impacts for Sha Tau Kok Tsuen (VSR15), Tam Shui Hang Village Settlement (VSR16) and Shan Tsui Village (VSR17) would be slight adverse while for the residents of and Kong Ha (VSR23) the predicted impacts would be negligible.

Table 7-11 Magnitude of Change for Visually Sensitive Receivers

ID. No.	Visually Sensitive Receivers (VSRs) / Viewing Distance	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Blockage of View (Nil / Small, Medium / Large)	Compatibility of the Project with Existing Visual Amenity (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
								Construction	Operational
Section 1 – Mai Po to Lok Ma Chau Control Point									
VSR 1	**Residents of Tam Kon Chau Village Settlement** / 15m	Erection of new check point. Proposed SBF to follow the alignment of existing PBF.	Medium	Small	High	Construction stage- Short Operation stage- Long	Yes	Intermediate	Small
VSR 2	**Residents of Sam Po Shue Village Settlement / Planned Development on OU (Comprehensive Development and Wetland Enhancement Area)** / 50m	Proposed SBF to follow the alignment of existing PBF.	Medium	Small	High	Construction stage- Short Operation stage- Long	Yes	Small	Small
VSR 3	**Travellers and Staff at Lok Ma Chau Cross-border**	Proposed SBF to follow the alignment of existing PBF.	Medium	Small	High	Construction stage- Short Operation stage- Long	Yes	Small	Small

ID. No.	Visually Sensitive Receivers (VSRs) / Viewing Distance	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Blockage of View (Nil / Small, Medium / Large)	Compatibility of the Project with Existing Visual Amenity (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
								Construction	Operational
	Infrastructure Facilities / 20m								
VSR 4	**Residents of Ha Wan Tseun Village Settlement /** 20m	Proposed SBF to follow new alignment on the banks of the Shenzhen River and utilise existing DSD road for the BPR. Proposal balanced against enhancements arising from the removal of the existing fence alignment (Green Route)	Medium	Nil	High	Construction stage- Short Operation stage- Long	Yes	Intermediate	Intermediate
Section 2 – Lok Ma Chau Control Point to Ng Tung River									
VSR 5	**Residents of Lok Ma Chau Village Settlement /** 80m	Proposed SBF to follow new alignment on the banks of the Shenzhen River and utilise existing DSD road for the BPR. Proposal balanced against enhancements arising from the removal of the existing fence alignment (Green Route)	Medium	Nil	Medium	Construction stage- Short Operation stage- Long	Yes	Intermediate	Intermediate

ID. No.	Visually Sensitive Receivers (VSRs) / Viewing Distance	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Blockage of View (Nil / Small, Medium / Large)	Compatibility of the Project with Existing Visual Amenity (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
								Construction	Operational
VSR 6	**Residents of Shun Yee San Tsuen Village Settlement /** 30m	Proposed SBF to follow new alignment on the banks of the Shenzhen River and utilise existing DSD road for the BPR. Proposal balanced against enhancements arising from the removal of the existing fence alignment (Green Route)	Medium	Nil	Medium	Construction stage- Short Operation stage- Long	Yes	Intermediate	Intermediate
VSR 7	**Residents of Tak Yuet Lau Tsuen Village Settlement /** 20m	Proposed SBF to follow new alignment on the banks of the Shenzhen River and utilise existing DSD road for the BPR. Proposal balanced against enhancements arising from the removal of the existing fence alignment (Green Route)	Medium	Medium	Low	Construction stage- Short Operation stage- Long	Yes	Intermediate	Small
VSR 8	**Travellers and Staff at Lo Wo**	Construction of the SBF immediately adjacent to	Medium	Small	High	Construction stage- Short Operation stage-	Yes	Small	Small

ID. No.	Visually Sensitive Receivers (VSRs) / Viewing Distance	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Blockage of View (Nil / Small, Medium / Large)	Compatibility of the Project with Existing Visual Amenity (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
								Construction	Operational
	Cross-border Infrastructure Facilities / 20m	the PBF.				Long			
OVSR 19	**Staff working in Shenzhen Futian Industrial Area /** 200m to new fence	Proposed SBF to follow new alignment on the banks of the Shenzhen River and utilise existing DSD road for the BPR.	Medium	Small	Low	Construction stage- Short Operation stage- Long	Yes	Intermediate	Intermediate
PVSR20	**Staff working in the future Development at the Lok Ma Chau Loop /** 50m to new fence	Proposed SBF to follow new alignment on the banks of the Shenzhen River and utilise existing DSD road for the BPR.	Medium	Medium	High	Construction stage- N/A Operation stage- Long	Yes	N/A Proposals constructed before the Lok Ma Chau Development becomes operational	Intermediate
Section 3 – Ng Tung River to Lin Ma Hang Village									
VSR 9	**Residents of Lo Wo Village Settlement /** 20m	Construction of the SBF immediately adjacent to the PBF.	Medium	Medium	High	Construction stage- Short Operation stage- Long	Yes	Small	Small
VSR 10	**Travellers and Staff at Man**	Construction of the SBF immediately adjacent to	Medium	Small	High	Construction stage- Short Operation stage-	Yes	Small	Small

ID. No.	Visually Sensitive Receivers (VSRs) / Viewing Distance	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Blockage of View (Nil / Small, Medium / Large)	Compatibility of the Project with Existing Visual Amenity (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
								Construction	Operational
	Kam To Cross-border Infrastructure Facilities / 130m	the PBF.				Long			
VSR 11	**Residents of Ta Kwu Ling Village Settlement** / 20m	Construction of the SBF immediately adjacent to the PBF.	Medium	Small	High	Construction stage- Short Operation stage- Long	Yes	Small	Small
VSR 12	**Residents of Kaw Liu Village Settlement** / 20m	Construction of the SBF immediately adjacent to the PBF.	Medium	Small	High	Construction stage- Short Operation stage- Long	Yes	Small	Small
VSR 13	**Residents of Village Settlement along Lin Ma Hang Road** / 250m	Proposed SBF to follow new alignment on the banks of the Shenzhen River and utilise existing DSD road for the BPR. Proposal balanced against enhancements arising from the removal of the existing fence alignment (Green Route)	Medium	Nil	High	Construction stage- Short Operation stage- Long	Yes	Intermediate	Intermediate
VSR 14	**Residents of Lin Ma Hang Village**	Construction of the SBF immediately adjacent to the PBF.	Medium	Small	High	Construction stage- Short Operation stage- Long	Yes	Small	Small

ID. No.	Visually Sensitive Receivers (VSRs) / Viewing Distance	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Blockage of View (Nil / Small, Medium / Large)	Compatibility of the Project with Existing Visual Amenity (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
								Construction	Operational
	Settlement / 20m to removal of existing fence **/** 150m to new fence								
OVSR 18	**Residents of Shenzhen Liantang High-rise Development /** 100m to new fence	Construction of the SBF immediately adjacent to the PBF.	Medium	Small	High	Construction stage- Short Operation stage- Short	Yes	Small	Small
VSR 21	**Residents of Chuk Yuen /** 150m to new fence	Proposed SBF to follow new alignment on the banks of the Shenzhen River and utilise existing DSD road for the BPR.	Medium	Nil	High	Construction stage- Short Operation stage- Long	Yes	Small	Small
VSR 22	**Residents of Tsung Yuen Ha /** 200m to new fence	Proposed SBF to follow new alignment on the banks of the Shenzhen River and utilise existing DSD road for the BPR. Proposal balanced	Medium	Small	High	Construction stage- Short Operation stage- Long	Yes	Small	Small

ID. No.	Visually Sensitive Receivers (VSRs) / Viewing Distance	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Blockage of View (Nil / Small, Medium / Large)	Compatibility of the Project with Existing Visual Amenity (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
								Construction	Operational
		against enhancements arising from the removal of the existing fence alignment (Green Route)							
Section 4 – Lin Ma Hang Village to Sha Tau Kok									
VSR 15	**Residents of Sha Tau Kok Tsuen Village Settlement /** 90m to new fence	Construction of the SBF immediately adjacent to the PBF.	Medium	Medium	Medium	Construction stage- Short Operation stage- Long	Yes	Intermediate	Intermediate
VSR 16	**Residents of Tam Shui Hang Village Settlement /** 50m to new fence	Construction of the SBF immediately adjacent to the PBF.	Medium	Medium	Medium	Construction stage- Short Operation stage- Long	Yes	Intermediate	Intermediate
VSR 17	**Residents of Shan Tsui Village Settlement /** 130m to new fence	Construction of the SBF immediately adjacent to the PBF.	Medium	Small	Medium	Construction stage- Short Operation stage- Long	Yes	Small	Small
VSR 23	**Residents of**	Construction of the SBF	Small	Small	Medium	Construction stage- Short	Yes	Small	Small

ID. No.	Visually Sensitive Receivers (VSRs) / Viewing Distance	Description of Impacts	Scale of the Development relative to Baseline Conditions (Nil / Small / Medium / Large)	Blockage of View (Nil / Small, Medium / Large)	Compatibility of the Project with Existing Visual Amenity (Nil / Low / Medium / High)	Duration of Impacts (Nil / Short / Medium / Long)	Reversibility of Change (Yes / No / Not Applicable)	Magnitude of Change (Large / Intermediate / Small / Negligible)	
								Construction	Operational
	Kong Ha / 100m to new fence	immediately adjacent to the PBF.				Operation stage- Long			

Table 7-12 Significance of Impacts on Visually Sensitive Receivers in the Construction and Operational Phases

ID. No.	Visually Sensitive Receivers	Sensitivity (Nil / Small / Medium / Large)	Magnitude of Change (Large / Intermediate / Small / Negligible)		Significance Threshold (Unmitigated) (Negligible / Slight / Moderate / Significant)		Mitigation Measures (Refer to Tables 7-13 and 7-14)	Significance Threshold (Mitigated) (Negligible / Slight / Moderate / Significant)	
			Construction	Operational	Construction	Operational		Construction	Operational
Section 1 – Mai Po to Lok Ma Chau Control Point									
VSR 1	**Residents of Tam Kon Chau Village Settlement**	High	Intermediate	Small	Moderate adverse	Moderate adverse	CP1 to CP5 and OP1to OP4	Moderate adverse	Moderate adverse
VSR 2	**Residents of Sam Po Shue Village Settlement / Planned Development on OU (Comprehensive Development and Wetland Enhancement Area)**	High	Small	Small	Moderate adverse	Moderate adverse	CP1 to CP5 and OP1to OP4	Moderate adverse	Slight adverse
VSR 3	**Travellers and Staff at Lok Ma Chau Cross-border Infrastructure Facilities**	Low	Small	Small	Slight adverse	Slight adverse	CP1 to CP5 and OP1to OP4	Slight adverse	Negligible
VSR 4	**Residents of Ha Wan Tseun Village Settlement**	High	Intermediate	Intermediate	Moderate adverse	Moderate beneficial	CP1 to CP5 and OP1to OP4	Moderate adverse	Moderate beneficial
Section 2 – Lok Ma Chau Control Point to Ng Tung River									
VSR 5	**Residents of Lok Ma Chau Village Settlement**	High	Intermediate	Intermediate	Moderate adverse	Moderate beneficial	CP1 to CP5 and OP1to OP4	Moderate adverse	Moderate beneficial
VSR 6	**Residents of Shun Yee San Tsuen Village Settlement**	High	Intermediate	Intermediate	Moderate adverse	Moderate beneficial	CP1 to CP5 and OP1to OP4	Moderate adverse	Moderate beneficial
VSR 7	**Residents of Tak Yuet Lau Tsuen Village Settlement**	High	Intermediate	Small	Moderate adverse	Moderate adverse	CP1 to CP5 and OP1to OP4	Moderate adverse	Slight adverse

ID. No.	Visually Sensitive Receivers	Sensitivity (Nil / Small / Medium / Large)	Magnitude of Change (Large / Intermediate / Small / Negligible)		Significance Threshold (Unmitigated) (Negligible / Slight / Moderate / Significant)		Mitigation Measures (Refer to Tables 7-13 and 7-14)	Significance Threshold (Mitigated) (Negligible / Slight / Moderate / Significant)	
			Construction	**Operational**	**Construction**	**Operational**		**Construction**	**Operational**
VSR 8	**Travellers and Staff at Lo Wo Cross-border Infrastructure Facilities**	Low	Small	Small	Slight adverse	Negligible	CP1 to CP5 and OP1to OP4	Slight adverse	Negligible
OVSR 19	**Staff working in Shenzhen Futian Industrial Area**	Medium	Intermediate	Intermediate	Moderate adverse	Moderate adverse	CP1 to CP5 and OP1to OP4	Moderate adverse	Moderate adverse
PVSR20	**Staff working in the future Development at the Lok Ma Chau Loop**	Medium	N/A	Intermediate	N/A	Moderate adverse	CP1 to CP5 and OP1to OP4	N/A	Slight adverse
Section 3 – Ng Tung River to Lin Ma Hang Village									
VSR 9	**Residents of Lo Wo Village Settlement**	High	Small	Small	Moderate adverse	Moderate adverse	CP1 to CP5 and OP1to OP4	Moderate adverse	Slight adverse
VSR 10	**Travellers and Staff at Man Kam To Cross-border Infrastructure Facilities.**	Low	Small	Small	Slight adverse	Slight adverse	CP1 to CP5 and OP1to OP4	Slight adverse	Negligible
VSR 11	**Residents of Ta Kwu Ling Village Settlement**	High	Small	Small	Moderate adverse	Moderate adverse	CP1 to CP5 and OP1to OP4	Moderate adverse	Slight adverse
VSR 12	**Residents of Kaw Liu Village Settlement**	High	Small	Small	Moderate adverse	Moderate adverse	CP1 to CP5 and OP1to OP4	Moderate adverse	Slight adverse
VSR 13	**Residents of Village Settlement along Lin Ma Hang Road**	High	Intermediate	Intermediate	Moderate adverse	Moderate beneficial	CP1 to CP5 and OP1to OP4	Moderate adverse	Moderate beneficial
VSR 14	**Residents of Lin Ma Hang Village Settlement**	High	Small	Small	Moderate adverse	Moderate adverse	CP1 to CP5 and OP1to OP4	Moderate adverse	Slight adverse
OVSR 18	**Residents of Shenzhen Liantang High-rise Development**	High	Small	Small	Moderate adverse	Moderate adverse	CP1 to CP5 and OP1to OP4	Moderate adverse	Moderate adverse

ID. No.	Visually Sensitive Receivers	Sensitivity (Nil / Small / Medium / Large)	Magnitude of Change (Large / Intermediate / Small / Negligible)		Significance Threshold (Unmitigated) (Negligible / Slight / Moderate / Significant)		Mitigation Measures (Refer to Tables 7-13 and 7-14)	Significance Threshold (Mitigated) (Negligible / Slight / Moderate / Significant)	
			Construction	**Operational**	**Construction**	**Operational**		**Construction**	**Operational**
VSR 21	**Residents of Chuk Yuen**	High	Small	Small	Moderate adverse	Moderate adverse	CP1 to CP5 and OP1to OP4	Moderate adverse	Slight adverse
VSR 22	**Residents of Tsung Yuen Ha**	High	Small	Small	Moderate adverse	Slight beneficial	CP1 to CP5 and OP1to OP4	Moderate adverse	Slight beneficial
Section 4 – Lin Ma Hang Village to Sha Tau Kok									
VSR 15	**Residents of Sha Tau Kok Tsuen Village Settlement**	High	Intermediate	Intermediate	Moderate adverse	Moderate adverse	CP1 to CP5 and OP1to OP4	Moderate adverse	Slight adverse
VSR 16	**Residents of Tam Shui Hang Village Settlement**	High	Intermediate	Intermediate	Moderate adverse	Moderate adverse	CP1 to CP5 and OP1to OP4	Moderate adverse	Slight adverse
VSR 17	**Residents of Shan Tsui Village Settlement**	High	Small	Small	Slight adverse	Slight adverse	CP1 to CP5 and OP1to OP4	Slight adverse	Slight adverse
VSR 23	**Residents of Kong Ha**	High	Small	Small	Slight adverse	Negligible	CP1 to CP5 and OP1to OP4	Slight adverse	Negligible

7.10 Cumulative Impacts

7.10.1 A number of projects are currently in progress or planned within the Study Area, which will result in landscape and visual impact during the degradation of landscape character and visual amenity, and loss of landscape resources. These planned projects include:

- **Proposed New Wave Wall / Modification to Existing Wave Wall in Section 2** - The works in Section 2 will have interface with DSD's proposed modification of the existing wave and construction of a new wave wall alongside the Shenzhen River. Liaison with DSD is on-going to resolve the interface problem and entrustment approach may be adopted. Current construction programme for the construction of boundary fences in Section 2 has already taken the potentially entrustment works from DSD into account. With good coordination between the two projects potential cumulative landscape and visual impacts can be minimised.

- **Liantang / Heung Yuen Wai Boundary Control Point in Section 3** - A new Boundary Control Point (BCP) is proposed at Heung Yuen Wai. Civil Engineering and Development Department confirmed Section 3 will be completed at end 2012 before the commencement of the proposed BCP. Therefore it is not anticipated that there will be any significant cumulative landscape and visual impacts.

- **Advanced Works for River Training in Section 3** - In association with the proposed BCP at Heung Yuen Wai, Drainage Service Department (DSD) will carry out advanced works for the river training works from Ping Yuen River to Pak Fu Shan. DSD have confirmed that these works would commence in mid 2012 and the actual extent of the works confirmed after a study at the end 2009. Since the advanced works would involve realignment of the existing boundary patrol road there may be some conflict with the Secondary Boundary Fence (SBF) alignment. It is proposed to provide the SBF under DSD's advance works. In turn, the proposed works from Ping Yuen River to Pak Fu Shan Project would be excised from this Project. The coordination of the two projects would minimise the potential landscape and visual impacts.

7.10.2 Mitigation measures to address landscape and visual impact have been incorporated into the design of each of the approved projects. It is envisaged that that although some aspects of the works will be concurrent with careful coordination any potential cumulative landscape and visual impacts can be minimised.

7.10.3 There are no other planned projects within the Study Area and so there will be no cumulative impact to the Landscape Resources and Landscape Character, and the visual amenity enjoyed by adjacent VSRs.

7.11 Recommended Mitigation Measures

7.11.1 The landscape mitigation measures described in this report are at a level which both demonstrates their ability to alleviate the potential landscape and visual impacts identified in the assessment and also to allow the proposals to be carried forward during the detailed design stage. The measures are designed to address both the construction and operational phases of the project. A more detailed landscape and compensatory planting proposals will be developed at a later stage during detailed design and construction phase of this project following the completion of the detailed Tree Survey Report. The tree survey report and the

proposed strategy for the treatment of the existing trees will be submitted to the relevant departments for approval at that stage.

7.11.2 The landscape and visual mitigation measures are described both in a generic sense for measures, which apply to all of works area and in terms of the proposed landscape strategy for the roadside planting and amenity areas alongside of the boundary fence. The aim of the mitigation measures is to:

- Alleviate where possible those landscape and visual impacts which are unavoidable through the review of fence and patrol road alignment.
- Establish a coherent and integrated landscape framework for the proposed works drawing together the visually disparate components if any of the proposed works. However given the limited land acquisition designed to minimise the impact on the existing fishponds and wetlands which have a high ecological value and requirements for clearance requirement alongside of boundary fence for security reasons there will be limited opportunities for new tree and shrub planting. Although there may be opportunities for off-site planting of woodland clumps and small tree groups to break up the horizontality of the fence alignment.
- Enhance the existing landscape and visual context of the surrounding areas providing integration between the proposed works and its context.
- Provide a co-ordinated approach between the ecological and landscape mitigation proposals where there is an interface.

7.11.3 **Figures 7-8A** to **7-8D** have mapped the main landscape and visual mitigation strategies and the application of design mitigation measures including integrated design approach, compensatory and new planting proposals. Application of the recommended mitigation measures including treatment of boundary fence are presented in **Figures 7-9A** to **7-9M** Photomontages.

7.11.4 It is recommended that the Environmental, Monitoring and Audit Requirements (EM&A) for landscape and visual resources described in Section 10 of this report is undertaken during both the construction and operational phases of the Project.

General Mitigation Measures

7.11.5 In accordance with the EIAO-TM, the hierarchy for landscape and visual impact mitigation is first avoidance of impact, then minimisation of impact and finally compensation of impact. As has been described in the Project description in this report, the current proposals have been undertaken to fulfil the following objectives:

- Minimisation of potential impacts on landscape resources such as watercourses and existing trees by review the alignment and location of check point facilities through preserving wooded knolls including those adjacent at Ma Tso Lung, Sandy Ridge and Lin Ma Hang, avoid impact to the Mai Po SSSI and the fishponds with high ecological value at Sham Po Shue.
- Restoration and enhancement of existing rural landscapes through the planting of trees, where the space and security concerns allow, following the completion of the construction phase of the project. This will help to reduce the horizontal emphasis of the fence alignment and integrate it within its landscape context.

- Review the site area for the proposed fence and patrol road to ensure that sufficient space is reserved for compensatory planting and other landscape works.
- Carefully locate the proposed check point and associated structures to minimise the potential ecological, visual and landscape impacts.

7.11.6 In accordance with the EIAO-TM, mitigation measures for the construction and operational phases of the project have been designed to minimise predicted landscape and visual impacts, and to compensate for lost landscape resources as far as is possible given the Project constraints.

Specific Mitigation Measures

7.11.7 A series of mitigation measures have been designed to alleviate the potential landscape and visual impacts and where possible compensate for the loss of landscape resources, change of landscape character and visual amenity for VSRs resulting from the construction and operational phases of the project. The implementation, funding, and management and maintenance for the amenity landscape areas associated with the proposed works will be undertaken by relevant departments.

7.11.8 The mitigation measures are summarised in **Table 7-13** and **Table 7-14**.

Table 7-13 Proposed Construction Phase Mitigation Measures

Mitigation Code	Mitigation Measure	Funding Agency	Implementation Agency
CP1	Preservation of Existing Vegetation - The proposed works should avoid disturbance to the existing trees as far as practicable within the works areas. It is recommended that a full tree survey and felling application will be undertaken and submitted for approval by the relevant government departments in accordance with ETWB TCW No. 3/2006, 'Tree Preservation' during the detailed design phase of the project. Where possible all trees which are not in conflict with the proposals would be retained and shall be protected by means of fencing where appropriate to prevent potential damage to tree canopies and root zones from vehicles and storage of materials. Specifications for the protection of existing trees will be circulated for approval by the relevant government authorities during the preparation of the detailed tree survey at detailed design and construction stage.	SB	ArchSD
CP2	Preservation of Existing Topsoil -	SB	ArchSD

Mitigation Code	Mitigation Measure	Funding Agency	Implementation Agency
	Topsoil disturbed during the construction phase will be tested using a standard soil testing methodology and where it is found to be worthy of retention stored for re-use. The soil will be stockpiled to a maximum height of 2 m and will be either temporarily vegetated with hydroseeded grass during construction or covered with a waterproof covering to prevent erosion. The stockpile should be turned over on a regular basis to avoid acidification and the degradation of the organic material, and reused after completion. Alternatively, if this is not practicable, it should be considered for use elsewhere, including other projects.		
CP3	Works Area and Temporary Works Areas - The landscape of the works areas shall be restored to their original state (or where appropriate adopt a new enhanced amenity) following the completion of the construction phase. Construction site controls shall be enforced, where possible, to ensure that the landscape and visual impacts arising from the construction phase activities are minimised including the storage of materials, the location and appearance of site accommodation and the careful design of site lighting to prevent light spillage. Screen hoarding may not be practicable for this project due to the viewing distances involved and the spatial constraints of the works area	SB	ArchSD
CP4	Mitigation Planting - Replanting of disturbed vegetation should be undertaken at the earliest possible stage of the construction phase of the project and this should use predominantly native and/or ornamental plant species. Replanting of disturbed vegetation should be undertaken at the earliest possible stage during the construction	SB	ArchSD

Mitigation Code	Mitigation Measure	Funding Agency	Implementation Agency
	phase of the project to maximise its effect during the operational phase		
CP5	Transplantation of Existing Trees - Existing trees which are recommended to be transplanted due to a conflict with the works will as far as possible be relocated to final recipient sites adjacent to their current locations. This will maintain their contribution to the local landscape context. The potential recipient sites will be determined during the detailed design stage of the project. The implementation programme of the proposed works should reserve enough time for advance tree transplanting preparation works to enhance the survival of these transplant trees. The transplanting proposals will subject to the findings of the detailed tree survey and felling application which will b prepared during the detailed design stage of the project and submitted for approval by the relevant departments.	SB	ArchSD

Note: The responsibilities for the funding, implementation, management and maintenance of the mitigation proposals will be resolved according to the principles contained in ETWB TCW No. No. 2/2004 on Maintenance of Vegetation and Hard Landscape Features.

Table 7-14 Proposed Operational Phase Mitigation Measures

Mit. Code	Mitigation Measure	Funding Agency	Implementation Agency	Maintenance/ Management Agency
OP1	Design of Boundary Fence, Boundary Patrol Road and Police Check Point – These structural elements will be designed in accordance with security requirement from Police Force and incorporate design features as part of design mitigation measures including: Integrated design approach – the boundary fence should integrated, as far as technically feasible, with existing built structures such as existing road, footpath and track and embankment of fishponds, river and drainage channel as part of design	SB	ArchSD	LCSD / ArchSD

Mit. Code	Mitigation Measure	Funding Agency	Implementation Agency	Maintenance/ Management Agency
	mitigation measures to reduce the potential cumulative impact of the proposed works. The location and orientation of the police check points should be away from landscape and visually sensitive areas such wetland, fishpond and agricultural field. Building massing - the proposed use of simple responsive design for the built structures with a low building height profile to reduce the potential visual mass of the structure within a rural context. Treatment of built structures - the architectural design should seek to reduce the apparent visual mass of the facilities further through the use of natural materials such as wooden frame, vertical greening or other sustainable materials such as recycled plastic. Responsive building and fence finishes - In terms of the proposed finishes natural tones should be considered for the colour palette with non-reflective finishes are recommended to reduce glare effect. The use of colour blocking on the proposed fence could be used to break up the visual mass of the structure. Responsive lighting design – Aesthetic design of architectural and track lighting with following glare design measures: Directional and full cut off lighting is recommended particularly for areas adjacent to existing village to minimise light spillage. Minimise geographical spread of lighting, only applied for safety and security reasons; Limited lighting intensity to meet the minimum safety and operation requirement; and High-pressure sodium road lighting is recommended for more stringent light control reducing spillage and thus visual impacts.			

Mit. Code	Mitigation Measure	Funding Agency	Implementation Agency	Maintenance/ Management Agency
OP2	Tree and Shrub Planting – Given the rural nature of the proposed alignment it is recommended that the where possible tree and shrub species which are native to Hong Kong be used. In addition where possible the planting of new trees and shrubs will aim to link together existing woodland areas and small tree groups to improve the connectivity between habitats and create more coherent landscape framework. The planting of small groups of trees along the alignment of the proposed fence will serve to de-emphasise the horizontality of the fence structure and provide for better sense of visual integration with the landscape context. Where practicable vertical greening measures should also be considered on engineering structures.	SB	ArchSD	LCSD
OP3	Compensatory Planting Proposals – Given the works extent is largely limited along existing roadside embankment to minimise impact to existing village settlements and valuable landscape resources such as wetland, fishpond, stream course and existing trees, and considered the importance of tree retention within the works area, new tree planting will concentrate in selected new amenity areas along the alignment, infilling between retained and transplanted trees. The preliminary planting proposals for the proposed works include the planting of some 357 new trees utilising a combination of mature to light standard sized stock (i.e. approximately 15% of mature trees, 75% of standard trees, and 10% light standard trees). These trees will be planted in woodland clumps and small tree groups at strategic locations to de-emphasise	SB	ArchSD	LCSD

Mit. Code	Mitigation Measure	Funding Agency	Implementation Agency	Maintenance/ Management Agency
	the horizontality of the fence alignment. Based on preliminary findings the proposed planting will result in a compensatory planting ratio of 1:1 (new planting: trees recommended for felling). This compares favourably with the report's assertion that some 357 trees would be felled due to the proposed works. With the proposed preservation of existing trees, transplantation of trees in conflict with the proposals and the planting of new trees the project area will contain approximately 2000 trees. Trees forming part of the new planting will provide screening to neighbourhood villagers and will utilise species native to Hong Kong. These proposals will be subject to review at detailed design stage of the project.			

Note: The responsibilities for the funding, implementation, management and maintenance of the mitigation proposals will be resolved according to the principles contained in ETWB TCW No. No. 2/2004 on Maintenance of Vegetation and Hard Landscape Features.

7.12 Programme for Landscape Works

7.12.1 The landscape works will closely follow the completion of the construction of the proposed fence construction works which are to be implemented by contractors to be appointed by ArchSD and the first contract is to be awarded in late 2009. The construction works are expected to commence in late 2009 and be completed in late 2012. The design year is for the purposes of this study taken as approximately 10 – 15 years after the scheme opening when the proposed soft landscape mitigation is mature. The landscape works will be implemented at the earliest possible time in the planting season immediately following the sectional completion of the construction works. The implementation schedule of landscape works is presented in Chapter 11 of this report and in the EM&A Manual.

Operational (Residual) Landscape and Visual Impacts

7.12.2 Overall, in terms of residual landscape and visual impacts the main effects will primarily result from the interruption of the existing landscape and visual amenity where the fence adopts a new alignment. However in general the proposals will be located adjacent to an existing fence alignment and many of the new structures will be direct replacement for

existing structures. Therefore given a combination of the condition of the landscape which is bisected by the existing fence and the utilisation of the existing DSD maintenance access track for the BPR the proposals will not cause a permanent impact to landscape resources and a relatively low level of disturbance to visual context and visual amenity available to VSRs.

7.12.3 A series of computer generated images or photomontages have been prepared for the proposed schemes are presented as **Figures 7-9A** to **M**. The location of the vantage points used for these images has been identified on **Figures 7-7A to B**. The photomontages of the proposed scheme show the existing conditions, after the completion of the construction phase when the primary mitigation measures have not been implemented, and Day 1 with the introduction of mitigation measures and Year 10 of the Operational Phase when the proposed soft landscape mitigation measures (tree and shrub planting) is fully established. The final image Operational Phase is designed to demonstrate the predicted residual impacts, which would exist in the design year during the operational phase usually taken as between 10 and 15 years after the completion of the construction phase.

7.13 Conclusion

7.13.1 This section summarises the landscape and visual impact assessment result for the Project and highlights the potential residual impacts after full establishment of recommended landscape and visual mitigation measures. Given the that the proposed SBF will closely follow the alignment for the existing boundary fence for much of its length the impacts on the landscape resources and character and visual amenity available to VSRs are not likely to be significant.

7.13.2 The landscape mitigation measures recommended and discussed in section 7.11 of this report and are designed to alleviate the potential and visual impacts to ensure the implementation of the fence proposals will fit into the existing landscape and visual context. These measures include the design of the fence proposals, the appearance of the proposed structures and where possible from a land take and security perspective the planting of trees and shrubs. Another important aspect of the landscape mitigation approach is the planting of new trees and shrubs utilizing native species where possible to restore and enhance the landscape setting and visual amenity of the road and its ecological value.

7.13.3 The proposed works will not impact upon the land use zonings discussed in section 7.5. Therefore the Project will fit within the future landscape planning framework as represented by the OZPs and so no amendment to the published land use plans is required.

Landscape Impacts

Preservation of Landscape Resources

7.13.4 Given the proposed works are largely located immediately adjacent to the existing fence alignment and that many of the associated structures are replacements for existing ones the impacts on the landscape resources are not thought to be significant. Therefore the residual impacts on the existing landscape resources are likely to be negligible with the full implementation of the proposed landscape mitigation measures. One exception to this is the predicted impacts on the fishponds within the Study Area which would be slight adverse for

their comparatively higher sensitivity to change. In fact the proposals will utilise the existing DSD access roads and pond bunds and will not lead to the loss of fishponds.

Maintenance of Landscape Character

7.13.5 Generally the impacts on the landscape character of the Study Area will be negligible due to the proposed alignment of the fence adjacent to the existing alignment. However there will be a slight adverse residual impact for lowland rural landscapes of Tam Kon Chau (LCA1), Mai Po (LCA2) and Sam Po Shue (LCA5) as these areas are directly affected or in close proximity to the proposals. There would also be a slight adverse indirect impact on the landscape character of Sandy Ridge Hillside (LCA7) due to the loss of landscape setting arising from the construction and operation of the proposed scheme. The landscape character of part of the central portion of the Study Area would be improved to an extent through the movement of the fence alignment to the banks on the channelised Shenzhen River. This would reduce the fragmentation of the landscape and create more naturalistic transition between the lowland plane and the upland backdrop formed by the hill slopes which line the route alignment.

Visual Impacts

7.13.6 Given the scale and nature of the Project, the nature of the existing landscape and the visual amenity enjoyed by the identified VSRs the impacts for many of the VSRs would be negligible. Even those located in close proximity to the proposed SBF already have the existing fence structures within their views.

7.13.7 Through a combination of the proposed realignment of sections of the PBR, PBF and SBF, and the planting of new trees and shrubs to break up the horizontal emphasis of the fence line the residual visual impacts are not predicted to be significant. The main residual impacts on the identified VSRs during the operational stage of the project are described below.

Section 1 – Mai Po to Lok Ma Chau Control Point

7.13.8 The main impacts will be apparent for residents of Tam Kon Chau (VSR1) where the moderate adverse visual impact will persist into the operational phase of the project due to proximity of the proposals to the settlement. For residents of Sam Po Shue and the planned development on the adjacent area zoned OU (VSR2) the operational impacts will be slight adverse due to the effect of the proposed planting of trees and shrubs along the fence alignment. With the relocation of the fence alignment to the north the residents of Ha Wan Tsuen (VSR4) will be subject to more open views of the open landscape to the north east and will therefore experience a moderate beneficial impact. Vehicle travellers and staff at the Lok Ma Chau border crossing (VSR3) will be subject to negligible level of impact due to the restricted nature of the existing views and the fact that the proposed scheme will be seen against backdrop of the existing fence alignment and security structures.

Section 2 – Lok Ma Chau Control Point to Ng Tung River

7.13.9 The proposed realignment of the PBF and SBF would allow more open views of the surrounding landscape for the residents of Lok Ma Chau (VSR 5) and Shun Yee San Tsuen (VSR 6) who would be subject to a moderate beneficial impact during the operational stage

of the project. These villages were located immediately adjacent to the existing alignment and so the proposals would realise a significant enhancement of existing views. The residents of Tak Yuet Lau Tsuen (VSR 7) would be subject to a slight adverse impact due to the proximity of the proposed fence alignment although the potential impacts would be mitigated to an extent by the tree and shrub panting proposed for the area to the south of the fence. These impacts are balanced to an extent by the enhancements in views to the south realised through the removal of the existing fence alignment. The staff of the Shenzhen Futian Industrial Area (OVSR19) would be subject to moderate adverse impacts due to the visual intrusion caused by the new structure. Vehicle travellers and staff at the Lo Wo border crossing (VSR 8) will be subject to negligible residual impacts due to the more restricted nature of the available views and the level of visual disturbance caused by the existing boundary and security facilities. For the future workers and staff within the development of the Lok Ma Chau Loop (PVSR 21) the potential impacts arising from the proposed PBF and SBF alignment could be mitigated to an extent through the use of tree and shrub planting along the northern periphery of the development zone resulting in a light adverse level of impact. .

Section 3 – Ng Tung River to Lin Ma Hang Village

7.13.10 Due to the proximity of the proposed works to the existing village settlements on the valley floor the residents of Lo Wo Village (VSR9), Ta Kwu Ling Village (VSR11), Kaw Lui Village (VSR12), Lin Ma Hang Village (VSR14), Chuk Yuen (VSR21) and Tsung Yuen Ha (VSR22) would be subject to a slight adverse residual impact mitigated to an extent through the planting of trees and shrubs along the proposed alignment. Vehicle travellers and staff at the Man Kam To border crossing (VSR 10) will be subject to a negligible impact due to the more restricted nature of the available views and the level of visual disturbance caused by the existing boundary and security facilities. The residents of the high-rise development in Shenzhen Liantang (OVSR18) would be subject to moderate adverse level of impact due in part to the proximity of the proposed works and the elevated nature of the viewing position. With the proposed realignment of the PBF and SBF to the north and west, and the opening up of new views the residents of the settlement along Lin Ma Hang Road (VSR 13) would be subject to a moderate beneficial impact and Tsung Yuen Ha (VSR22) a slight beneficial impact.

Section 4 – Lin Ma Hang Village to Sha Tau Kok

7.13.11 With the completion of the construction works and the growth proposed tree and shrub planting the predicted residual impacts for Sha Tau Kok Tsuen (VSR15), Tam Shui Hang Village Settlement (VSR16) and Shan Tsui Village (VSR17) would be slight adverse while for the residents of and Kong Ha (VSR23) the predicted impacts would be negligible.

Conclusion on Significance of Residual Impact

7.13.12 Although the proposed construction of the Second Boundary Fence is a significant project in terms of the length of the alignment the impacts are largely limited due to an alignment which mirrors that of the existing fence. Further in some instances the impacts would be beneficial due to the movement of the fence alignment away from villages or to the periphery of landscape character areas opening up new views in the first instance and minimising the fragmentation of the landscape in the second. Therefore in accordance with

Annex 10, Paragraph 1.1(c) of the EIAO TM, the landscape and visual impacts of the proposed works would be 'acceptable with mitigation' that is to say 'there would be some adverse effects, but these can be eliminated, reduced or offset to a large extent by specific measures'.

8 CULTURAL HERITAGE

8.1 Introduction

8.1.1 This section will present the baseline profile of the archaeological and built heritage resources present in the Study Area and results of the impact assessment

8.2 Environmental Legislation and Standards

8.2.1 Legislation, Standards and Guidelines relevant to the consideration of Cultural Heritage impacts under this study include the following:

- Antiquities and Monuments Ordinance
- Environmental Impact Assessment Ordinance
- Hong Kong Planning Standards and Guidelines
- Technical Memorandum on Environmental Impact Assessment Process
- Guidelines for Cultural Heritage Impact Assessment
- DEVB TC (W) No. 11/2007

Antiquities and Monuments Ordinance

8.2.2 The Antiquities and Monuments Ordinance (the Ordinance) provides the statutory framework to provide for the preservation of objects of historical, archaeological and palaeontological interest. The Ordinance contains the statutory procedures for the Declaration of Monuments. The proposed monument can be any place, building, site or structure, which is considered to be of public interest by reason of its historical, archaeological or palaeontological significance.

8.2.3 Under Section 6 and subject to sub-section (4) of the Ordinance, the following acts are prohibited in relation to certain monuments, except under permit;

- To excavate, carry on building works, plant or fell trees or deposit earth or refuse on or in a proposed monument or monument;
- To demolish, remove, obstruct, deface or interfere with a proposed monument or monument.

8.2.4 The discovery of an Antiquity, as defined in the Ordinance must be reported to the Antiquities Authority (the Authority), or a designated person. The Ordinance also provides that, the ownership of every relic discovered in Hong Kong after the commencement of this Ordinance shall vest in the Government from the moment of discovery. The Authority on behalf of the Government may disclaim ownership of the relic.

8.2.5 No archaeological excavation may be carried out by any person, other than the Authority and the designated person, without a licence issued by the Authority. A licence will only be issued if the Authority is satisfied that the applicant has sufficient scientific training or experience to enable him to carry out the excavation and search satisfactorily, is able to conduct, or arrange for, a proper scientific study of any antiquities discovered as a result of the excavation and search and has sufficient staff and financial support.

8.2.6 It should also be noted that the discovery of an antiquity under any circumstances must be reported to the authority, i.e. the Secretary for Development or designated person. The authority may require that the antiquity or suspected antiquity is identified to the authority and that any person who has discovered an antiquity or suspected antiquity should take all reasonable measures to protect it.

Environmental Impact Assessment Ordinance

8.2.7 The Environmental Impact Assessment Ordinance (EIAO) was implemented on 1 April 1998. Its purpose is to avoid, minimise and control the adverse impact on the environment of designated projects, through the application of the EIA process and the Environmental Permit (EP) system.

Hong Kong Planning Standards and Guidelines

8.2.8 Chapter 10 of the HKPSG details the principles of conservation of natural landscape and habitats, historical buildings and archaeological sites. The document states that the retention of significant heritage features should be adopted through the creation of conservation zones within which uses should be restricted to ensure the sustainability of the heritage features. The guidelines state that the concept of conservation of heritage features, should not be restricted to individual structures, but should endeavour to embrace the setting of the feature or features in both urban and rural settings.

8.2.9 The guidelines also address the issue of the preparation of plans for the conservation of historical buildings, archaeological sites and other antiquities. It is noted that the existing Declared Monuments and proposed Monuments be listed in the explanatory notes of Statutory Town Plans and that it be stated that prior consultation with AMO is necessary for any redevelopment or rezoning proposals affecting the Monuments and their surrounding environments.

8.2.10 It is also noted that planning intention for non-statutory town plans at the sub-regional level should be include the protection of monuments, historical buildings, archaeological sites and other antiquities through the identification of such features on sub-regional layout plans. It also addresses the issue of enforcement. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong, and Government departments involved in conservation.

Technical Memorandum on Environmental Impact Assessment Process

8.2.11 The general criteria and guidelines for evaluating and assessing impacts to Cultural Heritage are listed in Annexes 10 and 19 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). It is stated in Annex 10 that all adverse impacts to Sites of Cultural Heritage should be kept to an absolute minimum and that the general presumption of impact assessment should be in favour of the protection and conservation of all Sites of Cultural Heritage. Annex 19 provides the details of scope and methodology for undertaking Cultural Heritage Impact Assessment, including baseline study, impact assessment and mitigation measures.

Guidelines for Cultural Heritage Impact Assessment

8.2.12 This document, as issued by the Antiquities and Monuments Office, outlines the specific technical requirement for conducting terrestrial archaeological and built heritage impact assessments and is based upon the requirements of the Technical Memorandum for Environmental Impact Assessment. It includes the parameters and scope for the Baseline Study, specifically desk-based research and field evaluation. There are also included guidelines encompassing reporting requirements and archive preparation and submission in the form of *Guidelines for Archaeological Reports* and *Guidelines for the Handling of Archaeological Finds and Archives.*

8.2.13 The prerequisite conditions for conducting impact assessment and mitigation measures are presented in detail, including the prediction and evaluation of impacts based upon five levels of significance (Beneficial, Acceptable, Acceptable with Mitigation Measures, Unacceptable and Undetermined). The guidelines also state that preservation in totality must be taken as the first priority and if this is not feasible due to site constraints or other factors, full justification must be provided.

8.2.14 Mitigation measures will be proposed in cases with identified impacts and shall have the aim of minimising the degree of adverse impact and also where applicable providing enhancement to a heritage site through means such as enhancement of the existing environment or improvement to accessibility of heritage sites. The responsibility for the implementation of any proposed mitigation measures must be clearly stated with details of when and where the measures will be implemented and by whom.

Development Bureau Technical Circular (Works) No. 11/2007: Heritage Impact Assessment Mechanism for Capital Works Projects

8.2.15 The technical circular contains the procedures and requirements for assessing heritage impact arising from the implementation of new capital works projects as defined in section 5 of the TC. It is stated in the document that the works agent will provide a checklist to the AMO of any heritage sites (as defined in the TC) situated within or within the vicinity of the project boundary (usually to be defined as not more than 50 metres measured from the nearest point of the project boundary, including works areas).

8.2.16 The identification of the heritage sites should be undertaken at the earliest possible stage, preferably as part of the Technical Feasibility Statement. If the works boundary cannot be defined at this stage, the checklist should be provided as soon as the project boundary has been defined. Upon receipt of the above information from the works agent, the AMO will determine if the proposed project will affect the heritage value of any heritage site and decide the necessity of conducting an HIA based upon the submitted information.

8.2.17 If an HIA is required, the works agent shall submit a proposal for the scope of the HIA for AMO approval. Once the scope has been approved it will be the responsibility of the works agent to conduct the HIA.

8.3 Methodology

Archaeological Resources

Baseline Study

8.3.1 As stated in the Criteria for Cultural Heritage Impact Assessment, the baseline study is used to compile a comprehensive inventory of all sites of archaeological interest within and in the environs of the project Study Area. The results are then presented in a report that provides both clear evidence that the required processes have been satisfactorily completed as well as a detailed inventory of all identified sites of archaeological interest, which includes a full description of their cultural significance.

8.3.2 The following tasks are undertaken in order to gather the necessary information for the compilation of the baseline study:

Desk-based research

8.3.3 Firstly, desk-based research is carried out in order to identify any known or potential sites of archaeological interest within the project study area and to evaluate the cultural significance of these sites once identified. The following is a non-exhaustive list of resources that are consulted as part of the research programme: the Antiquities and Monuments Office published and unpublished papers and studies; publications on relevant historical, anthropological and other cultural studies; unpublished archival papers and records; collections and libraries of tertiary institutions; historical documents held in the Public Records Office, Lands Registry, District Lands Office, District Office and Museum of History; cartographic and pictorial documentation; and geotechnical information.

Site visit

8.3.4 To supplement the information gathered in the desk-based study, a site visit is undertaken to assess the current status of the Study Area and also to make note of existing impacts.

Archaeological Field Investigation (if required)

8.3.5 If the results of the desk-based study and site visit indicate that there is insufficient data for purposes of identification of sites of archaeological interest, determination of cultural significance and assessment of impacts, an archaeological field investigation programme will be designed and submitted to the AMO for approval. Once approved, a qualified archaeologist must apply for a licence to undertake the archaeological excavation, which must be approved by the Antiquities Authority before issuance. The archaeological field investigation typically consists of some or all of the following steps:

<u>Field Scan</u>

8.3.6 Field walking is conducted to identify archaeological deposits on the surface. The scanning of the surface for archaeological material is conducted, under ideal circumstances, in a systematic manner and covers the entire study area. Particular attention is given to areas of land undisturbed in the recent past and to exposed areas such as riverbed cuts, erosion areas,

terraces, etc. During the filed scanning, concentrations of finds are recorded, bagged and mapped on 1:1000 scale mapping and are retained as part of the archive. Topography, surface conditions and existing impacts are noted during the field walking.

Auger Testing Programme

8.3.7 Auger survey of the identified areas that will be impacted by proposed works will be carried out in order to establish soil sequence, the presence/absence of cultural soils or deposits and their horizontal extent. The auger tool consists of a bucket, pole and handle and is vertically drilled by hand into the surface. When the bucket is filled with soil the auger is extracted and the soil emptied from the bucket. Soils are described and depth changes are measured inside the hole. The depth and type of any finds recovered are also recorded. The auger hole is abandoned when water table, the end of the auger or rock is reached or the auger bucket fails to hold the soil. The location of each auger hole test is marked on a 1:1000 scale map. The results of the auger tests provide one of the criteria used to position the test pit excavations.

Test Pit Excavation

8.3.8 Test pit excavations are carried out to verify the archaeological potential within a study area. The choice of location for test pit excavations will depend on various factors such as desk-based information, landforms, field scan and auger test results as well as issues relating to access.

8.3.9 Hand digging of test pits measuring between 1 by 1 and 2 by 2 metres is carried out in order to determine the presence/absence of archaeological deposits and their stratigraphy. The size may depend on close proximity to large trees, narrow terraces or other external factors. Hand excavation will continue until decomposing rock or sterile soils are reached and no potential for further cultural layers exists. A test pit will also be abandoned when the effects of ground water prevent futher excavation or when the depth poses safety problems. During excavation contexts, finds and features are recorded, soils are described and relevant depths measured. Artefacts are recorded, bagged and labelled by context. Sections are photographed and drawn and, if required, ground plans are also photographed and/or drawn. The position of each test pit, its top and bottom levels and associated TBM are recorded by a qualified land surveyor and plotted on 1:1000 scale mapping. On completion of all recording the test pits are backfilled.

Reporting and Submission of Archive

8.3.10 A report of the findings of the archaeological survey will be compiled following the requirements as outlined in the AMO's *Guidelines for the Preparation of Archaeological Reports* (see Section 14.1). The processing of recovered archaeological material and preparation of the project archive will follow the AMO's *Guidelines for Handling of Archaeological Finds and Archives* (see Section 14.2).

Impact Assessment

8.3.11 The prediction and evaluation of both direct and indirect impacts must be undertaken to identify any potential adverse affects to all identified sites of archaeological interest within a project Study Area. A detailed description of the works and all available plans (with their

relationship to the identified resources clearly shown) should be included, to illustrate the nature and degree of potential impacts. The impact assessment must adhere to the detailed requirements of Annexes 10 and 19 of the Technical Memorandum on Environmental Impact Assessment Process.

Mitigation Measures

8.3.12 As stated in the Guidelines for Cultural Heritage Impact Assessment "Preservation in totality must be taken as the first priority". If such preservation is not feasible, as in the case where the need for a particular development can be shown to have benefits that outweigh the significance of the site of archaeological interest, a programme of mitigation measures must be designed and submitted to the AMO for approval. The mitigation measures must be clearly listed and the party responsible for implementation and timing of the measures must also be included. Examples of mitigation measures include; rescue excavation and archaeological watching brief.

Built Heritage Resources

Baseline Study

8.3.13 A baseline study was undertaken to ensure that all built heritage resources in the project area would be identified in order to identify any indirect or direct impacts to these resources, including direct loss, destruction or disturbance and any deterioration of the existing environmental setting. The baseline study consisted of a desk top research and a built heritage field survey.

Desk-Based Research

8.3.14 The purpose of undertaking the desk top study is to collect and collate all extant information on built heritage resources in the project study area and to determine if the existing information is sufficient for purposes of impact assessment or if field evaluation will also be required. In the case of the current project, it was determined that the existing information was not sufficient and a built heritage field survey was also undertaken.

Built Heritage Field Survey

8.3.15 A proposal for built heritage field survey was prepared and submitted to AMO for review and approval. The built heritage survey was conducted for any areas and resources that have not been covered by previous surveys within the project Study Area. A boundary of 50 metres from all alignments and works areas is proposed for the survey.

Resource Scope

8.3.16 Definition of Features that Fall within the Scope of Built Heritage Survey:

- All pre-1950 buildings and structures;
- Selected post-1950 buildings and structures of high architectural and historical significance or interest;
- Cultural landscape features, such as sites of historical events, or providing a

significant historical record or a setting for buildings or monuments of architectural importance, historical field patterns, tracks and fish pond and cultural elements, such as fung shui woods and historical clan graves.

Recording Requirements

8.3.17 Detailed Recording of all Identified Built Heritage Features divided into the following categories: Buildings and Structures, Graves and Cultural Landscape Features. It should be noted that any sections of identified historical village wall or paving stones will be covered under the built heritage survey. The recording of the structures must adhere to the requirements of conducting built heritage survey as presented in the *Guidelines for Cultural Heritage Impact Assessment.*

8.3.18 Interviews with local informants, including residents and village elders should also be undertaken. The interviews should be used to gather information, such as, cultural and historical background of the structures and the villages, historical events associated with the structures and villages for the compilation of a background description.

Documentation

8.3.19 Systematic documentation of all recorded features within each of the categories listed below must be undertaken. The following must be included:

For Built Structures

8.3.20 A set of photographs of each building or structure including the exterior, the interior (if permission of owner is given to enter the premises) and special architectural details where possible, as well as the surroundings of the feature should be included. The boundary and location of each recorded structure will be provided on a 1:1000 scale map and the relationship to the proposed site boundary, including all works areas will also be provided. Locations of Graded Historical Buildings and Declared Monuments will be provided on separate maps.

8.3.21 Written descriptions of each recorded feature, including; age of structure, details of architectural features, condition of the structure, past and present uses, architectural appraisal, notes on any modifications, direction faced and associations with historical/ cultural events or individuals is required, as is a description of the surrounding environment and orientation of each recorded resource.

8.3.22 A background summary of each village, including a physical description of the environmental setting (surrounding environment) as well as information gathered from oral interviews with local informants, should also be included in the report. For isolated structures descriptions must be done on an individual basis. The description for structures within a village can be covered by a village background summary, this must include physical and cultural attributes, such as orientation of villages to any identified fung shui features, general condition of structures, settlement history, historical economic activities and associated clans.

For Historical Clan Graves

8.3.23 The location of the each recorded grave including its relationship to the proposed site boundary, including all works areas on a 1:1000 scale map, as well as a written description of each recorded grave (including; the construction year of the grave if available, the associated clan, a copy of the inscription, the dimensions, the orientation, any renovation dates, a physical description of the architectural elements of the grave, including whether the grave consists of modern or historical building materials. The renovation dates must also be listed and the incorporation of any historical elements (such as an inscription plaque) have been incorporated into a modern renovated grave. Finally, a set of photographs of each grave must also be provided.

For Cultural Landscape Features

8.3.24 The location of each recorded feature including its relationship to the proposed site boundary, including all works areas must be provided on a 1:1000 scale map. A written description of each recorded feature, including information gathered from interviews with local informants and a set of photographs of each recorded feature must also be provided.

Reporting

8.3.25 The report will include a detailed inventory of all identified built heritage resources. The heritage significance of the resources will be included in the report under the following categories:

- HIGH: Declared or Proposed Monuments
- MEDIUM: Graded Historic Buildings and Government Historic Sites
- LOW: Buildings, structures, sites and landscape features that are included in the definition of heritage sites as stated in the *Guidelines for Cultural Heritage Impact Assessment*, but have not been included in the above government issued lists. It should be noted that as stated in section 4.3 of the Hong Kong Planning Standards and Guidelines, the AMO is responsible for identifying, recording and researching buildings and sites of historical interest and that it is the role of the Antiquities Advisory Board to recommend as to whether or not the identified structures merit conservation. Also, as stated in the standards and guidelines that as the recording of heritage resources is an ongoing process, any new items discovered should be referred to AMO for follow-up action.

8.4 Results of the Desk-Based Assessment

Archaeological Resources

8.4.1 This section presents the results of the desk-based assessment, which sought to provide background information on the project study area in terms of its geology, topography, historical development and known archaeological resource.

Geology and Topography

8.4.2 The topography of the Study Area ranges in character from coastal low-lying marshy land and estuarine/ intertidal deposits in the west, to flat alluvium and terrace alluvium in the north.

8.4.3 The geology of the north-eastern part of the Study Area at Pak Fu Shan and Lin Ma Hang consists mainly of Pleistocene debris flow deposits and strips of Holocene alluvium along the coast (**Figure 8.1**). There is also an extensive outcrop of volcanic rocks of coarse ash crystal tuff of Tai Mo Shan Formation.

8.4.4 In the middle part of the Study Area at Man Kam To, the geology is dominated by estuarine and intertidal deposits along the coast (**Figure 8.2**). Strips of Holocene alluvium and Pleistocene debris flow deposits are also identified. Outcropping volcanic rocks in the form of metasediments of the Lok Ma Chau Formation occur near Nam Hang.

8.4.5 Holocene estuarine and intertidal deposits are the major geological feature occupying the northern part of the Study Area at Hoo Hok Wai (**Figure 8.3**).

8.4.6 The geology of the western part of the Study Area at Mai Po, San Tin and south-west of Hoo Hok Wai is dominated by dark grey marine mud and low-lying marshy land (**Figure 8.3**). The Sha Tau Kok study area is mainly situated on Pleistocene terraced alluvium (**Figure 8.4**).

8.4.7 In general, the onshore superficial deposits of the Study Area comprise mainly of marine mud, alluvial, debris flow, estuarine, and intertidal deposits of Pleistocene and Holocene age. Alluvium is widespread along the Shenzhen River and River Indus valleys, forming extensive floodplains (GEO 1996). A series of existing ponds and wetland on marine mud occupy the western part of the Study Area along Mai Po, San Tin and Hoo Hok Wai.

Archaeological Background

8.4.8 There are several archaeological sites located within or close to the Study Area (**Figure 8.5**):

Section 1 – Mai Po to Lok Ma Chau Control Point

8.4.9 No known archaeological sites are located in this section.

Section 2 – Lok Ma Chau Control Point to Ng Tung River

8.4.10 No known archaeological sites are located in this section.

Section 3 – Ng Tung River to Lin Ma Hang Village

Muk Wu Nga Yiu Kilns

8.4.11 Four kilns in the Muk Wu Nga Yiu area were first recorded in 2000 during the Shenzhen River Regulation Project (HKIA 2001). Three of the kilns were located in Nga Yiu Tsuen and one in Muk Wu Nga Yiu Tsuen. These kilns date back to approximately 100 years ago and were used for brick and tile production (HKIA 2001).

Section 4 – Lin Ma Hang Village to Sha Tau Kok

Sha Tau Kok San Tsuen Archaeological Site

8.4.12 The site was first identified during the 1998 Territory-wide Survey, with the discovery of some Qing dynasty materials (AMO 1999). Field investigations in 2000 revealed that the site contained rich prehistoric cultural deposits including Warring States hard pottery sherds and Late Neolithic stone implements (Au 2000). An excavation was conducted at the centre of the archaeological site in San Tsuen in 2001 prior to a small village house construction. Four cultural layers (Early Neolithic, Mid Neolithic, Late Neolithic and Bronze Age), as well as a large number of stone artefacts, and features including 3 postholes, 2 pits and traces of stone working areas were identified (Mok 2001).

*Areas of Archaeological Interests located near the Study Area (**Figure 8.5**):*

Tsung Yuen Ha

8.4.13 The monitoring of sewerage groundworks in 2004 resulted in the identification of a Ming Dynasty occupation site at Tsung Yuen Ha and another settlement of indeterminate age, which appeared to extend under standing historical buildings. The structural remains had a different orientation to the current historical village, but the associated finds did not, however, allow the structures to be dated. The exact extent of the site could not be established due to the geographical limitations of the monitoring works and the concrete covering of the current village. Further investigation is needed to understand the extent both geographically and chronologically of the site (AAL 2005).

Tong Fong

8.4.14 The village has a settlement history of approximately 200 years. At the rear of the village at a depth of 1 m below the surface a single ceramic jar was found. The find, although not closely datable, suggested that the village may contain remains from earlier historical periods, which can only be confirmed through further investigation (AAL 2005).

Yuen Leng Tsai

8.4.15 The site was first identified in 2001 during the archaeological investigation for the Shenzhen River Regulation Project (with the discoveries of Bronze Age, Song/Yuan and Ming/Qing finds from surface scan, auger hole tests and test pit excavation) (HKIA 2001). Since the identified areas at Yuen Leng Chai would be directly impacted by the proposed works, a subsequent rescue excavation was carried out in 2001 as mitigation measure. Two burials dated to the Song/Yuan period, as well as some Bronze Age geometric sherds, were recorded in the excavation (HKIA 2003).

Previous archaeological investigations within or close to the Study Area:

Territory-wide Survey

8.4.16 Field investigations were carried out near Sha Tau Kok Hoi and on the south bank of Shenzhen River as part of the 1997-98 Territory-wide Survey. Some of the investigated

areas were located within or near the current Study Area boundary:

- Shan Tsui (NW) – 1 auger hole test; high water table, confirmed as having no archaeological potential
- Sha Tau Kok – 4 auger hole tests, highly modified landform/landscape, impossible to locate the original alluvial deposits
- Lin Ma Hang – Surface scan and 8 auger hole tests; no archaeological materials were identified
- Pak Fu Shan – Surface scan and 7 auger hole tests; Qing dynasty-recent period porcelain sherds were collected on surface
- Tsung Yuen Ha – Surface scan and 3 auger hole tests; Qing dynasty-recent period porcelain sherds were collected on surface
- Chuk Yuen – Surface scan and 3 auger hole tests; modern porcelain sherds were collected on the surface
- Lo Shu Ling – Surface scan and 3 auger hole tests; modified landform/landscape, no archaeological materials were identified
- Muk Wu Nga Yiu – 1 auger hole test; no archaeological materials were identified
- Muk Wu – 1 auger hole; no archaeological materials were identified
- Yuen Leng Chai – Surface scan and 1 auger hole; no archaeological materials were identified.

The 2000 Archaeological Survey & Assessment for Shenzhen River Regulation Project Stage III

8.4.17 An archaeological field investigation as part of the above EIA was undertaken in 2000. The entire Study Area was located within the closed area, along Shenzhen River. A Song/Yuan period site was identified at Yuen Leng Chai. Several Warring States-Hang Dynasty geometric pottery surface finds were also collected at the site. In addition, four early 20th-century kilns in the Muk Wu Ngau Yiu area were recorded (HKIA 2001).

Rescue Excavation at Yuen Leng Chai

8.4.18 This Song/Yuan site was identified during the archaeological investigation carried out for the Shenzhen River Regulation Project Stage III in 2000. Since the site would be directly impacted by the proposed work, a rescue excavation was conducted in 2002-2003 prior to the construction phase. Two well preserved burials dated to Song/Yuan period were recorded, along with associated finds such as celadon bowls, cloth-pattern tiles, and nine iron nails – probably part of the decayed coffins (HKIA 2003).

Agreement No. CE64/96, Planning & Development Study on NENT, CHIA

8.4.19 A field investigation was carried out for the above project at Kwu Tung, Ma Tso Lung, Fung Kong, Ho Sheung Heung, Yin Kong and Lo Wu Correctional Institute and its adjacent hills. Only the investigated area at Ma Tso Lung and Lo Wu Correctional Institute were located within the current Study Area boundary. A surface survey, 19 auger hole test and 8 test pit

excavations (1m x 1.5m) were conducted in Ma Tso Lung. Two Song celadon sherds were collected on the surface and some Qing Dynasty bowl base sherds were found in one of the test pits. All finds were identified as secondary deposits. For the investigated area at Lo Wu Correctional Institute, no archaeological materials were identified in the surface scan and test pit excavation. According to the report, the valley was filled by soil excavated from the hill slope during levelling and filling for the construction of the Lo Wu Camp (now known as the Correctional Institute). Any *in situ* ancient cultural remains had been destroyed and the entire area was confirmed by the field testing as having no archaeological potential (ERM 2001).

The 2001 Archaeological Survey & Assessment for the Proposed NENT Landfill Extension

8.4.20 An early 17th- to early 20th-century settlement site was identified in the Tong To Shan/ Lin Ma Hang area. Findings included 6 stone trackways surfaced with flat stone slabs, 74 'slope-protection walls', the remains of nine houses, and one cistern. Forty graves were also identified in the Ngong Tong area. Some Wun Yiu style blue-and-white porcelain sherds were collected at/near the house ruins (HKIA 2002).

Agreement No. CE20/2004 (EP), NENT Landfill Extension – Feasibility Study, CHIA

8.4.21 A total of ten auger hole tests and two test pit excavations were conducted at Tong To Shan. The results indicated that the hill slope and terraces consisted of moderate to deeply weathered colluvium. No archaeological material was recovered during the auger testing and test pit excavations (AAL 2005).

Northeast New Territories Village Sewerage: Archaeological Monitoring and Condition Survey

8.4.22 Archaeological watching brief was conducted within the closed border area at Ta Kwu Ling during the construction phase of the NENT Village Sewerage project. Significant findings included the identification of a Ming Dynasty occupation site at Tsung Yuen Ha and a settlement of indeterminate age, which appeared to continue under the existing historical buildings. Other materials were also collected from nearby historical villages, such as Tong Fong and Ping Che (AAL 2005).

Archaeological Survey at Wang Lek near Lin Ma Hang Road

8.4.23 A field investigation was carried out at Wang Lek near Lin Ma Hang Road for the Secondary Boundary Fence project in 2006. The works area measured approximately 2m wide by 800m long. The alignment of the proposed work was situated on either debris flow or alluvial deposits. A field scan, 25 auger hole tests and eight test pit excavations were conducted. No archaeological or historical remains were identified in the survey (HKIA 2006).

Built Heritage Resources

Declared or Proposed Monuments

8.4.24 There are no Proposed or Declared Monuments in the project Study Area.

Government Historic Sites

8.4.25 There are no such sites in the project Study Area.

Historical Villages

8.4.26 The proposed works will not take place within the boundaries of any occupied historical villages. The alignment will include the periphery of the ruins of the abandoned village of Chuk Yuen.

Graded Historic Buildings

8.4.27 There are no Graded Historic Buildings in the project Study Area.

8.5 Findings of Assessment

Assessment of Archaeological Potential

8.5.1 Although the archaeological potential of the closed area is generally high due to a lack of disturbance to potential deposits in the past and only limited archaeological investigation (which have provided very little information regarding the nature and extent of archaeological deposits), most of the current proposed works are located on Existing Boundary Patrol Roads. Such alignments were previously disturbed by the original construction work. Therefore, the potential for *in situ* archaeological deposits under the existing road corridors is limited. As well, some of the proposed alignments are located on former wet areas, or close to existing rivers, or in areas where the natural riverbank was modified during canalisation works, which would have had impacted archaeological potential.

Section 1

Proposed Secondary Boundary Fence along Existing Boundary Patrol Road (Mai Po to Lok Ma Chau Control Point)

8.5.2 No archaeological potential – The entire proposed alignment is located on former wetland/marine mud and is now surrounded by ponds. As well, the proposed alignment is located on the existing Boundary Patrol Road along Shenzhen River.

Existing Pak Hok Chau Checkpoint to be replaced

8.5.3 No archaeological potential – The study area is located on former wetland/marine mud and is now surrounded by ponds. In addition, the proposed checkpoint will be constructed on the footprint of the existing one.

Section 2

Proposed Secondary Boundary Fence along Existing Boundary Patrol Road at Lok Ma Chau

8.5.4 No archaeological potential – The study area is located on former wetland/marine mud and is now surrounded by ponds.

Existing Boundary Fence to be removed (from Lok Ma Chau to Ng Tung River)

8.5.5 No archaeological potential – No impacts on underground deposits are anticipated from the proposed work along the existing Boundary Fence from Lok Ma Chau to Ng Tung River.

Proposed new Boundary Patrol Road with Primary and Secondary Boundary Fences (North of the Lok Ma Chau Loop and Hoo Hok Wai)

8.5.6 No archaeological potential – The alignment is situated on an existing man-made river embankment/ road, which follows the canalised Shenzhen River. The embankment/ road was filled and constructed by DSD in the late 1990s. As well, the study area is located on former wetland and marine mud, and is now surrounded by ponds.

Existing Lok Ma Chau Checkpoint to be removed

8.5.7 No archaeological potential – No impacts on underground deposits are anticipated from the proposed work.

Section 3

Proposed Secondary Boundary Fence along Existing Boundary Patrol Road (Lo Wu to Lin Ma Hang)

8.5.8 No archaeological potential – Most parts of this section of the study area were investigated in the 2001 Shenzhen River Regulation Project (HKIA 2001). Historical kilns were identified in Muk Wu Ngau Yiu, and a Song/Yuan site was identified at Yuen Leng Chai. A rescue excavation was later conducted prior to the commencement of construction works, which led to the discovery of two Song/Yuan burials and Bronze Age geometric pottery sherds (HKIA 2003).

8.5.9 Although archaeological remains were discovered near the current project area, all of the proposed SBF are located on the existing BPR, which already has disturbance from the previous road construction work. As well, some areas were disturbed by the above mentioned Shenzhen River Regulation Project. Therefore, the potential of finding *in situ* archaeological deposits here is limited. More importantly, no impacts are anticipated from the proposed works, which involve the addition of a boundary fence along (and within the footprint of) the existing boundary patrol road. No field testing is therefore needed in this instance.

Existing Boundary Fence to be removed (at Pak Fu Shan area)

8.5.10 No archaeological potential – No impacts on underground deposits are anticipated from the proposed work.

*****Proposed new Boundary Patrol Road with Primary and Secondary Boundary Fences (Pak Fu Shan)*

8.5.11 Some archaeological potential – the proposed new road with secondary boundary fences is situated on alluvium, which fills the valley bottom between the river channel and foothill areas of Pak Fu Shan. The area presently consists of abandoned and overgrown agricultural land. No previous field testing has been carried out in this area, and there are only limited existing impacts.

8.5.12 The 2006 Wang Lek survey (HKIA 2006) was conducted along the southern edge of the Shenzhen River Valley at the base-of-hillslope area on debris flow deposits, solid geology and a small area with alluvium. The topographic, geological and landuse contrast between the Wang Lek survey area and the proposed Boundary Patrol Road alignments at Pak Fu Shan and Lin Ma Hang is archaeologically significant. Therefore, the negative result from Wang Lek survey does not usefully inform our assessment of archaeological potential of the proposed Pak Fu Shan alignment, which lies on land that would have been far more attractive to past human populations in the area.

*****Proposed new Boundary Patrol Road with Primary and Secondary Boundary Fences (Lin Ma Hang)*

8.5.13 Some archaeological potential – Proposed alignments are situated on strips of alluvium. The area presently consists of abandoned and overgrown agricultural land. No former field testing has been carried out in this area, and there are only limited existing impacts.

8.5.14 The 2006 Wang Lek survey was conducted along the southern edge of the Shenzhen River Valley at the base-of-hillslope area on debris flow deposits, solid geology and a small area with alluvium (HKIA 2006). The topographic, geological and landuse contrast between the Wang Lek survey area and the proposed Boundary Patrol Road alignments at Pak Fu Shan and Lin Ma Hang is archaeologically significant. Therefore, the negative result from Wang Lek survey does not usefully inform our assessment of archaeological potential of the proposed Lin Ma Hang alignment, which lies on land that would have been far more attractive to past human populations in the area.

Existing Sha Ling Checkpoint to be removed

8.5.15 No archaeological potential – No impacts on underground deposits are anticipated from the proposed work.

Existing Ping Che Checkpoint to be removed

8.5.16 No archaeological potential – No impacts on underground deposits are anticipated from the proposed work.

8.5.17 **** Since Pak Fu Shan and Lin Ma Hang Study Areas are evaluated as having some

archaeological potential, field testing is proposed in both areas. A methodology has been submitted and agreed by the AMO. However, part of those areas cannot be accessed currently. Therefore, the field testing can only be undertaken after land resumption (prior to construction work).

Section 4

Proposed Secondary Boundary Fence along Existing Boundary Patrol Road (Sha Tau Kok)

8.5.18 Although this study area is located in close proximity to Sha Tau Kok San Tsuen Archaeological Site, the proposed SBF is located on an Existing Boundary Patrol Road (Shan Tsui Village Road and Sha Ho Road). Any archaeological deposits under the road corridor would have been adversely impacted upon by the construction and ongoing maintenance of the road. The likelihood of finding *in situ* archaeological deposits is therefore limited.

Proposed 'Gate One' Checkpoint at Sha Tau Kok

8.5.19 No archaeological potential - Although this study area is located in close proximity to Sha Tau Kok San Tsuen Archaeological Site and near the former coast, the proposed site is situated on an existing path next to Sha Tau Kok Road Shek Chung Au Section. The area located to its immediate south consists of land that was artificially filled for development purposes. The potential of finding *in situ* archaeological deposits is limited.

Existing Shek Chung Au Checkpoint to be removed

8.5.20 No archaeological potential – No impacts on underground deposits are anticipated from the proposed work.

Results of the Field Survey for Built Heritage Resources

Section 1

8.5.21 This section of the alignment runs from Mai Po to the existing Lok Ma Chau Control Point. The works will consist of construction of a SBF of approximately 4.1 km and replacement of the existing checkpoint at Pak Hok Chau. No built heritage resources were identified in the project Study Area.

Section 2

8.5.22 This section of the alignment (which is approximately 5.6 km in length) runs along the southern edge of the Shenzen River, beginning at Lok Ma Chau through Hoo Hok Wai and to Lo Wu. The majority of the alignment runs through abandoned ponds and fields. Two built heritage resources were identified in the project Study Area a shrine associated with the village of Liu Pok (BF-HB1) and a renovated grave with an original burial dating to the Ming Dynasty (BF-G1). The locations of the shrine and grave can be seen on **Figure 8.6** and the descriptions and photographs can be found in **Appendix H**.

Section 3

8.5.23 This section of the alignment runs from the Ng Tung River to Lin Ma Hang Village. The construction works will consist of provision of a new SBF along the existing BPR north of Pak Fu Shan and Northwest of Lin Ma Hang Village (approximately 7.5 km) and to construct new sections of BPR along the Shenzen River (approximately 4 km). One renovated grave (BF-G2) was identified at this section of the alignment, see **Figure 8.7** for location and **Appendix H** for detailed description. As well, two ruined structures at the abandoned village of Chuk Yuen (BF-HB2 and BF-HB3) were found to be on the border of the Study Area and the locations of these are shown in **Figure 8.8** and description can be found in **Appendix H**. This village was one of the listed indigenous villages in the New Territories and according to local informants, the original Chuk Yuen Wai was a Hakka village established 200-300 years ago in the low-lying area by the river. 'Yiu' was the major clan occupying the village, with their own ancestral hall. There were also two families with the surname 'Yau'. About 40 years ago, many of the villagers immigrated to Europe and the village was eventually completely abandoned due to flooding.

Section 4

8.5.24 This section of the alignment is located in Sha Tau Kok Town and consists of the construction of approximately 0.5 km of secondary boundary fence and a new checkpoint at Gate 1. One built heritage resource was identified during the survey of the Study Area for section 4. It is an historical residential structure (BF-HB4). A map showing the location of the building is shown in **Figure 8.9** and a description and photograph of the building is provided in **Appendix H**.

8.6 Impact Assessment

Archaeological Resources

Construction Phase

Section 1

Proposed Secondary Boundary Fence along Existing Boundary Patrol Road (Mai Po to Lok Ma Chau Control Point)

8.6.1 The Study Area will have direct impacts from the proposed works. However, the proposed alignment has already been disturbed during the construction of the existing Boundary Patrol Road. In addition, the Study Area is located on former wetland/marine mud and is now surrounded by ponds.

Existing Pak Hok Chau Checkpoint to be replaced

8.6.2 The Study Area will have direct impacts from the proposed works. However, the proposed checkpoint will be constructed on the footprint of the existing one. In addition, the Study Area is located on former wetland/marine mud and is now surrounded by ponds.

Section 2

Proposed Secondary Boundary Fence along Existing Boundary Patrol Road at Lok Ma Chau

8.6.3 The Study Area will have direct impacts from the proposed works. However, the proposed alignment has already been disturbed during the construction of the existing Boundary Patrol Road. In addition, the Study Area is located on former wetland/marine mud and is now surrounded by ponds.

Existing Boundary Fence to be removed (from Lok Ma Chau to Ng Tung River)

8.6.4 No impacts on underground deposits are anticipated from the proposed work.

Proposed new Boundary Patrol Road with Primary and Secondary Boundary Fences (North of the Lok Ma Chau Loop and Hoo Hok Wai)

8.6.5 The Study Area will have direct impacts from the proposed works. However, the proposed alignment is situated on an existing man-made river embankment/ road, which follows the canalised Shenzhen River. The embankment/ road was filled and constructed by DSD in the late 1990s. As well, the study area is located on former wetland and marine mud, and is now surrounded by ponds.

Existing Lok Ma Chau Checkpoint to be removed

8.6.6 No impacts on underground deposits are anticipated from the proposed work.

Section 3

Proposed Secondary Boundary Fence along Existing Boundary Patrol Road (Lo Wu to Lin Ma Hang)

8.6.7 The Study Area will have direct impacts from the proposed works. However, the proposed alignment has already been disturbed during the construction of the existing Boundary Patrol Road. In addition, the Study Area is located on former wetland/marine mud and is now surrounded by ponds.

Existing Boundary Fence to be removed (at Pak Fu Shan area)

8.6.8 No impacts on underground deposits are anticipated from the proposed work.

Proposed new Boundary Patrol Road with Primary and Secondary Boundary Fences (Pak Fu Shan)

8.6.9 An archaeological survey to confirm the archaeological impact will be conducted after land resumption and before commencement of construction works.

Proposed new Boundary Patrol Road with Primary and Secondary Boundary Fences (Lin Ma Hang)

8.6.10 An archaeological survey to confirm the archaeological impact will be conducted after land resumption and before commencement of construction works.

Existing Sha Ling Checkpoint to be removed

8.6.11 No impacts on underground deposits are anticipated from the proposed work.

Existing Ping Che Checkpoint to be removed

8.6.12 No impacts on underground deposits are anticipated from the proposed work.

Section 4

Proposed Secondary Boundary Fence along Existing Boundary Patrol Road (Sha Tau Kok)

8.6.13 The Study Area will have direct impacts from the proposed works. However, the proposed alignment has already been disturbed during the construction of the existing Boundary Patrol Road.

Proposed 'Gate One' Checkpoint at Sha Tau Kok

8.6.14 The Study Area will have direct impacts from the proposed works. However, the proposed alignment has already been disturbed during the construction of the existing Boundary Patrol Road and the potential of finding *in situ* archaeological deposits is limited.

Existing Shek Chung Au Checkpoint to be removed

8.6.15 No impacts on underground deposits are anticipated from the proposed work.

Operational Phase

8.6.16 There will be no impacts to archaeological resources during the operational phase for all Study Areas.

Built Heritage

Construction Phase

8.6.17 The proposed works in the vicinity of the identified resources will only involve the removal and/ or construction of new boundary control fences along existing roads. As such, the impacts be limited to works areas where machinery and construction activities could cause damage to structures through direct contact. Details of the proposed works are provided below.

Section 1

8.6.18 The works associated with this section will not have adverse impact on any built heritage resources.

Section 2

8.6.19 The works that are located in the vicinity of built heritage resources (BF-HB1 and BF-G1) will involve the removal of the existing boundary fence along the existing Boundary Patrol Road.

- *BF-HB1:* The shrine is located approximately 34 metres from the existing fence. If any works are in close proximity to the shrine it could be damaged. Also, safe public access to the shrine could be restricted by the construction works.

- *BF-G1:* The grave is situated in close proximity to the alignment and may be damaged by any construction works in close proximity. Also, safe public access to the grave may be restricted by the construction works.

Section 3

8.6.20 The works in the vicinity of built heritage resources will involve the construction of a secondary boundary fence along the existing Boundary Patrol Road (BF-HB2 and HB3) and removal of the existing boundary fence (BF-G2).

- *BF-HB2 and HB3:* The ruins are located at approximately 50 metres from the proposed works and will not be adversely impacted by the construction works.

- *BF-G2:* The grave is situated in close proximity to the alignment and may be damaged by any construction works in close proximity. Also, safe public access to the grave may be restricted by the construction works.

Section 4

8.6.21 The works in the vicinity of the built heritage resource (BF-HB4) will involve the construction of a secondary boundary fence along the existing Boundary Patrol Road.

- *BF-HB4:* The structure is located approximately 50 metres from the proposed construction works and this distance will provide an adequate buffer zone to ensure that the building will not be adversely impacted during the construction phase.

Operational Phase

8.6.22 There will be no impacts from sections of fence to be removed. The construction of a boundary fence may cause visual impacts to sensitive heritage structures.

Removal of Existing Fence

8.6.23 The removal of an existing fence and this will provide beneficial impacts to the currently existing environment, as the removal of the fence will return the area to a more natural setting. Resources to be beneficially impacted are BF-HB1, BF-G1 and BF-G2.

Construction of Fence

8.6.24 The fence construction will be approximately 50 metres from the nearest identified resource.

- *BF-HB2 and HB3:* The fence construction will have no impact on the resources, as the buildings are located in a village area that was abandoned over 40 years ago and consist of unused (it was confirmed on the site visit that the former occupants do not maintain family shrines or utilise the buildings in any way) and un-maintained ruinous shells of buildings with no heritage value apart from marking the location of the original Chuk Yuen Village. Hence, the setting of the ruins will not be adversely impacted by the construction of the fence.

- *BF-HB4:* The building is situated at the base of the existing boundary patrol road (with boundary fence). The presence of the proposed fencing will not adversely impact on the existing environment of the structure.

8.7 Mitigation Recommendations

Archaeological Resources

8.7.1 Since Pak Fu Shan and Lin Ma Hang Study Areas are evaluated as having some archaeological potential, archaeological survey with an aim to confirm the archaeological impact is required. Since part of those areas cannot be accessed currently, the proposed survey will be carried out after land resumption and before commencement of construction works.

8.7.2 If the archaeological survey has identified that there are archaeological interests in the works area, appropriate mitigation measures should be designed and implemented, such as:.

- Preservation in situ

- Full-scale excavation prior to construction works

- Archaeological monitoring, whereby a professional archaeologist monitors the excavation works in area of archaeological interests in the course of excavation.

8.7.3 The project proponent should design and implement the mitigation measures in consultation with the Antiquities and Monuments Office.

Construction Phase

8.7.4 Based on the findings of the baseline study, no mitigation measures are required within the Study Areas, except the proposed new boundary road alignments at Pak Fu Shan and Lin Ma Hang of Section 3. An archaeological survey should be conducted at both areas after land resumption and before commencement of construction works.

Operational Phase

8.7.5 No mitigation measure is required for all Study Areas.

Built Heritage Resources

Construction Phase

8.7.6 The following resources have been found to have the potential to be adversely impacted by the proposed construction works if mitigation measures are not implemented:

- BF-HB1: A buffer zone of a minimum distance of 1 metres should be established between the shrine and any construction works in close proximity. The buffer zone should be marked out by temporary fencing. Safe public access should be provided to the shrine during any construction works in close proximity.

- BF-G1 and BF-G2: A buffer zone of a minimum distance of 1 metres should be established between the graves and any construction works in close proximity. The buffer zone should be marked out by temporary fencing. Safe public access should be provided to the graves during any construction works in close proximity.

Operational Phase

8.7.7 No adverse impacts will occur during the operational phase of the project and no mitigation will be required.

8.8 Conclusion

Archaeological Resources

8.8.1 Based on the findings of the baseline study, no mitigation measures are required within the Study Area, except the proposed new boundary road alignment at Pak Fu Shan and Lin Ma Hang of Section 3 which are evaluated as having some archaeological potential. As part of those areas cannot be accessed currently, an archaeological survey should be undertaken after land resumption and before commencement of construction works. It is anticipated that no adverse impacts to archaeological resources will be caused during the operational phase for all Study Areas.

Built Heritage Resources

8.8.2 No major adverse impacts have been identified as arising from the proposed project. Minor impacts may occur during the construction phase to resources in close proximity to the proposed construction works. No adverse impacts are expected to arise during the operational phase of the project. Mitigation in the form of buffer zones and safe public access have been proposed for one shrine (BF-HB1) and two graves (BF-G1 and G2). The project will not cause any insurmountable impacts to built heritage resources if the mitigation measures as recommended are properly implemented.

8.9 References

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9 SUMMARY OF ENVIRONMENTAL OUTCOMES

9.1 Overall

9.1.1 This section summarises the environmental outcomes associated with the construction and operation of the Project. The EIA process has facilitated integration of environmental considerations into the design process for the Project. One of the key environmental outcomes has been the ability to plan, design and ultimately construct the Project so that direct impacts to sensitive receivers are avoided, as far as practically possible. The mitigation measures are detailed in the Implementation Schedule of Environmental Mitigation Measures in Section 11.

9.2 Air Quality

9.2.1 Air quality impacts resulting from the construction works of the Project are not anticipated be significant to air sensitive receivers.

9.2.2 Gaseous emissions from the operation of the secondary boundary fence and the new boundary patrol roads are considered to be insignificant, no air quality impact will be anticipated during the operational phase.

9.3 Noise

9.3.1 The potential noise impact that could arise from daytime construction/ demolition activities of the Project has been evaluated. With the use of quiet plant, the movable noise barriers and alternative demolition method, all the construction noise impact can be mitigated to acceptable levels. The Contractor shall, from time to time, be aware of the noise impacts on the surrounding NSRs through adequate noise monitoring during the works so that adjustments could be made to control the construction noise levels. These requirements should be triggered by an Event and Action Plan as part of the EM&A which should be incorporated in the works contract in order to make it enforceable.

9.3.2 During the operational phase, the road traffic noise generated from the newly constructed Border Road is predicted remaining unchanged to the existing scenario as there are mainly police patrol cars and maintenance cars (e.g. WSD, DSD etc.) travelling along the boundary patrol road. A worst-case assumption of road traffic flow and the percentage of heavy vehicle has been adopted in the prediction, it is concluded that potential road traffic noise impact would comply with the noise criteria stipulated in the EIAO-TM.

9.4 Water Quality

9.4.1 Water quality impacts are not anticipated in both construction and operational phases.

9.5 Waste Management

9.5.1 Impacts associated with waste are not anticipated in both construction and operational phases.

9.6 Ecology

9.6.1 Potential ecological impacts during construction and operational stages are considered acceptable given that recommended mitigation measures are fully implemented.

9.7 Landscape and Visual

9.7.1 The potential landscape and visual impacts during the construction and operational stages are considered to be acceptable given the full implementation of the proposed mitigation measures. This is largely due to the proposed alignment of the SBF will closely follow the alignment for the existing boundary fence for much of its length and so the impacts on the landscape resources and character and visual amenity available to VSRs are not likely to be significant. In addition the movement of the fence to follow the new red alignment in some locations will benefit the landscape character of these areas and improve the visual amenity available to the adjacent villagers.

9.8 Cultural Heritage

9.8.1 No adverse impacts towards built heritage resources are anticipated in both construction and operational phase.

9.8.2 No adverse impacts towards archaeology in the opertiaonl phase are anticipated.

9.8.3 For the proposed new boundary road alignment at Pak Fu Shan and Lin Ma Hang of Section 3, an archaeological survey will be conducted after land resumption and before commencement of construction works to confirm the archaeological impact.

10 ENVIRONMENTAL MONITORING AND AUDIT (EM&A) REQUIREMENTS

10.1.1 The Project mainly comprises the construction of an SBF along the southern edge of the existing BPR (approximately 21.7km) from west (Pak Hok Chau) to east (Sha Tau Kok). For sections where the existing PBF runs along the southern edge of the BPR, a new fence with sensor alarm system will be constructed on the northern edge of the BPR as part of the PBF whereas the existing PBF will become the SBF. The project also includes the conversion of the existing maintenance services road along the Shenzhen River bank to the north of the Lok Ma Chau Loop and Hoo Hok Wai into a new section of the BPR with a PBF and an SBF; and construction of two new sections of the BPR with a PBF and an SBF along the Shenzhen River side to the north of Pak Fu Shan and northwest of Lin Ma Hang Village. In addition, the Project includes the construction of a checkpoint at the entrance to the Sha Tau Kok town (i.e. location of "Gate One") and replacement of the existing checkpoint at Pak Hok Chau, removal of the existing checkpoints at Lok Ma Chau, Sha Ling, Ping Che and Shek Chung Au, and removal of the existing PBF along those sections of the existing BPR which will be replaced by new sections of the BPR.

10.1.2 A detailed EM&A Manual has been prepared for this project under a separate cover as part of the EIA study. The following sections provide a summary of the need for monitoring and auditing of the individual environmental aspects.

10.1.3 In accordance with the requirements in Section 3.4.9.3 of the EIA Study Brief, an Implementation Schedule of the environmental mitigation measures recommended in the EIA study has been prepared in form of a checklist. The Implementation Schedule is presented in Section 11 and also given in the EM&A Manual under a separate cover.

10.2 Air Quality

10.2.1 Full compliance with the air quality criteria will be achieved at all ASRs with the implementation of dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation. Dust monitoring is considered not necessary during the construction phase but weekly site audits are required to ensure that the dust control measures are properly implemented. No operational monitoring is considered to be necessary for this project.

10.3 Noise Impact

10.3.1 Environmental monitoring and audit is recommended to ensure that the noise levels do not exceed the criteria during the construction/ demolition activities as discussed in the EM&A Manual especially in recognition of the close proximity of the village type house along the boundary fence. No operational monitoring is recommended.

10.4 Water Quality

10.4.1 Water quality impacts during the construction phase will be controlled through the implementation of good site practice. With appropriate mitigation and precautions measures in place during construction, there should be relatively minor impacts associated with this project. In the operation phase, the impact from sanitary facilities is anticipated to be negligible. No construction and operational monitoring is recommended.

10.5 Waste Management

10.5.1 Auditing of each waste stream is recommended to be carried out periodically during the construction phase to determine if wastes are being managed in accordance with approved procedures. A site waste management plan will be prepared by the Contractor to define the waste management procedures and protocols. The audits will examine all aspects of waste management including waste generation, storage, recycling, treatment, transport and disposal and would be conducted on a monthly basis or more frequently if required.

10.6 Ecology

10.6.1 Good site practices for checking air, noise and water quality are considered necessary to control potential impacts on adjacent habitats. Regular checking on the proposed protection measures for plant species of conservation concern shall be conducted as part of the routine site inspection during construction period. Avoidance of particular construction activities during the bird migratory season and ardeid breeding season should be strictly followed to avoid potential disturbance to the wetland dependent birds of conservation concern and egretry respectively.

10.7 Landscape and Visual

10.7.1 Good site practices shall be employed including the protection of the existing trees and the monitoring of the works in terms of minimising potential; landscape and visual impacts. The progress of the engineering works should be regularly reviewed on site to identify the earliest practical opportunities for the landscape works to be undertaken.

10.7.2 A specialist Landscape Sub-Contractor should be employed by the Contractor for the implementation of landscape construction works and subsequent maintenance operations during the 12 month establishment period. It is proposed that the planting works be phased to coincide with the completion of each of the sections of the SBF and SBP so as to ensure that the affects of the mitigation measures are apparent at the earliest possible time. A minimum 12 month establishment period will be allowed for the planting works.

10.8 Cultural Heritage

10.8.1 Based on the findings of the baseline study, no mitigation measures are required within the Study Area, except the proposed new boundary road alignment at Pak Fu Shan and Lin Ma Hang of Section 3 which are evaluated as having some archaeological potential. As part of those areas currently cannot be accessed, an archaeological survey should be undertaken after land resumption and before commencement of construction works.

11 PROJECT IMPLEMENTATION SCHEDULE

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
Air Quality							
During Construction							
2.5.2	3.2.2	The following good site practice should be implemented: • any excavated dusty materials or stockpile of dusty materials should be covered entirely by impervious sheeting or sprayed with water so as to maintain the entire surface wet, and recovered or backfilled or reinstated within 24 hours of the excavation or unloading; • the working area of excavation should be sprayed with water immediately before, during and immediately after the operations so as to maintain the entire surface wet; • dusty materials carried by vehicle leaving a construction site should be covered entirely by clean impervious sheeting; • the area where vehicle washing takes place and the section of the road between the washing facilities and the exit point should paved with concrete, bituminous materials or hardcores; • the portion of road leading only to a construction site that is within 30m of designated vehicle entrance or exit should be kept clear of dusty materials; • all dusty materials should be sprayed with water prior to any loading, unloading or transfer; • vehicle speed should be limited to 10kph except on completed access roads; • every vehicle should be washed to remove any dusty materials from its body and wheels before leaving the construction sites.	To minimize construction dust impact	Contractor	Construction Work Sites	During Construction	EIAO-TM, Air Pollution Control (Construction Dust) Regulation
Noise							
During Construction							
3.8.14	4.8.1	The following good site practical should be implemented: • The Contractor shall adopt the Code of Practice on Good Management Practice to Prevent Violation of the Noise Control Ordinance (Chapter 400) (for Construction Industry) published by EPD; • The Contractor shall observe and comply with the statutory and non-statutory requirements and guidelines;	To mitigate construction noise impact	Contractor	Construction Work Sites	During Construction	EIAO-TM, NCO

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		• Before commencing any work, the Contractor shall submit to the Engineer Representative for approval the method of working, equipment and noise mitigation measures intended to be used at the site; • The Contractor shall devise and execute working methods to minimise the noise impact on the surrounding sensitive uses, and provide experienced personnel with suitable training to ensure that those methods are implemented; • Noisy equipment and noisy activities should be located as far away from the NSRs as is practical; • Unused equipment should be turned off. PME should be kept to a minimum and the parallel use of noisy equipment / machinery should be avoided; • Regular maintenance of all plant and equipment; • Material stockpiles and other structures should be effectively utilised as noise barriers, where practicable.					
3.8.1 - 3.8.3	4.8.2 - 4.8.3	Other than good site practice, the Contractor is required to adopt Levels 1 and 2 site-specific direct mitigation measures as specified below during the construction phase. With construction / demolition work undertaken at a distance of 60m or less to the NSRs, below mitigation measures should be included: **Level 1 – Use of Quiet Plant and Movable Noise Barrier** • The Contractor shall obtain particular models of plant that are quieter than standards given in GW-TM. • Purpose-built movable noise barriers should be used to mitigate construction noise directly at sources that are not usually mobile provide that the direct line of sight to the source is blocked.	To mitigate construction noise impact	Contractor	Construction work sites, **Figure 3.9** shows the typical section of movable noise barrier	During construction	EIAO-TM, NCO

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
3.8.9	4.8.4	In addition to the use of quiet plant and movable noise barrier, alternative demolition method of existing boundary fence at Section 2-3 shall be used where demolition works would be undertaken at a distance of 12m or less to the NSRs. These particular mitigation measures should be included: **Level 2 – Alternative Demolition Method of Existing Boundary Fence** • The use of welder is recommended to replace the use of hand-held driller; • The use of hand-held breaker with movable noise barrier is recommended to replace the use of mini-robot mounted breaker; and the duration for the use of hand-held breaker is minimal as only the surface level of the footing to be broken; and • The removal of the footing of the existing boundary fence should be carried by concrete crusher mini-robot mounted after the surface level broken by hand-held breaker.	To mitigate construction noise impact for demolition of existing boundary fence	Contractor	Construction work sites (Section 2 - 3)	Before the commencement of demolition works	EIAO-TM, NCO
Water Quality							
During Construction							
4.7.1	5.3.1	Good site practices in addition to the implementation of mitigation measures would minimize the impact to the surrounding environment. *General Prevention and Precaution Measures* • The site should be confined to avoid silt runoff to the site. • No discharge of silty water into the storm drain and drainage channel within and the vicinity of the site. • Any soil contaminated with chemicals/oils shall be removed from site and the void created shall be filled with suitable materials. • Stockpiles to be covered by tarpaulin to avoid spreading of materials during rainstorms; • Suitable containers shall be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport;	To avoid site runoff and chemical leakage	Contractor	Construction work sites	During construction	Practice Note for Professional Persons with regard to site drainage (ProPECC PN 1/94) and TM standard under the WPCO

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		• Chemical waste containers shall be labelled with appropriate warning signs in English and Chinese to avoid accidents. there shall also be clear instructions showing what action to take in the event of an accidental; • Storage areas shall be selected at safe locations on site and adequate space shall be allocated to the storage area; • Any construction plant which causes pollution to the water system due to leakage of oil or fuel shall be removed off-site immediately; • Spillage or leakage of chemical waste to be controlled by using suitable absorbent materials; • Chemicals will always be stored on drip trays or in bunded areas where the volume is 110% of the stored volume; • Regular clearance of domestic waste generated in the temporary sanitary facilities to avoid waste water spillage. • Temporary sanitary facilities to be provided for on-site workers during construction.					
4.7.2 – 4.7.3	5.3.2-5.3.3	**Concreting Work** A temporary drainage channel and associated facilities should be provided to collect the runoff generated and prevent concrete-contaminated water from entering watercourses. Adjustment of pH can be achieved by adding a suitable neutralising reagent to wastewater prior to discharge. The concreting works should be temporarily isolated with proper methods, such as by placing of sandbags or silt curtains with lead edge at bottom and properly supported props.	To collect runoff generated and prevent concrete-contaminated water from entering watercourses To prevent adverse impacts on the water quality of Lin Ma Hang Stream SSSI	Contractor	Construction work sites Work sites of Section 3 in the proximity of Lin Ma Hang Stream SSSI	During construction	Practice Note for Professional Persons with regard to site drainage (ProPECC PN 1/94) and TM standard under the WPCO CEDD General Specification-Protection of natural streams/rivers-Clause 25.09
4.7.4	5.3.4	**Soil Excavation and Stockpiling** Excavated soil which needs to be temporarily stockpiled should be stored in a specially designated area and provided with a tarpaulin cover to avoid runoff into the drainage channels.	To avoid site runoff	Contractor	Construction work Sites	During construction	Practice Note for Professional Persons with regard to site drainage (ProPECC PN 1/94) and TM standard under the WPCO

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
4.7.5 - 4.7.6	5.3.5-5.3.6	**Site Depot** All compounds in works areas should be located on areas of hard standing with provision of drainage channels and settlement ponds where necessary to allow interception and controlled release of settled/treated water. Hard standing compounds should drain via an oil interceptor. The oil interceptor should be regularly inspected and cleaned to avoid wash-out of oil during storm conditions. A bypass should be provided to avoid overload of the interceptor's capacity. Any contractor generating waste oil or other chemicals as a result of his activities should register as a chemical waste producer. Disposal of the waste oil should be done by a licensed collector. Good housekeeping practices should be implemented to minimise careless spillage and to keep the storage and the work space in a tidy and clean condition. Appropriate training including safety codes and relevant manuals should be given to the personnel who regularly handle the chemicals on site.	To avoid wash-out of oil during storm conditions	Contractor	Construction work Sites	During construction	Practice Note for Professional Persons with regard to site drainage (ProPECC PN 1/94) and TM standard under the WPCO
4.7.7	5.3.7	**Construction of Checkpoint** Sewage system should be constructed to divert domestic sewage, which will be generated from the sanitary facilities provided in the new checkpoint at Shek Chung Au, to public sewer connected to government sewage treatment facilities.	To avoid disposal of domestic sewage into watercourses.	Contractor	Construction work Site at Checkpoint	During construction	N/A
Waste Management							
During Construction							

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
5.6.7	6.3.6	**Site Clearance** The topsoil and vegetation removed and excavated material may have to be temporarily stockpiled on-site. Control measures should be taken at the stockpiling area to prevent the generation of dust and pollution of stormwater channels, fish ponds or river channels. However, to eliminate the risk of blocking drains in the wet season, it is recommended that stockpiling of excavated materials during the wet season should be avoided as far as practicable.	Prevent the generation of dust and pollution of storm water channels	Contractor	Construction work sites	During construction	Waste Disposal Ordinance (Cap.354); ETWBTC No. 15/2003, Waste Management on Construction Site
5.6.10 – 5.6.12	6.3.8	**Construction and Demolition Materials** Careful design, planning and good site management can minimize over-ordering and generation of waste materials such as concrete mortars and cement grouts. The design of formwork should maximize the use of standard wooden panels so to achieve high reuse levels. Alternatives such as steel formwork or plastic facing should be considered to increase the potential for reuse. The Contractor should recycle as much of the C&D materials as possible on-site. Proper segregation of waste on-site will increase the feasibility of certain components of the waste stream by the recycling contractors. Different areas of the worksite shall be designated for such segregation and storage wherever site conditions permit. Trip-ticket system should be employed to monitor the disposal of C&D material and solid at public filling facilities and landfills, and to control fly-tipping. Government has established a differentiated charging scheme for the disposal of waste to landfill, construction waste sorting facilities and public fill facilities. This will provide additional incentives to reduce the volume of waste generated and to ensure proper segregation of wastes.	Minimize over-ordering and generation of waste materials	Contractor	Construction work sites	During construction	Waste Disposal Ordinance (Cap.354); ETWBTC No. 15/2003, Waste Management on Construction Site
5.6.13-5.6.14	6.3.9 – 6.3.13	**Chemical Waste** For those processes which generate chemical waste, it may be possible to find alternatives which generate reduced quantities or even no chemical waste, or less dangerous types of chemical waste.	To avoid chemical leakage	Contractor	Construction work sites	During construction planning	Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes, Waste

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		Chemical waste that is produced, as defined by Schedule 1 of the Waste Disposal (Chemical Waste) (General) Regulation, should be handed in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Waste as follows: Containers used for the storage of chemical wastes should: • be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed: • have a capacity of less than 450 litres unless the specification have been approved by the EPD; and • display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the Regulations, The storage area for chemical wastes should: • be clearly labelled and used solely for the storage of chemical waste; • be enclosed on at least 3 sides; • have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area whichever is the greatest; • have adequate ventilation; • be covered to prevent rainfall entering (water collected within the bund must be tested and disposed as chemical waste if necessary); and • be arranged so that incompatible materials are adequately separated. Disposal of chemical waste should: • be via a licensed waste collector; and • be to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Facility which also offers a chemical waste collection service and can supply the necessary storage containers, or • to be re-user of the waste, under approval from the EPD.					Disposal (Chemical Waste) (General) Regulation

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
5.6.16	6.3.15	**General Refuse** Should be stored in enclosed bins or compaction units separate from C&D and chemical wastes. The Contractor should employ a reputable waste collector to remove general refuse from the site, separate from C&D and chemical wastes, on a regular basis to minimise odour, pest and litter impacts. Burning of refuse on construction sites is prohibited by law.	Minimise odour, pest and litter impacts	Contractor	Construction work sites	During construction	Public Health and Municipal Services Ordinance (Cap. 132)
5.6.18	6.3.16	**Construction Waste Management Plan** A construction waste management plan (CWMP) should be prepared and developed by the contractor to ensure proper collection, treatment and disposal of waste on site. This CWMP will also take into account the requirement to handle chemical wastes on site which will need to be managed by a licensed waste collection contractor.	Waste management during construction	Contractor	Construction work sites	During construction	ETWB TCW No. 19/2005, Waste Management on Construction Sites
Ecology							
Table 6.38	7.2	**Ecological Impacts on Floral Species of Conservation Concern** Erection of protective fencing to protect the plant during construction period	Protect the plant during construction period	Contractor	Construction work sites	During construction	EIAO
Table 6.40	7.2	**Potential Ecological Impacts on Offsite Habitats** Good site practices for controlling the dust and water quality (avoid stockpiles adjacent to wetlands, covering the stockpiles with impervious sheeting, control of vehicle speed, no discharge of silty water to the rivers, streams and drainage channels); Clear definition of works limit to avoid impact on adjacent habitats	To avoid site runoff and dust impact	Contractor	Construction work sites	During construction	EIAO / Air Pollution Control (Construction Dust) Regulation / WPCO

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
Table 6.39- Table 6.45	7.2	**Disturbance to Wetland-Dependent Birds, Raptors, Terrestrial Birds and Egretry** Good working practices include switching off unused equipment, keep minimum number of powered mechanical equipment in operation at the same period, the use of stockpiles and other structures to form noise barriers where practicable, avoidance of feeding the wildlife to cause disturbance, site confinement and proper cover of stockpiles with impervious sheeting to minimize construction noise, uncontrolled surface runoff and discharge of silts; Avoidance of construction works using Power Mechanical Equipments within the Wetland Conservation Area during bird migratory season (15th November – 15th March); and Restriction of excavation works within a 150m buffer zone from the egretry to ardeid non-breeding season (from August to February).	To minimize disturbance to wildlife	Contractor	Construction work sites	During construction	EIAO / Air Pollution Control (Construction Dust) Regulation / WPCO
Landscape and Visual							
		Preservation of Existing Vegetation					
Table 7-13 CP1	Table 9-1	• To retain trees that have high amenity or ecology value and contribute most to the landscape and visual amenity of the site and its immediate environs.	Preservation of Existing Vegetation	Project Landscape Architect / Contractor	Site	Throughout construction phase	TM-EIA Annex 18, ETWB TCW No. 2/2004 & ETWB TCW No. 3/2006
Table 7-13 CP1	Table 9-1	• Creation of precautionary area around trees to be retained equal to half of the trees canopy diameter. Precautionary area to be fenced.	To ensure the success of the tree preservation proposals.	Project Landscape Architect / Contractor	Site	Before construction phase commences	TM-EIA
Table 7-13 CP1	Table 9-1	• Prohibition of the storage of materials including fuel, the movement of construction vehicles, and the refuelling and washing of equipment including concrete mixers within the precautionary area.	To ensure the success of the tree preservation proposals.	Project Landscape Architect / Contractor	Site	Throughout construction phase	TM-EIA Annex 18, ETWB TCW No. 2/2004 & ETWB TCW No. 3/2006

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
Table 7-13 CP1	Table 9-1	• Phased segmental root pruning for trees to be retained and transplanted over a suitable period (determined by species and size) prior to lifting or site formation works which affect the existing rootball of trees identified for retention. The extent of the pruning will be based on the size and the species of the tree in each case.	To ensure the success of the tree preservation proposals.	Project Landscape Architect / Contractor	Site	Throughout construction phase	TM-EIA Annex 18, ETWB TCW No. 2/2004 & ETWB TCW No. 3/2006
Table 7-13 CP1	Table 9-1	• Pruning of the branches of existing trees identified for transplantation and retention to be based on the principle of crown thinning maintaining their form and amenity value.	To ensure the success of the tree preservation proposals.	Project Landscape Architect / Contractor	Site	Throughout construction phase	TM-EIA Annex 18, ETWB TCW No. 2/2004 & ETWB TCW No. 3/2006
Table 7-13 CP1	Table 9-1	• The watering of existing vegetation particularly during periods of excavation when the water table beneath the existing vegetation is lowered.	To ensure the success of the tree preservation proposals.	Project Landscape Architect / Contractor	Site	Throughout construction phase	TM-EIA Annex 18, ETWB TCW No. 2/2004 & ETWB TCW No. 3/2006
Table 7-13 CP1	Table 9-1	• The rectification and repair of damaged vegetation following the construction phase to it's original condition prior to the commencement of the works or replacement using specimens of the same species, size and form where appropriate to the design intention of the area affected	To ensure the success of the tree preservation proposals.	Project Landscape Architect / Contractor	Site	Throughout construction phase	Annex 18, ETWB TCW No. 2/2004 & ETWB TCW No. 3/2006
Table 7-13 CP1	Table 9-1	• All works affecting the trees identified for retention and transplantation will be carefully monitored. This includes the key stages in the preparation of the trees, the implementation of protection measures and health monitoring through out the construction period	To ensure the success of the tree preservation proposals.	Project Landscape Architect / Contractor	Site	Throughout construction phase	TM-EIA Annex 18, ETWB TCW No. 2/2004 & ETWB TCW No. 3/2006

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
Table 7-13 CP1	Table 9-1	• Detailed landscape and tree preservation proposals will be submitted to the relevant government departments for approval under the lease conditions and in accordance with ETWB TCW No. 2/2004 and WBTC No. 3/2006.	To ensure the tree preservation and planting proposals are integrated with the existing landscape context and that the landscape resources are preserved where appropriate.	Project Landscape Architect / Contractor	Site	Throughout construction phase	TM-EIA Annex 18, ETWB TCW No. 2/2004 & ETWB TCW No. 3/2006
Table 7-13 CP1	Table 9-1	• The tree preservation works should be implemented by approved Landscape Contractors and inspected and approved on site by a qualified Landscape Architect. A tree protection specification would be included within the contract documents.	To ensure the tree preservation and planting proposals are integrated with the existing landscape context and that the landscape resources are preserved where appropriate.	Contractor	Site	Throughout construction phase	TM-EIA Annex 18, ETWB TCW No. 2/2004 & ETWB TCW No. 3/2006
		Preservation of Existing Topsoil					
Table 7-13 CP2	Table 9-1	• Topsoil disturbed during the construction phase should be tested using a standard soil testing methodology and where it is found to be worthy of retention stored for re-use.	To provide a viable growing medium suited to the existing conditions and reduce the need for the importation of top soil.	Contractor	Site	Throughout construction phase	TM-EIA Annex 18

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
Table 7-13 CP2	Table 9-1	• The soil will be stockpiled to a maximum height of 2m and will be either temporarily vegetated with hydroseeded grass during construction or covered with a waterproof covering to prevent erosion.	To provide a viable growing medium suited to the existing conditions and reduce the need for the importation of top soil.	Contractor	Site	Throughout construction phase	TM-EIA Annex 18
Table 7-13 CP2	Table 9-1	• The stockpile should be turned over on a regular basis to avoid acidification and the degradation of the organic material, and reused after completion. Alternatively, if this is not practicable, it should be considered for use elsewhere, including other projects.	To provide a viable growing medium suited to the existing conditions and reduce the need for the importation of top soil.	Contractor	Site	Throughout construction phase	TM-EIA Annex 18
		Permanent and Temporary Works Areas					
Table 7-13 CP3	Table 9-1	• Where appropriate to the final design the landscape of these works areas should be restored following the completion of the construction phase.	To minimise the disturbance to existing landscape resources and change of visual amenity.	Contractor	Site	Through out construction phase	TM-EIA Annex 18
Table 7-13 CP3	Table 9-1	• Construction site controls should be enforced including the storage of materials, the location and appearance of site accommodation and the careful design of site lighting to prevent light spillage.	To minimise the disturbance to existing landscape resources and change of visual amenity.	Contractor	Site	Through out construction phase	TM-EIA Annex 18
		Mitigation Planting					

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
Table 7-13 CP4	Table 9-1	• Replanting of disturbed vegetation should be undertaken at the earliest possible stage of the construction phase	To minimise the disturbance to existing landscape resources and change of visual amenity.	Contractor	Site	Through out construction phase	TM-EIA Annex 18
Table 7-13 CP4	Table 9-1	• Use of native plant species predominantly in the planting design for the buffer areas.	To minimise the disturbance to existing landscape resources and change of visual amenity.	Contractor	Site	Through out construction phase	TM-EIA Annex 18
Table 7-13 CP4	Table 9-1	• The tree planting works should be implemented by approved Landscape Contractors and inspected and approved on site by a qualified Landscape Architect. A tree planting specification would be included within the contract documents.	To minimise the disturbance to existing landscape resources and change of visual amenity.	Contractor	Site	Through out construction phase	TM-EIA Annex 18
		Transplantation of Existing Trees					
Table 7-13 CP5	Table 9-1	• The tree transplanting works should be implemented by approved Landscape Contractors and inspected and approved on site by a qualified Landscape Architect. A tree protection / transplanting specification would be included within the contract documents.	To minimise the disturbance to existing landscape resources and minimize the impacts on the visual amenity of the area.	Contractor	Site	Prior to the commencement of the proposed works	TM-EIA Annex 18, ETWB TCW No. 2/2004 & ETWB TCW No. 3/2006
		Operational Phase					
		Design of the Fence and associated Structures					
Table 7-14 OP1	Table 9-2	• Design of Boundary Fence, Boundary Patrol Road and Police Check Point – These structural elements will be designed in accordance with security requirement from Police Force and incorporate design features as part of design mitigation measures including:	Responsive design to integrate the proposals into their landscape and visual context.	ArchSD	Site	Throughout design phase	TM-EIA Annex 18 and BD

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		1. Integrated design approach – the boundary fence should integrated, as far as technically feasible, with existing built structures such as existing road, footpath and track and embankment of fishponds, river and drainage channel as part of design mitigation measures to reduce the potential cumulative impact of the proposed works. The location and orientation of the police check points should be away from landscape and visually sensitive areas such wetland, fishpond and agricultural field.					
		2. Building massing - the proposed use of simple responsive design for the built structures with a low building height profile to reduce the potential visual mass of the structure within a rural context.					
		3. Treatment of built structures - the architectural design should seek to reduce the apparent visual mass of the facilities further through the use of natural materials such as wooden frame, vertical greening or other sustainable materials such as recycled plastic.					
		4. Responsive building and fence finishes - In terms of the proposed finishes natural tones should be considered for the colour palette with non-reflective finishes are recommended to reduce glare effect. The use of colour blocking on the proposed fence could be used to break up the visual mass of the structure.					

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		5. Responsive lighting design – Aesthetic design of architectural and track lighting with following glare design measures: ▪ Directional and full cut off lighting is recommended particularly for areas adjacent to existing village to minimise light spillage. ▪ Minimise geographical spread of lighting, only applied for safety and security reasons; ▪ Limited lighting intensity to meet the minimum safety and operation requirement; and ▪ High-pressure sodium road lighting is recommended for more stringent light control reducing spillage and thus visual impacts.					
		Compensatory Planting Proposals					
Table 7-14 OP2	Table 9-2	• Utilise native to Hong Kong will be utilized within the buffer planting areas.	Planting will serve to visually integrate the proposals within the existing landscape framework.	Contractor	Site	Throughout design phase	TM-EIA Annex 18, HKPSG and BD
Table 7-14 OP 2 / 3	Table 9-2	• A qualified or registered landscape architect will be involved in the design, construction supervision and monitoring, and maintenance period to oversee the implementation of the recommended landscape and visual mitigation measures including the tree preservation and landscape works on site.	Provide a linkage with the existing wooded areas creating a more coherent landscape framework whilst also improving the ecological connectivity between existing and proposed woodland habitats.	Contractor	Site	Throughout design phase	TM-EIA Annex 18, HKPSG and BD

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
Table 7-14 OP 2	Table 9-2	Tree and Shrub Planting – Given the rural nature of the proposed alignment it is recommended that the where possible tree and shrub species which are native to Hong Kong be used. In addition where possible the planting of new trees and shrubs will aim to link together existing woodland areas and small tree groups to improve the connectivity between habitats and create more coherent landscape framework. The planting of small groups of trees along the alignment of the proposed fence will serve to de-emphasise the horizontality of the fence structure and provide for better sense of visual integration with the landscape context. Where practicable vertical greening measures should also be considered on engineering structures.	The planting proposal seeks to compensate for the predicted tree loss.	Contractor	Site	Throughout design phase	TM-EIA Annex 18, HKPSG and BD

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
Table 7-14 OP 3	Table 9-2	Compensatory Planting Proposals – Given the works extent is largely limited along existing roadside embankment to minimise impact to existing village settlements and valuable landscape resources such as wetland, fishpond, stream course and existing trees, and considered the importance of tree retention within the works area, new tree planting will concentrate in selected new amenity areas along the alignment, infilling between retained and transplanted trees. The preliminary planting proposals for the proposed works include the planting of some 357 new trees utilising a combination of mature to light standard sized stock (i.e. approximately 15% of mature trees, 75% of standard trees, and 10% light standard trees). These trees will be planted in woodland clumps and small tree groups at strategic locations to de-emphasise the horizontality of the fence alignment. Based on preliminary findings the proposed planting will result in a compensatory planting ratio of 1:1 (new planting: trees recommended for felling). This compares favourably with the report's assertion that some 357 trees would be felled due to the proposed works. With the proposed preservation of existing trees, transplantation of trees in conflict with the proposals and the planting of new trees the project area will contain approximately 2000 trees. Trees forming part of the new planting will provide screening to neighbourhood villagers and will utilise species native to Hong Kong. These proposals will be subject to review at detailed design stage of the project.	The planting proposal seeks to compensate for the predicted tree loss.	Contractor	Site	Throughout design phase	TM-EIA Annex 18, HKPSG and BD
Cultural Heritage							
During Construction							

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
8.7.1 – 8.7.4	8.1.1 – 8.1.4	An archaeological survey should be undertaken at the study areas of Pak Fu Shan and Lin Ma Hang of Section 3 after land resumption and before commencement of construction works	Assess the archaeological impact on the two identified sites of archaeological potential.	Contractor (through professional archaeologist)	the study areas of Pak Fu Shan and Lin Ma Hang of Section 3	after land resumption and before commencement of construction works	Antiquities and Monuments Ordinance / EIAO
8.7.6	8.2.1	Built Heritage Resources Mitigation in the form of buffer zones and safe public access have been proposed for one shrine (BF-HB1) and two graves (BF-G1 and G2) BF-HB1 A buffer zone of a minimum distance of 1 metre should be established between the shrine and any construction works in close proximity. The buffer zone should be marked out by temporary fencing. Safe public access should be provided to the shrine during any construction works in close proximity. BF-G1 and BF-G2 A buffer zone of a minimum distance of 1 metre should be established between the graves and any construction works in close proximity. The buffer zone should be marked out by temporary fencing. Safe public access should be provided to the graves during any construction works in close proximity.	Avoid impacts to built heritage resources	Contractor	The works that are located in the vicinity of built heritage resources (BF-HB1 and BF-G1 and G2)	During Construction	EIAO

12 SUMMARY AND CONCLUSIONS

12.1 Summary

12.1.1 The impacts associated with the construction and operation of the Project are assessed according to the criteria listed in Annexes of the Technical Memorandum on Environmental Impact Assessment Process (TMEIA). The major potential impacts during construction and operation associated with the boundary fences are assessed.

12.2 Conclusions

12.2.1 The conclusions of the technical assessments are described below.

Air Quality

12.2.2 The dust control requirements of the Air Pollution Control (Construction Dust) Regulation will be followed to control the dust emission arising from the construction activities. It is expected no adverse impact to the surroundings or nearby sensitive receivers. During operational phase, no adverse impact is anticipated

Noise Impact

12.2.3 During the construction phase, the assessments have demonstrated that there no exceedances of noise criteria provided that the mitigation measures implemented properly.

12.2.4 For the proposed new boundary patrol road near Hoo Hok Wai and Pak Fu Shan, it is anticipated that the road traffic generated would be minimal as there are mainly police patrol cars and maintenance cars (e.g. WSD, DSD etc.) travelling along the boundary patrol road. A worst-case assumption of road traffic flow and the percentage of heavy vehicle has been adopted in the prediction, it is concluded that potential road traffic noise impact would comply with the noise criteria stipulated in the EIAO-TM.

Water Quality Impact

12.2.5 Water quality impacts for adjacent natural rivers, streams and fish ponds during the construction phase will be controlled through the implementation of good site practice. During operation, sewers and associated facilities should be provided to collect the domestic waste generated in the sanitary facilities inside the Checkpoints. No adverse water quality impacts are anticipated.

Waste Management

12.2.6 The construction activities generate waste types include site clearance, C&D material, chemical waste from the maintenance of construction plant and equipment and general refuse from the workforce. Provided that these wastes are handled, transported and disposed of using approved methods and that the recommended good site practices are followed, adverse environmental impacts are not expected during the construction phase.

12.2.7 The potential land contamination for this Project is expected to be low. No adverse

environmental impacts are expected during operational phase. No site investigations or laboratory testing are proposed.

12.2.8 The waste type generated during the operational phase is a small amount of general refuse, which will have no adverse environmental impact.

Ecological Impact Assessment

12.2.9 An Ecological Impact Assessment had been conducted for the proposed project. Ecological surveys were carried out in November 2007 to October 2008 which covered both wet and dry seasons.

12.2.10 A total of 15 habitat types were identified within the Assessment Area, including woodland, shrubland, plantation, gei wai, mangrove, pond, marsh, wet agricultural land, dry agricultural land, abandoned agricultural land / low-lying grassland, hillside grassland, stream / river, drainage channel, open field and developed area.

12.2.11 Two individuals of flora species of conservation interest, *Berchemia lineata* and *Aquilaria sinensis* were recorded within the Project Area at Section 2 and Section 3 respectively. In-situ preservation and providing protective fencing during construction period are recommended to avoid potential impact on these plants.

12.2.12 The construction works at WCA without mitigation measures would have adverse impact on the ecology of the area notably the wetland-depended birds roosting in the Mai Po Nature Reserve and the surrounding fishponds. To avoid the potential disturbance to these ecological sensitive receivers, avoidance of construction works using PMEs in WCA during the wintering period (15th November to 15th March) is recommended.

12.2.13 Excavation works at Mai Po during the ardeid breeding season (from 1st March to 31th July) should not be carried out to prevent potential disturbance to the Tam Kon Chau egretry.

Landscape and Visual Impact Assessment

12.2.14 The potential landscape and visual impacts during the construction and operational stages are considered to be acceptable given the full implementation of the proposed mitigation measures. This is largely due to the proposed alignment of the SBF will closely follow the alignment for the existing boundary fence for much of its length and so the impacts on the landscape resources and character and visual amenity available to VSRs are not likely to be significant. In addition the movement of the fence to follow the new red alignment in some locations will benefit the landscape character of these areas and improve the visual amenity available to the adjacent villagers.

Cultural Heritage Impact Assessment

12.2.15 Based on the findings of the baseline study, only the proposed new boundary road alignments at Pak Fu Shan and Lin Ma Hang of Section 3 have some archaeological potential. As part of those areas currently cannot be accessed, an archaeological survey should be undertaken after land resumption and before commencement of construction works.

12.2.16 No major adverse impacts towards built heritage have been identified. Minor impacts may occur during the construction phase to resources in close proximity to the proposed construction works. No adverse impacts are expected to arise during the operational phase of the project. The project will not cause any insurmountable impacts to built heritage resources if the mitigation measures as recommended are properly implemented.

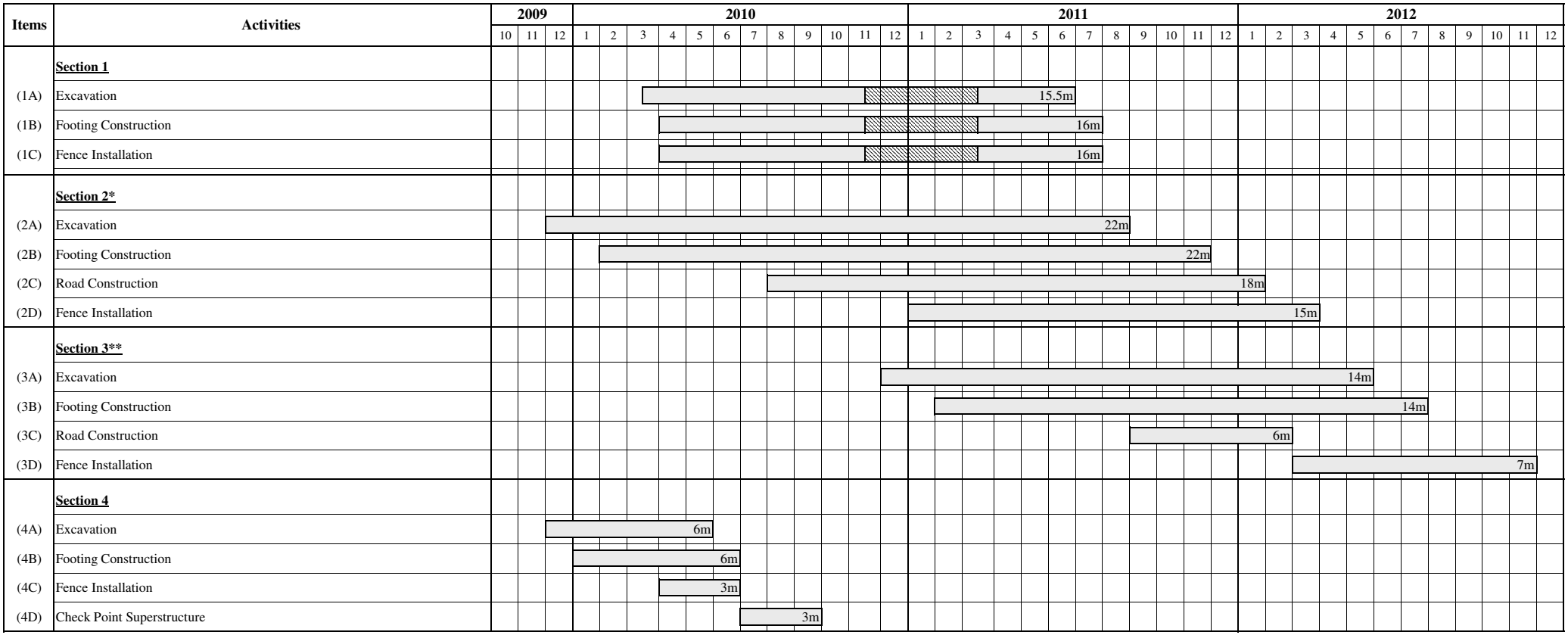
APPENDICES

APPENDIX A

Tentative Construction Programme

Appendix A Tentative Construction Programme

Construction of a Secondary Boundary Fence and New Sections of Primary Boundary Fence and Boundary Patrol Road (Sections 1-4)



Remarks:

Construction works are restricted. Please refer to Sections 6.6.46 and 6.10.4 for details.

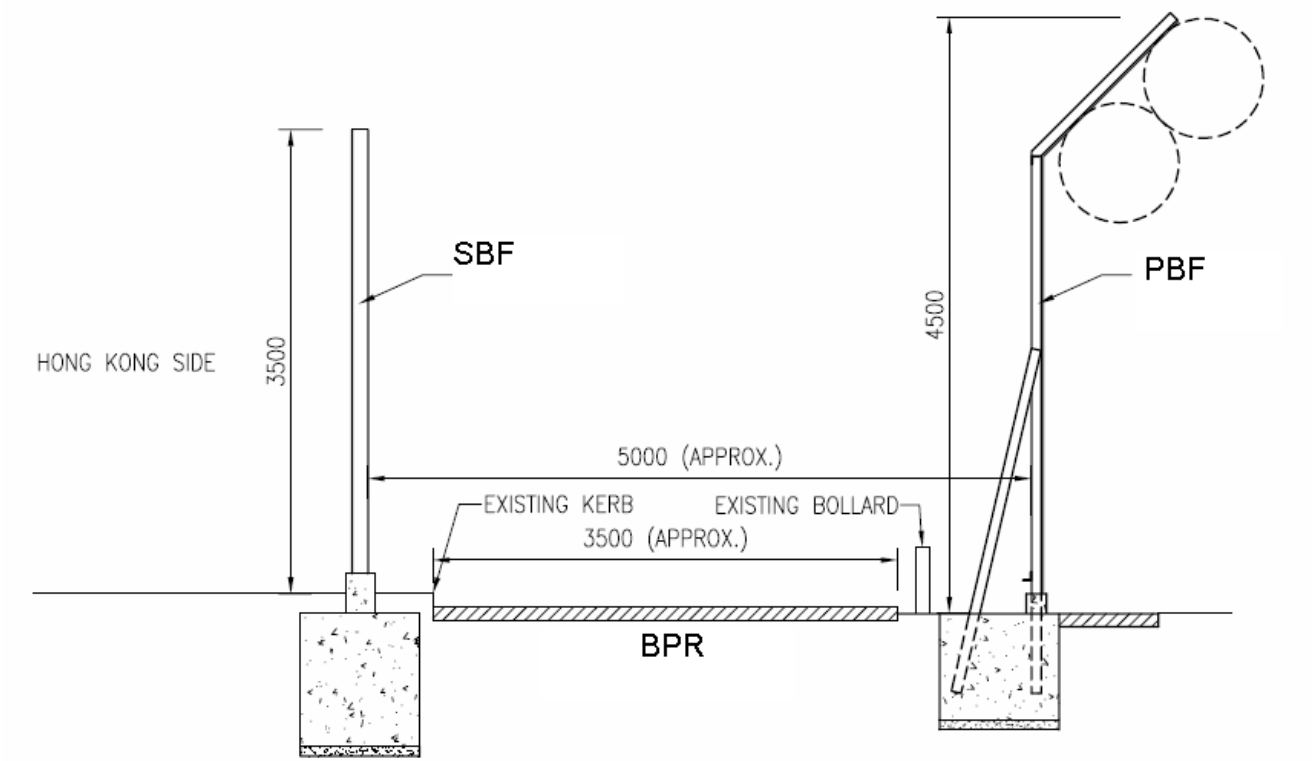
* The completion date would be subject to the schedule of the advance river training works for Liantang/Heung Yuen Wai Boundary Control Point as described in Section 1.8.4.

** The construction programme of Section 3 excludes the works at the interface section with Liantang/Heung Yuen Wai Boundary Control Point (BCP) as described in Sections 1.8.2 and 1.8.3, the completion date of which would be subject to the schedule of the advance river training works for the BCP and the BCP construction works.

APPENDIX B

Typical Cross Sections of Proposed PBF, SBF, BPR and Checkpoints

Appendix B1 Typical Cross Sections of Proposed PBF, SBF and BPR



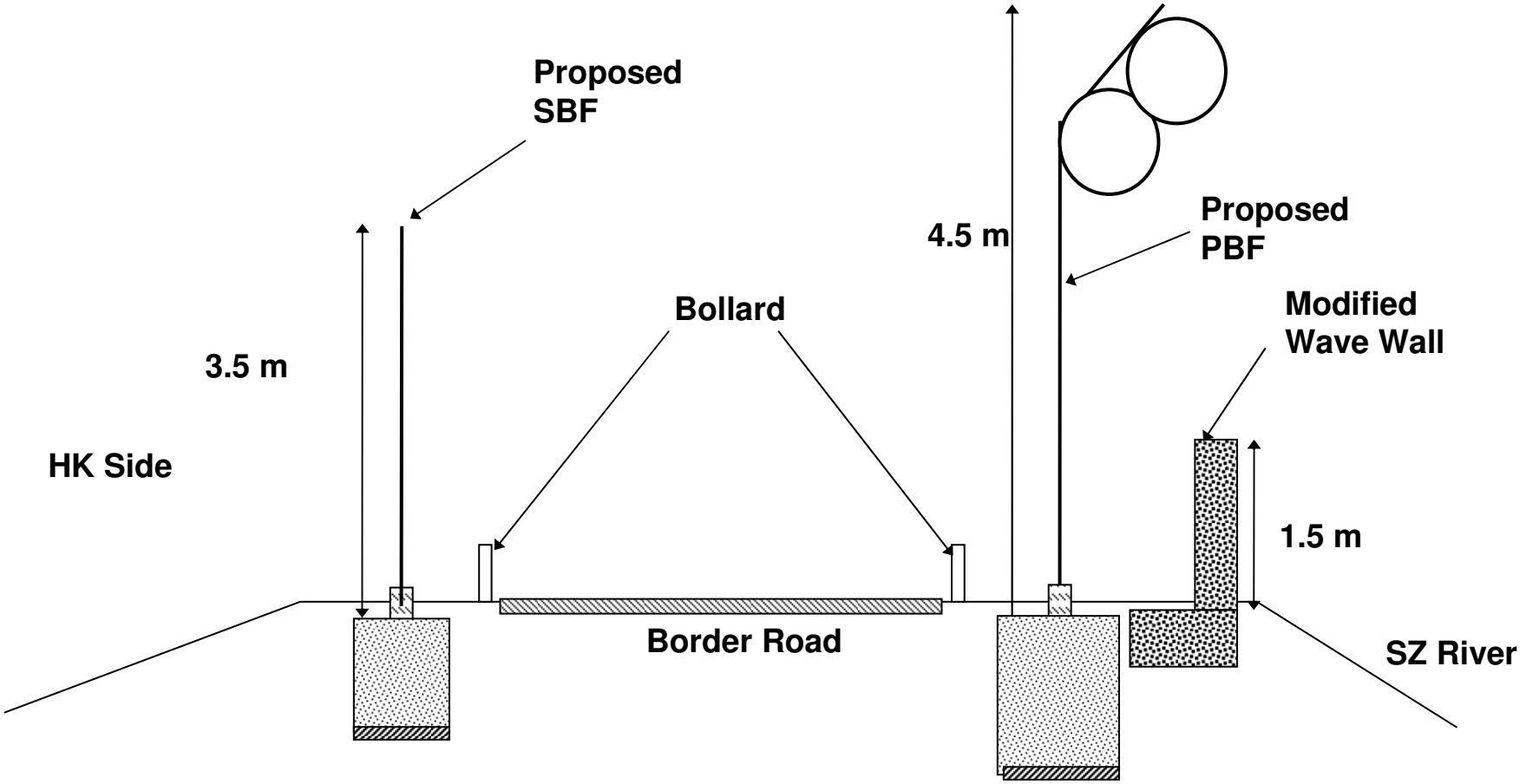
TYPICAL SECTIONS OF SBF, PBF AND BPR

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE NOTED.
2. ALL SIZES AND DIMENSIONS ARE TO BE VERIFIED ON SITE PRIOR TO FABTICATION AND INSTALLATION .
3. COLOUR SAMPLES ARE TO BE SUMBMITTED AND APPROVED TO THE ARCHITECT PRIOR TO FABRICATION

Appendix B2

Typical Cross Sections of Border Road in Section 2

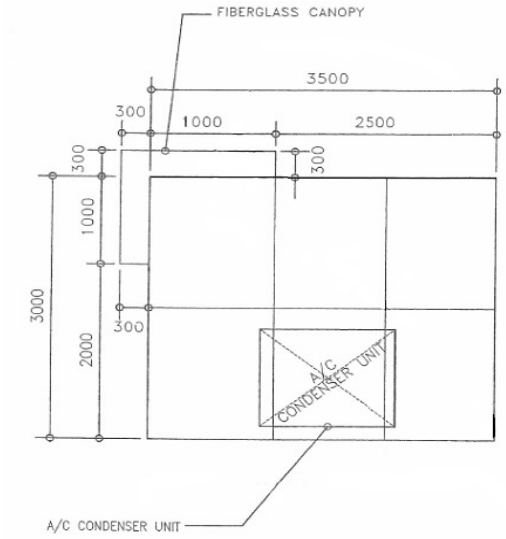


GENERAL NOTES:

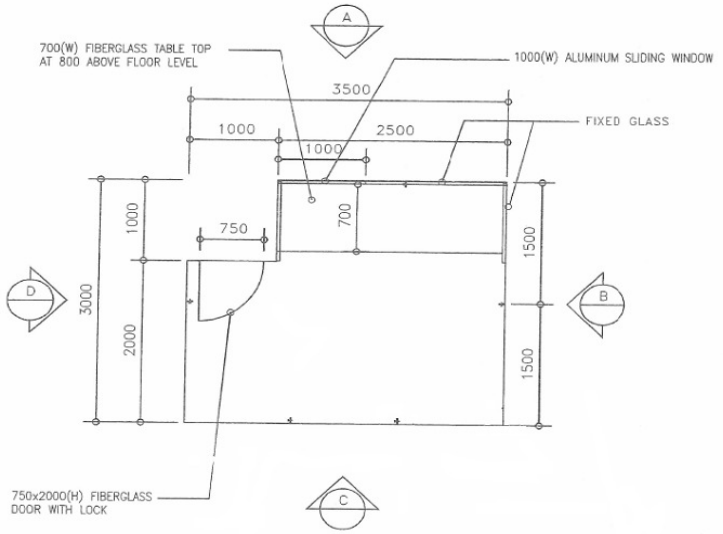
1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE NOTED.
2. ALL SIZES AND DIMENSIONS ARE TO BE VERIFIED ON SITE PRIOR TO FABTICATION AND INSTALLATION .
3. COLOUR SAMPLES ARE TO BE SUMBMITTED AND APPROVED TO THE ARCHITECT PRIOR TO FABRICATION

Appendix B3

Typical Cross Sections of Proposed Checkpoints (1)



2 ROOF PLAN

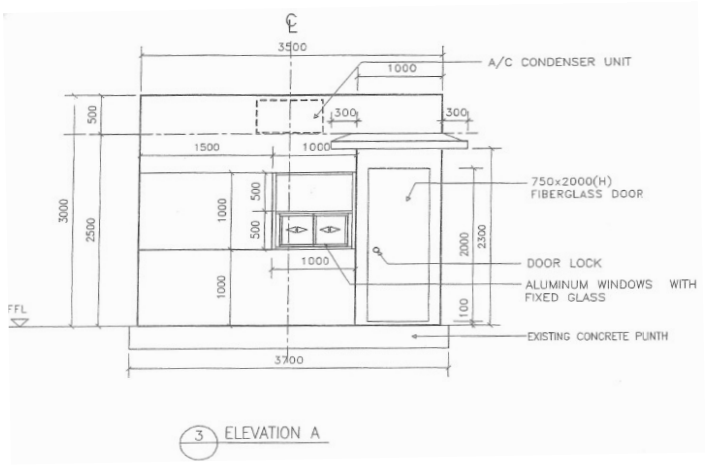


1 FLOOR PLAN

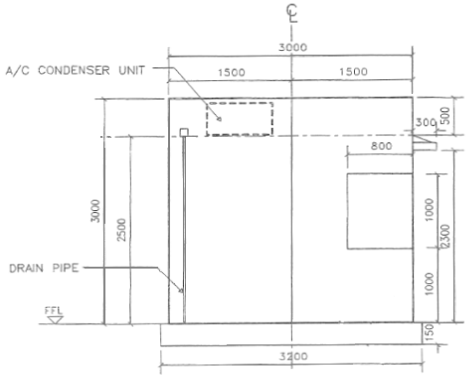
GENERAL NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE NOTED.
2. ALL SIZES AND DIMENSIONS ARE TO BE VERIFIED ON SITE PRIOR TO FABTICATION AND INSTALLATION .
3. COLOUR SAMPLES ARE TO BE SUMBMITTED AND APPROVED TO THE ARCHITECT PRIOR TO FABRICATION

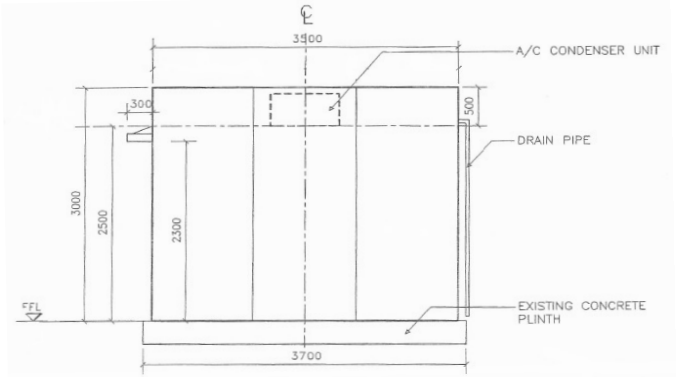
Appendix B4 Typical Cross Sections of Proposed Checkpoints (2)



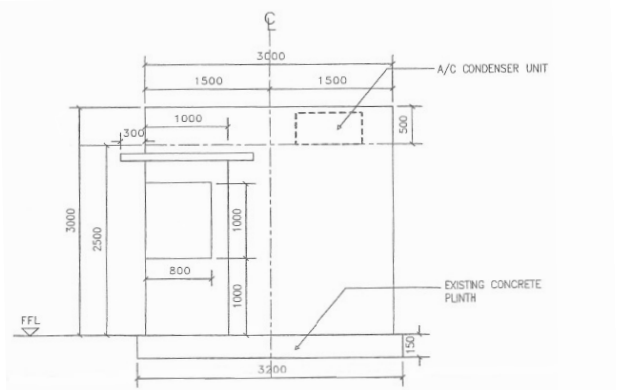
3 ELEVATION A



2 ELEVATION B



5 ELEVATION C



6 ELEVATION D

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE NOTED.
2. ALL SIZES AND DIMENSIONS ARE TO BE VERIFIED ON SITE PRIOR TO FABTICATION AND INSTALLATION .
3. COLOUR SAMPLES ARE TO BE SUMBMITTED AND APPROVED TO THE ARCHITECT PRIOR TO FABRICATION

APPENDIX C

Construction Noise Impact Assessment

APPENDIX C1

Relevant Correspondences with Planning Department and Lands Department

規劃署
屯門及元朗規劃處
新界沙田上禾輋路一號
沙田政府合署 14 樓

Planning Department
Tuen Mun and Yuen Long
District Planning Office
14/F., Sha Tin Government Offices,
No. 1, Sheung Wo Che Road,
Sha Tin, N.T.

來函檔號 Your Reference: KMY/TI/WHC/WKC/T216727/07.01/L-0519
本署檔號 Our Reference: ( ) in PDYL 2/10/62 Pt II
電話號碼 Tel. No.: 2158 6289
傳真機號碼 Fax No.: 2489 9711

1 December 2008

Urgent by fax 2827 1823 and Post

Mott MacDonald Hong Kong Limited
7th Floor West Wing Office Building
New World Centre
20 Salisbury Road
Tsim Sha Tsui, Kowloon
Hong Kong
(Attn.: Mr. W.H. CHEUNG)

Dear Sir,

Agreement No. 9SN005
Construction of a Secondary Boundary Fence and
New Sections of Primary Boundary Fence and Boundary Patrol Road
EIA- Planned and Committed Noise Sensitive Uses

I refer to your letter of 20.11.2008 which was received by this office on 24.11.2008 regarding the captioned.

For both temporary and permanent development, provision of the San Tin Outline Zoning Plan, Mai Po & Fairview Park Outline Zoning Plan should be observed. With regard to approved development proposal in the area, please be advised that there is neither rezoning application approved nor any planned/committed development including residential/school/hotel development within the 300m assessment area of the proposed boundary fence. However, a planning application No. A/YL-ST/313 for temporary open storage of new left-hand-drive vehicles prior to sale was approved by the Rural and New Town Planning Committee on 21.7.2006 up to 21.7.2009 within the subject 300m assessment area (extract plan attached). Apart from the above, the Board on 17.5.1996 agreed to defer a review application No. A/DPA/YL-MP/31 for a residential development beyond 30.8.1996 upon the request of the applicant (extract plan attached). There is no information indicating whether the applicant will or will not proceed with the review application.

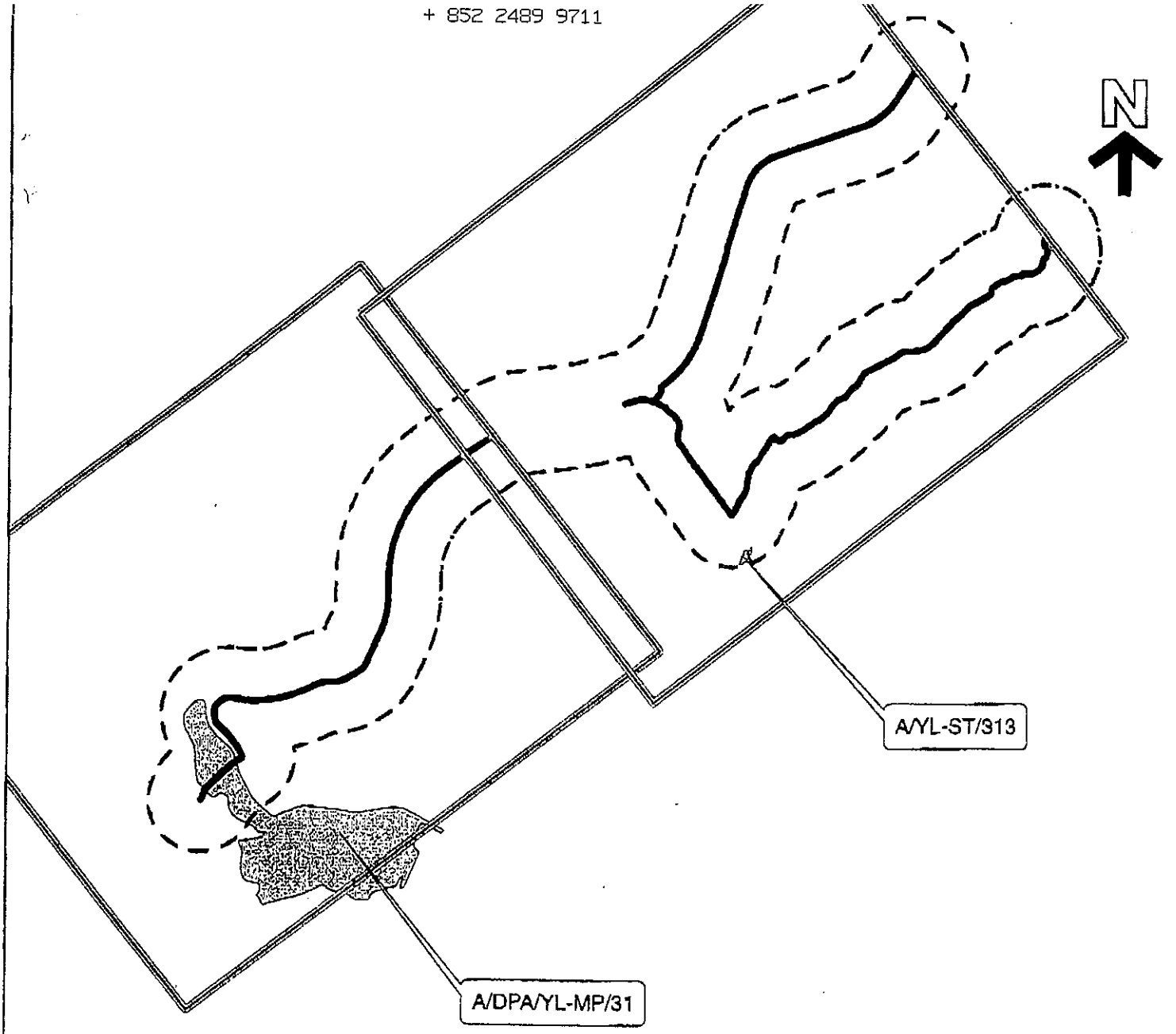
Should you need further information, please feel free to contact me at 2158 6289.

Yours faithfully

(Ms. Vienna TONG)
for District Planning Officer/TMYL
Planning Department

C.C.
DPO/STN (Attn.: Ms. Stephanie LAI)
CTP/SR (Attn.: Mr. Terry CHAO)

VT/vt [L1_planned uses]



Legend

Study Area

Lengend

- 300m Assessment Area
- Proposed Secondary Boundary Fence along Existing Boundary Patrol Road
- Proposed New Boundary Patrol Road with Primary and Secondary Boundary Fences
- Existing Boundary Fence to be Removed
- Frame of Figure 3.2
- Frame of Figure 3.3
- Application

Reference	Construction of a Secondary Boundary Fence and New Sections of Primary Boundary Fence and Boundary Patrol Road	TUEN MUN AND YUEN LONG DISTRICT PLANNING OFFICE **PLANNING DEPARTMENT**
Extracted from	Scale 1: 35000	
Date : 01-December-2008	Site Boundary Subject to Detailed Land Survey	

Chiu, Waikwan

From: leylp22@landsd.gov.hk
Sent: 28 November 2008 12:29
To: Chiu, Waikwan
Cc: Cheung, WH
Subject: Re: Information Request for Secondary Boundary Fence

Importance: High

Attachments: Letter 20081120.pdf

Letter
!0081120.pdf (1 MB

Dear Mr. CHIU,

I refer to my telephone conversations with you and your W. H. CHEUNG this morning and would like to advise you that I am not in the position to release the information to you. It is because, as informed by you, the information might be released to the public.

(T. S. KONG)
for DLO/YL
Tel. : 2443-1063

"Chiu, Waikwan"
<Waikwan.Chiu@mottmac.com.hk>

To: <leylp22@landsd.gov.hk>
cc:
Subject: Information Request for Secondary Boundary Fence

27-11-2008 18:09

Dear Mr. Kong,

As discussed on the phone today afternoon, please find attached the letter regarding the information request for the Planned/ Comitted Noise Sensitive Uses for EIA purpose.

Due to the tight EIA programe, gratefully if you could provide us the reply by 2 December 2008.

If have any queries, feel free to contact me at 2828-5808.

Best regards,
W K Chiu

Environmental Division
Mott MacDonald Hong Kong Limited
(See attached file: Letter 20081120.pdf)

Chiu, Waikwan

From: Cheung, WH
Sent: 28 November 2008 17:57
To: Chiu, Waikwan
Subject: FW: EIA - Planned and Committed Noise Sensitive Uses

F.Y.I.

-----Original Message-----
From: lena4@landsd.gov.hk [mailto:lena4@landsd.gov.hk]
Sent: Friday, November 28, 2008 5:55 PM
To: Cheung, WH
Subject: EIA - Planned and Committed Noise Sensitive Uses

Dear Mr. Cheung,

I refer to your letter dated 20 November 2008 and our teleconversation today. Please be informed that I am not in a position to release the information to you as you revealed that the required information might be released to the public.

Regards,
Shirley Wong
LE/A4
DLO/N
2675 1744

Mott MacDonald

7th Floor
West Wing Office Building
New World Centre
20 Salisbury Road
Tsim Sha Tsui, Kowloon
Hong Kong

T +852 2828 5757
F +852 2827 1823
W www.mottmac.com.hk

Our Ref.: KMY/TI/WHC/WKC/T216727/07.01/L-0519

20 November 2008

See distribution

Dear Sirs/Madams,

Agreement No. 9SN005
Construction of a Secondary Boundary Fence and
New sections of Primary Boundary Fence and Boundary Patrol Road
EIA – Planned and Committed Noise Sensitive Uses

We are currently preparing an Environmental Impact Assessment Report for the captioned project. The 300m assessment area of the proposed boundary fence, boundary patrol road and checkpoints from Mai Po to Sha Tau Kok are shown on the attached layout plan. The assessment area lines within the latest Outline Zoning Plan Statutory Plans 'Mai Po & Fairview Park OZP – S/YL-MP/6'; 'San Tin OZP – S/YL-ST/8' and Fu Tei Au & Sha Ling OZP – S/NE-FTA/10' and some unzoned areas. As requested by the Environmental Protection Department, we would be grateful if you could advise the followings:

(i) whether there are any plans of rezoning of existing zones to sensitive uses in place;
(ii) whether there are any planned / committed development, such as residential building, school and hotel, etc. in place or approved recently within the assessment area; and
(iii) location and time of implementation of the development if there are any plans that outlining the unzoned area and rezoning of the existing zones to other sensitive uses are in place or approved applications in record.

Due to the tight schedule of the project, your reply on or before 27 November 2008 will be appreciated. Should you have any further queries, please feel free to contact our Mr. W.K. Chiu on 2828 5808 or the undersigned on 2828 5744.

Yours sincerely
for MOTT MACDONALD HONG KONG LIMITED

W.H. Cheung

Encl.

c.c. ArchSD: Mr. Y.F. Cheung (PM225) / Mr. Sammy Yue (PM254)
EPD: Ms. Sally Fung

Distribution List

Department	Contact
Planning Department District Planning Branch New Territories District Planning Division Sha Tin, Tai Po and North District Planning Office 13/F Sha Tin Government Offices, 1 Sheung Wo Che Road, Shatin New Territories (one copy)	Ms. Lai Pik Hung, Stephanie
Planning Department District Planning Branch New Territories District Planning Division Tuen Mun and Yuen Long District Planning Office 14/F Sha Tin Government Offices, 1 Sheung Wo Che Road, Shatin New Territories (one copy)	Ms. Tong Yuet King, Vienna
Lands Department Lands Administration Office District Lands Office, Yuen Long 9th-11th floors Yuen Long Government Offices 2 Kiu Lok Square Yuen Long New Territories (one copy)	Mr. T.S Kong
Lands Department Lands Administration Office District Lands Office, North 6th floor, North District Government Offices, 3 Pik Fung Road, Fanling, New Territories (one copy)	Ms. H.K. Wong

APPENDIX C2

Unmitigated Construction Noise Impact

PME	TM or other reference	No. of PME	SWL, dB(A)/ unit	Percentage On Time	Total SWL, dB(A)
Activity 1 - Excavation					
Group 1					
Breaker, mini-robot mounted	[1]	1	115	100%	115
				Total	**115**
Group 2					
Excavator, mini-robot mounted	[1]	1	94	100%	94
Generator, standard	CNP 101	1	108	100%	108
Water pump (electric)	CNP 281	1	88	100%	88
				Total	**108**
Group 3					
Lorry	CNP 141	1	112	50%	109
				Total	**109**
				Max. of Activity 1	**115**
Activity 2 - Footing Construction					
Group 1					
Lorry	CNP 141	1	112	50%	109
				Total	**109**
Group 2					
Generator, standard	CNP 101	1	108	100%	108
Bar bender and cutter (electric)	CNP 021	1	90	100%	90
Water pump (electric)	CNP 281	1	88	100%	88
				Total	**108**
Group 3					
Compactor, vibratory	CNP 050	1	105	100%	105
Concrete lorry mixer	CNP 044	1	109	100%	109
				Total	**110**
				Max. of Activity 2	**110**
Activity 3 - Fence Installation					
Group 1					
Lorry	CNP 141	1	112	50%	109
				Total	**109**
Group 2					
Generator, standard	CNP 101	1	108	100%	108
Drill/grinder, hand-held (electric)	CNP 065	1	98	100%	98
				Total	**108**
				Max. of Activity 3	**109**
Activity 4 - Road Construction					
Group 1					
Lorry	CNP 141	1	112	50%	109
				Total	**109**
Group 2					
Excavator, mini-robot mounted	[1]	1	94	100%	94
				Total	**94**
Group 3					
Road roller	CNP 185	1	108	100%	108
				Total	**108**
				Max. of Activity 4	**109**
Activity 5 - Check Point Superstructure					
Group 1					
Excavator, mini-robot mounted	[1]	1	94	100%	94
				Total	**94**
Group 2					
Lorry	CNP 141	1	112	50%	109
				Total	**109**
Group 3					
Generator, standard	CNP 101	1	108	100%	108
Bar bender and cutter (electric)	CNP 021	1	90	100%	90
				Total	**108**
Group 4					
Compactor, vibratory	CNP 050	1	105	100%	105
Concrete lorry mixer	CNP 044	1	109	100%	109
Concrete pump, stationary/ lorry mounted	CNP 047	1	109	100%	109
				Total	**113**
				Max. of Activity 5	**113**
Activity 6 - Demolition of Existing Boundary Fence and Check Points					
Group 1					
Generator, standard	CNP 101	1	108	100%	108
Drill/grinder, hand-held (electric)	CNP 065	1	98	100%	98
				Total	**108**
Group 2					
Breaker, mini-robot mounted	[1]	1	115	100%	115
				Total	**115**
Group 3					
Excavator, mini-robot mounted	[1]	1	94	100%	94
				Total	**94**
Group 4					
Lorry	CNP 141	1	112	50%	109
				Total	**109**
				Max. of Activity 6	**115**

Note [1]: Details extracted from EPD website: http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

NSRs		Slant Distance to the Nearest Construction Activities, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Construction Activities and Maximum SWL (apart from Loading and Uploading Activities), dB(A)														Slant Distance to the Lorry, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Section 1 - 4	Maximum SPL, dB(A)
					Section 1			Section 2				Section 3				Section 4								
					Excavation (1A)	Footing Construction (1B)	Fence Installation (1C)	Excavation (2A)	Footing Construction (2B)	Road Construction (2C)	Fence Installation (2D)	Excavation (3A)	Footing Construction (3B)	Road Construction (3C)	Fence Installation (3D)	Excavation (4A)	Footing Construction (4B)	Fence Installation (4C)	Check Point Superstructure (4D)				Loading and Uploading Activities with the use of Lorry	
					115	110	108	115	110	108	108	115	110	108	108	115	110	108	113				109	
Section 1	VH01	44.4	-41	3	77	73	70													64.4	-44	3	68	77
	VH02	58.9	-43	3	75	70	68													78.9	-46	3	66	75
	VH03	147.0	-51	3	67	62	60													167.0	-52	3	60	67
Section 2	HAT01	206.0	-54	3				64	59	57	57									226.0	-55	3	57	64
	TYL01	204.3	-54	3				64	59	57	57									224.3	-55	3	57	64
Section 3	LW01	103.2	-48	3								70	65	63	63					123.2	-50	3	62	70
	LW02	60.9	-44	3								74	70	67	68					80.9	-46	3	66	74
	MW01	129.8	-50	3								68	63	61	61					149.8	-52	3	60	68
	MW02	77.9	-46	3								72	68	65	66					97.9	-48	3	64	72
	TKL01	43.2	-41	3								77	73	70	71					63.2	-44	3	68	77
	KL01	18.2	-33	3								85	80	78	78					38.2	-40	3	72	85
	CY01	106.3	-49	3								69	65	62	63					126.3	-50	3	62	69
	WL01	101.9	-48	3								70	65	63	63					121.9	-50	3	62	70
	WL02	85.1	-47	3								71	67	64	65					105.1	-48	3	64	71
	WL03	155.1	-52	3								66	62	59	60					175.1	-53	3	59	66
Section 4	STK01	41.5	-40	3												78	73	71		61.5	-44	3	68	78
		131.9	-50	3															65	151.9	-52	3	60	
	STK02	100.4	-48	3												70	65	63		120.4	-50	3	62	70
		235.0	-55	3															60	255.0	-56	3	56	
	STK03	16.4	-32	3												86	81	79		36.4	-39	3	73	86
		72.5	-45	3															71	92.5	-47	3	65	
	STK04	91.3	-47	3												71	66	64		111.3	-49	3	63	71
		169.0	-53	3															63	189.0	-54	3	58	

Demolition of Existing Boundary Fence (Unmitigated)

NSRs		Slant Distance to the Nearest Demolition Activities, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Demolition Activities and Maximum SWL, dB(A)		Slant Distance to the Lorry, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Section 2 - 3	Maximum SPL, dB(A)
					Section 2	Section 3					
					Demolition of Existing Boundary Fence	Demolition of Existing Boundary Fence				Loading and Uploading Activities with the use of Lorry	
					115	115				109	
Section 2	HAT01	8.9	-27	3	91		28.9	-37	3	75	91
	LMC01	20.6	-34	3	84		40.6	-40	3	72	84
	LMC02	73.4	-45	3	73		93.4	-47	3	65	73
	LMC03	55.0	-43	3	75		75.0	-46	3	66	75
	V01	11.1	-29	3	89		31.1	-38	3	74	89
	PH01	7.4	-25	3	93		27.4	-37	3	75	93
	MTL01	15.4	-32	3	86		35.4	-39	3	73	86
	LP01	117.8	-49	3	69		137.8	-51	3	61	69
	TYL01	4.2	-20	3	98		24.2	-36	3	76	98
Section 3	WL01	49.1	-42	3		76	69.1	-45	3	67	76
	WL02	6.3	-24	3		94	26.3	-36	3	76	94

NSRs		Slant Distance to the Nearest Demolition Activities, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Demolition Activities and Maximum SWL, dB(A)				Slant Distance to the Nearest Demolition Activities, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Section 1 - 4	Maximum SPL, dB(A)
					Section 1	Section 2	Section 3	Section 4				Loading and Uploading Activities with the use of Lorry	
					Demolition of Check Point	Demolition of Check Point	Demolition of Check Point	Demolition of Check Point					
					115	115	115	115				109	
Section 1	VH01	75.0	-46	3	72				95.0	-48	3	64	72
Section 2	LMC03	53.0	-42	3		76			73.0	-45	3	67	76
Section 3	SL01	149.0	-51	3			67		169.0	-53	3	59	67
Section 3	PC01	59.0	-43	3			75		79.0	-46	3	66	75
Section 4	STK05	110.5	-49	3				69	130.5	-50	3	62	69

APPENDIX C3

Mitigated Construction Noise Impact (Level 1)

PME	TM or other reference	No. of PME	SWL, dB(A)/ unit	Barrier Correction, dB(A)	Percentage On Time	Total SWL, dB(A)
Activity 1 - Excavation						
Group 1						
Breaker, excavator mounted (hydraulic), 52kW	BS 5228 Table C.8/12	1	106	-5	100%	101
					Total	**101**
Group 2						
Excavator, mini-robot mounted	[1]	1	94	-5	100%	89
Generator, super silenced, 70 dB(A) at 7 m	CNP 103	1	95	-10	100%	85
Water pump (electric)	CNP 281	1	88	-10	100%	78
					Total	**91**
Group 3						
Lorry (35 t)	BS 5228 Table C.3/59	1	105	0	50%	102
					Total	**102**
					Max. of Activity 1	**102**
Activity 2 - Footing Construction						
Group 1						
Lorry (35 t)	BS 5228 Table C.3/59	1	105	0	50%	102
					Total	**102**
Group 2						
Generator, super silenced, 70 dB(A) at 7 m	CNP 103	1	95	-10	100%	85
Bar bender and cutter (electric)	CNP 021	1	90	0	100%	90
Water pump (electric)	CNP 281	1	88	-10	100%	78
					Total	**91**
Group 3						
Compactor, vibratory	CNP 050	1	105	-5	100%	100
Concrete lorry mixer (6m3)	BS 5228 Table C.6/23	1	100	0	100%	100
					Total	**103**
					Max. of Activity 2	**103**
Activity 3 - Fence Installation						
Group 1						
Lorry (35 t)	BS 5228 Table C.3/59	1	105	0	50%	102
					Total	**102**
Group 2						
Generator, super silenced, 70 dB(A) at 7 m	CNP 103	1	95	-10	100%	85
Drill/grinder, hand-held (electric)	CNP 065	1	98	-5	100%	93
					Total	**94**
					Max. of Activity 3	**102**
Activity 4 - Road Construction						
Group 1						
Lorry (35 t)	BS 5228 Table C.3/59	1	105	0	50%	102
					Total	**102**
Group 2						
Excavator, mini-robot mounted	[1]	1	94	-5	100%	89
					Total	**89**
Group 3						
Road roller	BS 5228 Table C.8/30	1	101	-5	100%	96
					Total	**96**
					Max. of Activity 4	**102**
Activity 5 - Check Point Superstructure						
Group 1						
Excavator, mini-robot mounted	[1]	1	94	-5	100%	89
					Total	**89**
Group 2						
Lorry (35 t)	BS 5228 Table C.3/59	1	105	0	50%	102
					Total	**102**
Group 3						
Generator, super silenced, 70 dB(A) at 7 m	CNP 103	1	95	-10	100%	85
Bar bender and cutter (electric)	CNP 021	1	90	0	100%	90
					Total	**91**
Group 4						
Compactor, vibratory	CNP 050	1	105	-5	100%	100
Concrete lorry mixer (6m3)	BS 5228 Table C.6/23	1	100	0	100%	100
Concrete pump (100kW)	BS 5228 Table C.6/36	1	106	-10	100%	96
					Total	**104**
					Max. of Activity 5	**104**
Activity 6 - Demolition of Existing Boundary Fence and Check Points						
Group 1						
Generator, super silenced, 70 dB(A) at 7 m	CNP 103	1	95	-10	100%	85
Drill/grinder, hand-held (electric)	CNP 065	1	98	-5	100%	93
					Total	**94**
Group 2						
Breaker, excavator mounted (hydraulic), 52kW	BS 5228 Table C.8/12	1	106	-5	100%	101
					Total	**101**
Group 3						
Excavator, mini-robot mounted	[1]	1	94	-5	100%	89
					Total	**89**
Group 4						
Lorry (35 t)	BS 5228 Table C.3/59	1	105	0	50%	102
					Total	**102**
					Max. of Activity 6	**102**

Note [1]: Details extracted from EPD website: http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

NSRs		Slant Distance to the Nearest Construction Activities, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Construction Activities and Maximum SWL (apart from Loading and Uploading Activities), dB(A)																Slant Distance to the Lorry, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Section 1 - 4	Maximum SPL, dB(A)
					Section 1			Section 2				Section 3				Section 4									
					Excavation (1A)	Footing Construction (1B)	Fence Installation (1C)	Excavation (2A)	Footing Construction (2B)	Road Construction (2C)	Fence Installation (2D)	Excavation (3A)	Footing Construction (3B)	Road Construction (3C)	Fence Installation (3D)	Excavation (4A)	Footing Construction (4B)	Fence Installation (4C)	Check Point Superstructure (4D)				Loading and Uploading Activities with the use of Lorry	
					101	103	94	101	103	96	94	101	103	96	94	101	103	94	104				102	
Section 1	VH01	44.4	-41	3	63	65	56													64.4	-44	3	61	65
Section 3	TKL01	43.2	-41	3								63	65	58	56					63.2	-44	3	61	65
	KL01	18.2	-33	3								71	73	66	63					38.2	-40	3	65	73
Section 4	STK01	41.5	-40	3												64	66	56		61.5	-44	3	61	66
		131.9	-50	3															56	151.9	-52	3	53	
	STK03	16.4	-32	3												72	74	64		36.4	-39	3	66	74
		72.5	-45	3															62	92.5	-47	3	58	

Demolition of Existing Boundary Fence (Mitigated- Level 1)

NSRs		Slant Distance to the Nearest Demolition Activities, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Demolition Activities and Maximum SWL, dB(A)		Slant Distance to the Lorry, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Section 2 - 3	Maximum SPL, dB(A)
					Section 2	Section 3					
					Demolition of Existing Boundary Fence	Demolition of Existing Boundary Fence				Loading and Uploading Activities with the use of Lorry	
					101	101				102	
Section 2	HAT01	8.9	-27	3	77		28.9	-37	3	68	77
	LMC01	20.6	-34	3	70		40.6	-40	3	65	70
	V01	11.1	-29	3	75		31.1	-38	3	67	75
	PH01	7.4	-25	3	79		27.4	-37	3	68	79
	MTL01	15.4	-32	3	72		35.4	-39	3	66	72
	TYL01	4.2	-20	3	84		24.2	-36	3	69	84
Section 3	WL01	49.1	-42	3		62	69.1	-45	3	60	62
	WL02	6.3	-24	3		80	26.3	-36	3	69	80

NSRs		Slant Distance to the Nearest Demolition Activities, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Demolition Activities and Maximum SWL, dB(A)			
					Section 1	Section 2	Section 3	Section 4
					Demolition of Check Point 101	Demolition of Check Point 101	Demolition of Check Point 101	Demolition of Check Point 101
Section 2	LMC03	53.0	-42	3		62		

Slant Distance to the Nearest Demolition Activities, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Section 1 - 4	Maximum SPL, dB(A)
			Loading and Uploading Activities with the use of Lorry 102	
73.0	-45	3	60	62

APPENDIX C4

Mitigated Construction Noise Impact (Level 2)

PME	TM or other reference	No. of PME	SWL, dB(A)/ unit	Barrier Correction, dB(A)	Percentage On Time	Total SWL, dB(A)
Activity 6 - Demolition of Existing Boundary Fence and Check Points						
Group 1						
Welder/ Generator, super silenced, 70 dB(A) at 7m	CNP 103	1	95	-10	100%	85
					Total	**85**
Group 2						
Breaker, hand-held, mass > 10kg and < 20kg	CNP 024	1	108	-10	20%	91
Concrete crusher mini robot mounted	[1]	1	94	-5	80%	88
					Total	**93**
Group 3						
Excavator, mini-robot mounted	N/A	1	94	-5	100%	89
					Total	**89**
Group 4						
Lorry (35 t)	BS 5228 Table C.3/59	1	105	0	50%	102
					Total	**102**
					Max. of Activity 6	**102**

Note [1]: Details extracted from EPD website: http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

NSRs		Slant Distance to the Nearest Demolition Activities, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Demolition Activities and Maximum SWL, dB(A)		Slant Distance to the Lorry, (m)	Distance Correction, dB(A)	Façade Correction, dB(A)	Section 2 - 3	Maximum SPL, dB(A)
					Section 2	Section 3					
					Demolition of Existing Boundary Fence	Demolition of Existing Boundary Fence				Loading and Uploading Activities with the use of Lorry	
					93	93				102	
Section 2	HAT01	8.9	-27	3	69		28.9	-37	3	68	69
	PH01	7.4	-25	3	70		27.4	-37	3	68	70
	TYL01	4.2	-20	3	75		24.2	-36	3	69	75
Section 3	WL02	6.3	-24	3		72	26.3	-36	3	69	72

APPENDIX D

(Not Used)

APPENDIX E

Waste Management

Appendix E-1A

Questionnaire for land use history and possible site contamination

CHECKLIST FOR BOUNDARY PATROL ROAD

In which year (approximately) started the use as Boundary Patrol Road in the area:

_____

Type of operation, land use, or status of the area before used as Boundary Patrol Road:

_____

Please indicate whether the following materials have been used, stored or generated on the site:

Materials	Possible Source	Yes/No	Method of Disposal (historical & current), if applicable (see *Note* below)
1. Fuels	Petroleum storage, LPG storage		
2. Lubricating oils, hydraulic fluids	Spillage, maintenance and dismantling of equipment scrapped tanks and pipeworks, vehicle maintenance		
3. Cleaning solvents	Engine room and equipment maintenance		
4. Used chemical solutions	Engine coolant, battery fluid		
5. Acids	Treating steel plate to remove millscale		
6. Asbestos	Application and removal of engine room insulation		

Materials	Possible Source	Yes/No	Method of Disposal (historical & current), if applicable (see *Note* below)
7. Transformer oil (PCB)	Scrapped electrical equipment		
8. Anti-corrosive paints, thinners	Application of anti-corrosive coatings		
9. Coal, ash, oily tank and bilge sludge	Boiler room/engine room maintenance, tank cleaning		
10. Finely divided metal wastes	Grinding and milling operations, especially welding joints		
11. Electrical wiring	Electrical installation, maintenance, scrapped electrical equipment		
12. Low-level radioactive waste	Scrapped instruments		
13. Wood preservatives	timber treatment		
14. Polyurethane foam	Hull manufacture/ maintenance		

Note: Methods of disposal include:

i) collection by a municipal solid waste collector;
ii) collection by a licensed chemical waste collector;
iii) disposal to foul sewer in liquid form;
iv) disposal to storm drain in liquid form;
v) burial at pits within the site.

Appendix E-1B

Reply from Drainage Services Department

CHECKLIST FOR CHECKPOINT

In which year (approximately) started the use as Checkpoint in the area:

_____

Type of operation, land use, or status of the area before used as Checkpoint:

_____

Please indicate whether the following materials have been used, stored or generated on the site:

Materials	Possible Source	Yes/No	Method of Disposal (historical & current), if applicable (see *Note* below)
1. Fuels	Petroleum storage, LPG storage		
2. Lubricating oils, hydraulic fluids	Spillage, maintenance and dismantling of equipment scrapped tanks and pipeworks, vehicle maintenance		
3. Cleaning solvents	Engine room and equipment maintenance		
4. Used chemical solutions	Engine coolant, battery fluid		
5. Acids	Treating steel plate to remove millscale		
6. Asbestos	Application and removal of engine room insulation		

Materials	Possible Source	Yes/No	Method of Disposal (historical & current), if applicable (see *Note* below)
7. Transformer oil (PCB)	Scrapped electrical equipment		
8. Anti-corrosive paints, thinners	Application of anti-corrosive coatings		
9. Coal, ash, oily tank and bilge sludge	Boiler room/engine room maintenance, tank cleaning		
10. Finely divided metal wastes	Grinding and milling operations, especially welding joints		
11. Electrical wiring	Electrical installation, maintenance, scrapped electrical equipment		
12. Low-level radioactive waste	Scrapped instruments		
13. Wood preservatives	timber treatment		
14. Polyurethane foam	Hull manufacture/ maintenance		

Note: Methods of disposal include:

i) collection by a municipal solid waste collector;
ii) collection by a licensed chemical waste collector;
iii) disposal to foul sewer in liquid form;
iv) disposal to storm drain in liquid form;
v) burial at pits within the site.

Drainage Services Department
Mainland North Division
14/F, Kowloon Government Offices,
405 Nathan Road, Kowloon

渠務署
新界北渠務部
九龍彌敦道 405 號
九龍政府合署 14 樓

本署檔號 Our Ref : (71245) in MN 11/N/527
來函檔號 Your Ref : KMY/PEJ/TI/WHC/HC/T216727/07.01?L-0482
電 話 (852) 2300 1629
Telephone : (852) 2770 4761
圖文傳真 Fax :

By Fax (2827 1823)

25 September 2008

Mott Connell
7th Floor,
West Wing Office Building
New World Centre
20 Salisbury Road
Tsim Sha Tsui, Kowloon
Hong Kong
(Attn: W.H. Cheung)

Dear Sir/Madam,

Agreement No. 9SN005
Construction of Secondary Boundary Fence and
New sections of Primary Boundary Fence and Boundary Patrol Road
Questionnaires for Possible Site Contamination and Land Use History

The existing maintenance access was constructed under Stage I and Stage II of the Shenzhen River Regulation Project and the access have been used since 1997. Most of the lands used for the river regulation project are originally fish ponds or landscaping areas.

Please note that we have no records on the possibility of land contamination of the area of the existing maintenance access as shown in your plan.

Yours faithfully,

(P.S. LI)
for Chief Engineer/Mainland North
Drainage Services Department

15

c.c.
CE/DP – Attn: Mr. W.H. Poon (Fax No.: 2827 8700)

Internal:
E/MR1 by eDMS

MAINLAND NORTH
DIVISION, D.S.D.
26 SEP 2008
DESPATCHED

Chung, Hasina

From:	winghongpoon@dsd.gov.hk
Sent:	24 September 2008 16:55
To:	psli@dsd.gov.hk
Cc:	Chung, Hasina
Subject:	Re: Fw: (eDMS) Mott Connell: Agreement No. 9SN005
Attachments:	07D5-2-1-04.pdf; 07D5-2-1-01.pdf; 07D5-2-1-02.pdf; MCL's letter.PDF; Drg SZR-002 (Stage I to III).pdf

Dear Mr. Li,

Please be advised that the existing access was constructed under Stage I and Stage II of the Shenzhen River Regulation Project (attached plan refers). Stage I works was completed in April 1997 while Contract A of Stage II, Phase II works was completed in May 1999.

Moreover, most of the lands used for the river regulation project are orginally fish ponds or landscaping areas.

Regards,
WH POON
E/D14, DSD
Tel. 2594 7450

Po Sum LI/MND/DSD/HKSARG
2008/09/24 下午 04:00

To Wing Hong POON/DPD/DSD/HKSARG@DSD
cc KW YUEN/MND/DSD/HKSARG@DSD
Subject Re: Fw: (eDMS) Mott Connell: Agreement No. 9SN005Link

Dear Mr Poon,

Thanks. Do you know when we start using the maintainence access?

Regards
PS LI
E/TP4

Wing Hong POON/DPD/DSD/HKSARG

2008/09/24 下午 12:13

To Po Sum LI/MND/DSD/HKSARG@DSD

cc hasina.chung@mottconnell.com.hk

Subject Re: Fw: (eDMS) Mott Connell: Agreement No. 9SN005Link

Dear Mr. Li,

Please be advised that under Shenzhen River Regulation Project (Stage I & II), we have no records on the land use history nor possibility of land contamination of the area of the existing maintenance access as shown on Mott Connell's plan.

However, please be adivsed that as the Shenzhen River (the old river) had not been dredged for many years before the commencement of the Regulation Project, unconsolidated sediments on the old river bottom were polluted (as per EIA report of the project). It is therefore during the construction project, part of the contaminated and uncontaminated excavated materials were disposed at the Lok Ma Chau Loop area which fall within the vicinity of Mott Connell's concerned areas. In this connection, I attach the as-built drawings of the Lok Ma Chau Loop Area for their information.

Should you require any further information, please feel free to contact me.

Regards,
WH POON
E/D14, DSD
Tel. 2594 7450

Po Sum LI/MND/DSD/HKSARG
2008/09/24 上午 11:19

To Wing Hong POON/DPD/DSD/HKSARG@DSD
cc
Subject Fw: (eDMS) Mott Connell: Agreement No. 9SN005

Dear Mr Poon,

As discussed, please check any use of material as stated and fill-in the checklist.
Many thanks.

Regards
PS LI
E/TP4, MN

----- Forwarded by Po Sum LI/MND/DSD/HKSARG on 2008/09/24 上午 11:17 -----

Po Sum LI/MND/DSD/HKSARG

2008/09/05 下午 04:03

To HW NGAI/DPD/DSD/HKSARG
cc
Subject Fw: (eDMS) Mott Connell: Agreement No. 9SN005

Dear Mr. Ngai,

Does your team have any such information? May I have your reply by 9.9.2008 please?

Regards

PS LI
E/TP4

----- Forwarded by Po Sum LI/MND/DSD/HKSARG on 2008/09/05 下午 04:01 -----

KW YUEN/MND/DSD/HKSARG

2008/09/05 上午 10:43

To Po Sum LI/MND/DSD/HKSARG@DSD

cc Chun Kee WONG/DSD/HKSARG@DSD

Subject Re: (eDMS) Mott Connell: Agreement No. 9SN005
Construction of a Secondary Boundary Fence and
New sections of Primary Boundory Fence and Boundary Patrol Road
Questionnaires for Possible Site Contamination and Land Use History (Ref : MND-20080903-00069438)Link

Dear PS,

Please be advised that no information regarding land use history and land contamination on the maintenance access is kept by our team. You may ask DPD if they have such information as they are the project office of Regulation of Shenzhen River.

Esther K W Yuen
Tel. 2300 1595 Fax 2770 4761
Mainland North Division
Drainage Services Department
==========

BK KWOK/DSD/HKSARG
2008/09/04 上午 10:35

To Po Sum LI/MND/DSD/HKSARG@DSD

cc KW YUEN/MND/DSD/HKSARG@DSD

Subject (eDMS) Mott Connell: Agreement No. 9SN005
Construction of a Secondary Boundary Fence and
New sections of Primary Boundory Fence and Boundary Patrol Road
Questionnaires for Possible Site Contamination and Land Use History (Ref : MND-20080903-00069438)

Please co-ordinate inputs from the DM team and CE/DP. Lands D should be the major contributor but DSD needs to point out whether in-situ disposal of contaminated mud has taken place along Shenzhen River as part of its training projects.

Please see the attached document sent to you by BK KWOK.

Link http://ASDSD04N/MND/MNDDoclib.nsf/vDocByUNID/EB83FC9C1BC37FF7482574B900187CBB

To access a document, please click on the yellow icon. Colleagues at remote offices please click on the link instead.
Thank you for using the Electronic Document Management System.

Document Profile:

Reference : 11/N/527
Serial Number : MND-20080903-00069438
Received/Dispatched Date 2008/9/3
From Mott Connell
To DSD

北
N

深 圳 經 濟 特 區
SHENZHEN SPECIAL ECONOMIC ZONE

第二期第二階段合約A
31CD - Stage II Phase II Contract A

第三期
90CD - Stage III

第一期
24CD - Stage I

第二期第二階段合約B
31CD - Stage II Phase II Contract B

第二期第一階段
44CD - Stage II Phase I

沙灣河
SHA WAN RIVER

平原河
RIVER GANGES

文錦渡
MAN KAM TO

老鼠嶺
LO SHUE LING

馬草壟
MA TSO LUNG

料壆
LIU POK

羅湖
LO WU

梧桐河
RIVER INDUS

落馬洲
LOK MA CHAU

福田
FUTIAN

后海灣
DEEP BAY

米埔
MAI PO

圖則名稱 drawing title

治 理 深 圳 河 計 劃
SHENZHEN RIVER REGULATION PROJECT

參考編號 ref. no.	比例 scale	日期 date
SZR - 002	N.T.S	AS AT JAN. 2001

部門 office

排 水 工 程 部
DRAINAGE PROJECTS DIVISION

香港特別行政區政府渠務署
DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE
HONG KONG
SPECIAL ADMINISTRATIVE REGION

$$plotter$$ $$pentable$$ $$colortable$$ $$dgnfile$$

N

浆砌石护坡

排水涵

深圳河旧河曲

落马洲旧河曲

排水暗涵

落马洲水文站

接堤外排水沟

水塘、洼地

低洼地

落马洲排水箱涵

堤顶

排水管

福田河

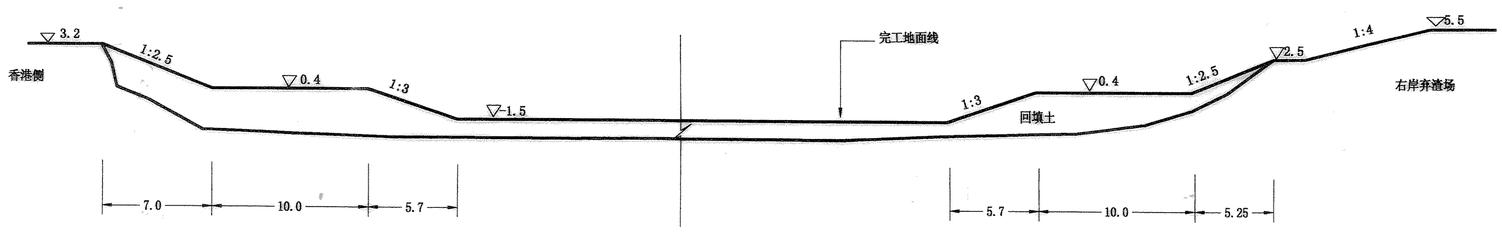
深圳河旧河曲

图例说明

1、 ═══ ：排水沟

2、 □ ：集水井

3、 图中座标为深圳河独立座标系
高程为黄海基面高程



落马洲旧河出境工断面图

治理深圳河第二期第二阶段工程竣工图			
雇主	深圳市治理深圳河办公室		
设计	广东省水利电力勘测设计研究院 / 安建顾问公司		
监理	珠江水利委员会勘测设计研究院		
	长江水利委员会工程建设监理中心		
承建商	深圳市瑞沃建设有限公司		
承建商		工程主任代表	雇主（代表）
审定			
校核			
制图			
CAD			
图名	落马洲弃土场平面图		
图号	0705-2-1-04	比例	1:2000

新 河 轴 线
AXIS OF NEW CHANNEL

一期工程 STAGE I

淋溶水应急处理池
EMERGENCY TREATMENT POND FOR BUPERNATANT

Ⅲ池

Ⅱ池

工池

上 河 段 填 土 区
SOLL FILLING AREA IN UPPER REACHES

上下河段填土分界线
BONDARY LINE OF FILLING SOIL BETWEEN UPPER AND LOWER REACHES

下 河 段 填 土 区
SOLL FILLING AREA IN LOWER REACHES

落马洲旧河道
EXISTING LOK MA CHAU CHANNEL

香港
HONG KONG

1.2 -3.0 -3.1 -2.7 0.2 -2.6 0.5 -2.5 0.7 1.3 -3.0 0.3 -2.6 0.1 0.5 0.3 -2.5 -2.6 0.2 -2.5 -0.1 -2.3 0.6 -2.6 -0.2 -2.4 0.2 -2.4 0.3

4.0 4.3 4.0 5.5 4.5 4.5 4.2 4.5 5.5 5.5

说明：

在弃置污染土期间，位于旧福田河的 Ⅰ、Ⅱ、Ⅲ池需保留，作为污水处理之用。

NOTES:

DURING DISPOSAL OF CONTAMINATED MUD, PONDS Ⅰ, Ⅱ AND Ⅲ ALONG OLD FUTIAN RIVER SHALL BE MAINTAINED FOR TREATMENT PURPOSES

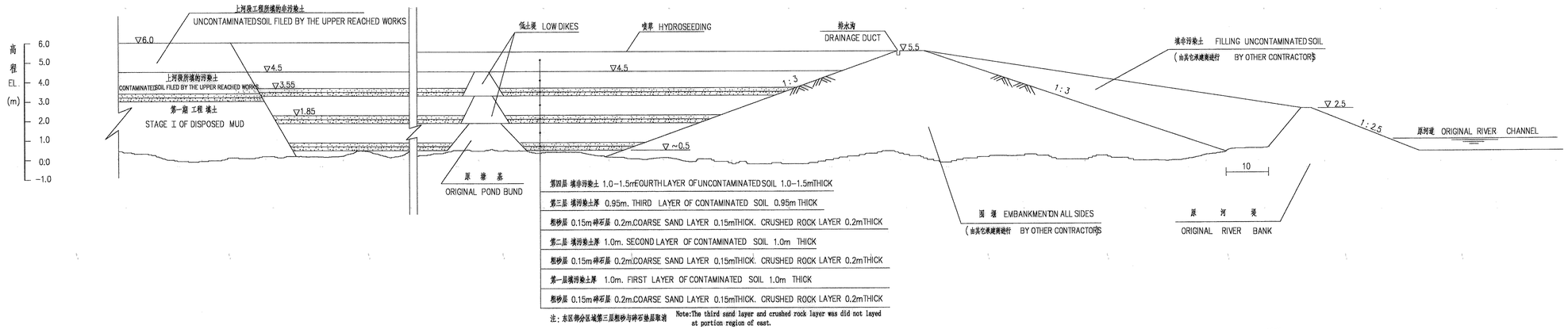
图例 LEGEND

围堰 EMBANKMENT ON ALL SIDES

上下河段填土分界线 BONDARY LINE OF FILLING SOIL BETWEEN UPPER AND LOWER REACHES

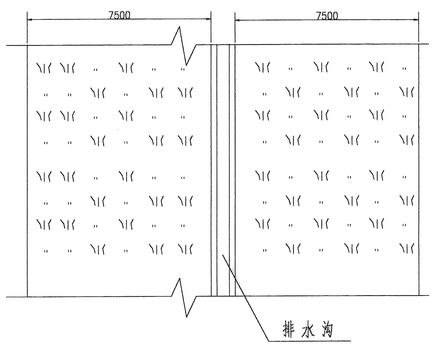
填土控制高程 CONTROL ELEVATION FOR SOIL FILLING

治理深圳河第二期第二阶段工程竣工图			
业主	深圳市治理深圳河办公室		
设计	广东省水利电力勘测设计研究院 / 安建顾问公司		
监理	珠江水利委员会勘测设计研究院		
	长江水利委员会工程建设监理中心		
承建商	深圳市瑞沃建设有限公司		
承建商		工程主任代表	业主(代表)
审定			
校核			
制图			
CAD			
图名	落马洲 芦土场二期第二阶段工程下河段填土布置图		
图号	07DS-2-1-01	比例	1:2000

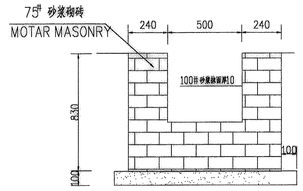


注：东区围垦区域第三层粗砂与碎石垫层取消 Note:The third sand layer and crushed rock layer was did not layed at portion region of east.

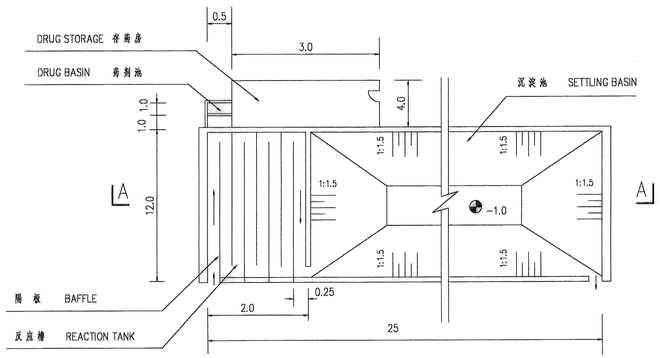
Ⅰ—Ⅰ 剖 面 图 1:100
Ⅰ—Ⅰ SECTION



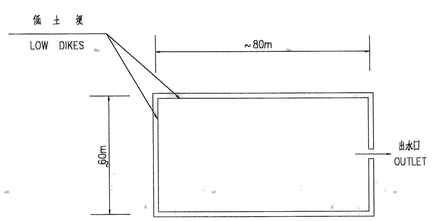
喷 草 局 部 图 1:100
PART PLAN OF HYDROSEEDING



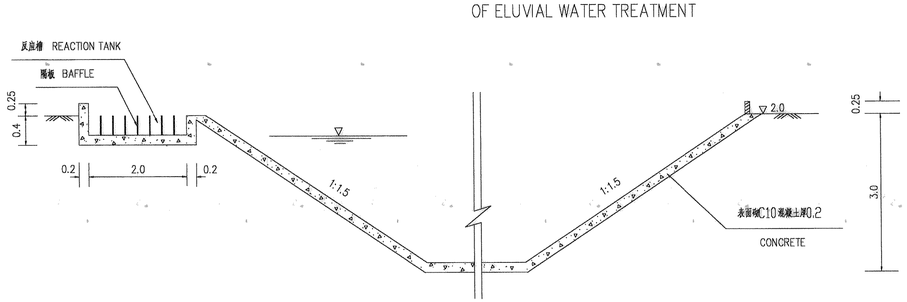
排 水 沟 断 面 图 1:25
SECTION OF DRAINAGE DUCT



淋溶水处理工艺平面图 1:200 1:50
PLAN OF TECHNOLOGICAL PROCESS OF ELUVIAL WATER TREATMENT



污染土脱水分隔池平面图 1:1000
LAYOUT PLAN OF SEPARATION POOL FOR CONTAMINATED SOIL DEWATERING



A—A 剖 面 1:50
A—A SECTION

说明：

1. 图中尺寸单位均为米。
2. 高程为黄基高程。
3. 污染土填筑 第一层以现有塘基作低围堤地面适当平整后布设脱水层； 第二三层应修筑 低围堤形成分隔池(按 80x60m分隔)。
4. Ⅰ—Ⅰ 剖面系指图 07D5-2-1-2 的Ⅰ—Ⅰ 剖面。

NOTES:

1. ALL DIMENSIONS ARE IN m;
2. YELLOW SEA DATUM ARE USED;
3. CONCERNING THE FILLING OF CONTAMINATED SOIL. FOR THE FIRST LAYER. THE EXISTING POND BUND IS USED FOR LOWER EMBANKMENT THE DEHYDRATION LAYER IS PLACED AFTER, LAND LEVELING; FOR THE SECOND AND THIRD LAYER, LOWER EMBANKMENT SHALL BE CONSTRUCTEDTO FORM SEPARATION POOL (80X60m).
4. CROSS SECTIONⅠ—Ⅰ REFERS TO THE CROSS SECTIONⅠ—Ⅰ OF DRAWING 07D5-2-1-2.

治理深圳河第二期第二阶段工程竣工图			
雇主	深圳市治理深圳河办公室		
设计	广东省水利电力勘测设计研究院 / 安建顾问公司		
监理	珠江水利委员会勘测设计研究院		
	长江水利委员会工程建设监理中心		
承建商	深圳市瑞沃建设有限公司		
承建商		工程主任代表	雇主(代表)
审定			
校核			
制图			
CAD	2007.6		
图名	落马洲井土场下河段填土细部及剖面图		
图号	07D5-2-1-02	比例	见 图

Drainage Services Department
Mainland North Division
14/F, Kowloon Government Offices,
405 Nathan Road, Kowloon

渠務署
新界北渠務部
九龍彌敦道 405 號
九龍政府合署 14 樓

By Fax: 2827 1823

本署檔號 Our Ref : (00063441) in 11/N/527/
來函檔號 Your Ref :KMY/PEJ/TI/TTA/WHC/HC/T216727/07.01/L-0452
電 話(852) 2332 9713
Telephone : (852) 2770 4761
圖文傳真 Fax :

30 June, 2008

Mott Connell
(attn; Taj Ishola)

Dear Sir/Madam,

Agreement No. 9SN005
Construction of a Secondary Boundary Fence and
New sections of Primary Boundary Fence and Boundary Patrol Road
Questionnaires for Possible Site Contamination

I refer to your letter dated 12 June 2008 and submit a nil return.

Yours faithfully,

(PF NG)
for Chief Engineer/Mainland North
Drainage Services Department

	To	Action	Informan	Copy	Sign	D
1	Taj					3/7
2	Mike					7/7
Rec'd	03 JUL 2008					
3						
4	PG					
File No. T216727/07.01					Mott Connell	

Appendix E-1C

Reply from Hong Kong Police Force

Chung, Hasina

From: IP-SIP-OPS-SUP-TRG-BORDIST@police.gov.hk
Sent: 17 July 2008 18:36
To: Chung, Hasina
Subject: RE: Secondary Boundary Fence EIA - Questionnaires for Possible Site Contamination

Hasina

Police did not use, stored or generated item 7 - 14 on the Boundary Patrol Road. As to the Checkpoints, only anti-corrosive paints have been used on the drop bars and associated metalwork, and electrical wiring of course for the supply of electricity.

Regards
Jack WONG
SIP OS & TRG BORDIST
2668 3576 (mob 97239866)

"Chung, Hasina" <Hasina.Chung@mottconnell.com.hk>
2008-07-14 16:37

To: ip-sip-ops-sup-trg-bordist/BORDIST/STATION/POLICE/HKSARG@HPF
cc: "Wong, Peter" <Peter.Wong@mottmac.com>, "Chan, Julia" <Julia.Chan@mottconnell.com.hk>, "Cheung, WH" <WH.Cheung@mottconnell.com.hk>
Subject: RE: Secondary Boundary Fence EIA - Questionnaires for Possible Site Contamination

|----------|
| ( ) GR to file |
| ( ) Self-file |
( ) Non-Record

Dear Jack,

We would be grateful if you could advise, as soon as possible, whether the materials list on the Page 2 of the questionnaire (Item 7-14, as listed below for the ease of your reference) also had not been used, stored or generated on the site.

The items are:

7) Transformer oil (PCB)
8) Anti-corrosive paints, thinners
9) Coal, ash, oily tank and bilge sludge
10) Finely divided metal wastes
11) Electrical wiring
12) Low-level radioactive waste
13) Wood preservatives
14) Polyurethane foam

Thank you very much.

Regards,

Hasina Chung
Assistant Environmental Consultant

Mott Connell Ltd.
7th Floor
West Wing Office Building
New World Centre

20 Salisbury Road
Tsim Sha Tsui, Kowloon
Hong Kong
Dir. Line: +852 2828 5932
Fax. no.: +852 2827 1823

-----Original Message-----
From: Chung, Hasina
Sent: 08 July 2008 17:45
To: ''
Cc:
Subject: RE: Secondary Boundary Fence EIA - Questionnaires for Possible Site Contamination

Dear Jack,

Thank you very much for reply. They do help a lot in our works.
I am writing to re-confirm whether the materials listed on the Page 2 of the questionnaire (Item 7-14, as listed below for the ease of your
reference) also had not been used, stored or generated on the site.

The items are:

7) Transformer oil (PCB)
8) Anti-corrosive paints, thinners
9) Coal, ash, oily tank and bilge sludge
10) Finely divided metal wastes
11) Electrical wiring
12) Low-level radioactive waste
13) Wood preservatives
14) Polyurethane foam

We would be grateful to hear from you as soon as possible. Thanks again for your help.

Regards,

Hasina Chung
Assistant Environmental Consultant

Mott Connell Ltd.
7th Floor
West Wing Office Building
New World Centre
20 Salisbury Road
Tsim Sha Tsui, Kowloon
Hong Kong
Dir. Line: +852 2828 5932
Fax. no.: +852 2827 1823

-----Original Message-----
From: IP-SIP-OPS-SUP-TRG-BORDIST@police.gov.hk
[mailto:IP-SIP-OPS-SUP-TRG-BORDIST@police.gov.hk]
Sent: 04 July 2008 17:35
To: Chung, Hasina
Cc: Wong, Peter; Chan, Julia; Cheung, WH
Subject: Re: Secondary Boundary Fence EIA - Questionnaires for Possible Site Contamination

Dear Hasina,

Our replies are attached. (See attached file: CHECKLIST FOR BOUNDARY PATROL ROAD.doc)(See attached file: CHECKLIST FOR CHECKPOINTS.doc)

Jack WONG
SIP OS & TRG BORDIST
2668 3576 (mob 97239866)

"Chung, Hasina"

<Hasina.Chung@mottconn To:
ip-sip-ops-sup-trg-bordist/BORDIST/STATION/POLICE/HKSARG@HPF

ell.com.hk> cc: "Wong,
Peter" <Peter.Wong@mottmac.com>, "Chan, Julia"

<Julia.Chan@mottconnell.com.hk>, "Cheung, WH"
<WH.Cheung@mottconnell.com.hk>
2008-06-27 15:05 Subject: Secondary
Boundary Fence EIA - Questionnaires for Possible Site Contamination
|----------|

| ( ) GR to file |

| ( ) Self-file |

| ( ) Non-Record |

|----------|

Dear Mr Wong,

Further to our phone conversation this morning about the letter dated 12 June 2008, I attached a scanned copy of the letter for your ease of reference. Another hard copy is also sent to you this afternoon for your kind advices.

In order to meet the tight programme of the Assignment, we would be grateful if you could finish the questionnaire and return to us by 4 July 2008. Should you have any queries, please contact me by mail or on 28285932.

Regards,

Hasina Chung
Assistant Environmental Consultant

Mott Connell Ltd.
7th Floor
West Wing Office Building
New World Centre
20 Salisbury Road
Tsim Sha Tsui, Kowloon
Hong Kong
Dir. Line: +852 2828 5932
Fax. no.: +852 2827 1823

Attached File 1 from HKPF

CHECKLIST FOR BOUNDARY PATROL ROAD

In which year started the use as Boundary Patrol Road?

The Boundary Patrol Road is situated at the boundary between HKSRA and Shenzhen. The area immediately south of the boundary is declared a Closed Area under the Public Order Ordinance, CAP 245 since 1951.

There have been vast changes across the border since 1962 when China withdrew its army and police units. Within days, tens of thousands of people swept south over the river, to be rounded up and returned. Until 1980, most of those who swam Deep Bay or sneaked over the border were allowed to stay, provided they had reached the urban areas. Since then, with our society straining under the enormous burden of new arrivals, China and Hong Kong have agreed to repatriate all those who arrived illegally. After a worrying influx in 1979, British Army units were stationed on the Sino-British border to bolster hard-pressed policemen. But in 1990, the Police began to take back sole responsibility for the security of the land border.

According to our knowledge, the Boundary Patrol Road was originally built by the British Army over a period of time along with the old border fence and other security feature, such observation towers. Police formally took over the security facilities, including road, from the British Army in 1990.

Type of operation, land use or status of the area before used as Boundary Patrol Road:
Rural area immediately due south of the boundary with no specific land use.

Please indicate whether the following material have been used stored, or generated on the site:

After taken over by the Police, the following material had not been used, stored or generated by the Police in the site:

Fuel, lubricating oil, hydraulic oil, cleaning solvents, used chemical solution, acids and asbestos.

Attached File 2 from HKPF

CHECKLIST FOR :

(a) PAK HO CHAU CHECKPOINT
(b) LOK MA CHAU CHECKPOINT
(c) SHA LING CHECKPOINT
(d) PING CHE CHECKPOINT
(e) SHEK CHUNG AU CHECKPOINT
(f) GATE ONE CHECKPOINT

In which year started the use as Checkpoint in the area?

The area immediately due south of the boundary is declared a Closed Area, i.e. the FCA, under the Public Order Ordinance, CAP 245 since 1951. Access to the FCA was control by the above Checkpoints, except GATE ONE Checkpoint. Originally a curfew, imposed under the same ordinance, was in force from midnight to 0400 hours since 1956. However, it was cancelled with effect from August 1994.

There have been vast changes across the border since 1962 when China withdrew its army and police units. Within days, tens of thousands of people swept south over the river, to be rounded up and returned. Until 1980, most of those who swam Deep Bay or sneaked over the border were allowed to stay, provided they had reached the urban areas. Since then, with our society straining under the enormous burden of new arrivals, China and Hong Kong have agreed to repatriate all those who arrived illegally. After a worrying influx in 1979, British Army units were stationed on the Sino-British border to bolster hard-pressed policemen. But in 1990, the Police began to take back sole responsibility for the security of the land border.

According to our knowledge, the above Checkpoints were originally built by the British Army. With the exception of GATE ONE Checkpoint which was designed to regulate access to Sha Tau Kok Village only, all other Checkpoint were built to regulate access to the FCA. In 1990, Police formally took over the Checkpoints along with other security features from the British Army.

Nowadays, the PAK HOK CHAU and GATE ONE Checkpoint are no longer manned.

Type of operation, land use or status of the area before used as Checkpoint:

Rural area within the FCA.

Please indicate whether the following material have been used stored, or generated on the site:

After taken over by the Police, the following material had not been used stored or generated by the Police in the above sites:

Fuel, lubricating oil, hydraulic oil, cleaning solvents, used chemical solution, acids and asbestos.

Appendix E-2

Plates

Plate 1 Boundary Patrol Road in Mai Po (Section 1)

Plate 2 Boundary Fence to be removed in Lok Ma Chau (Section 2)

Plate 3 Boundary Fence to be removed in Pak Fu Shan (Section 3)

Plate 4 Site of the Boundary Fence to be built in Sha Tau Kok (Section 4)

Plate 5 Drainage Maintenance Road located at the north of Lok Ma Chau Loop (Section 2)

Plate 6 Site of the BPR/BF to be built at the north of Pak Fu Shan (Section 3)

Plate 7 Pak Hok Chau Checkpoint

Plate 8 Lok Ma Chau Checkpoint

Plate 9 Shek Chung Au Checkpoint

Plate 10 Ping Che Checkpoint

Plate 11 Sha Ling Checkpoint

Plate 12 Proposed site for the new GATE ONE Checkpoint

Plate 13 Proposed site for the shelter of the new Checkpoint

APPENDIX F

Ecology

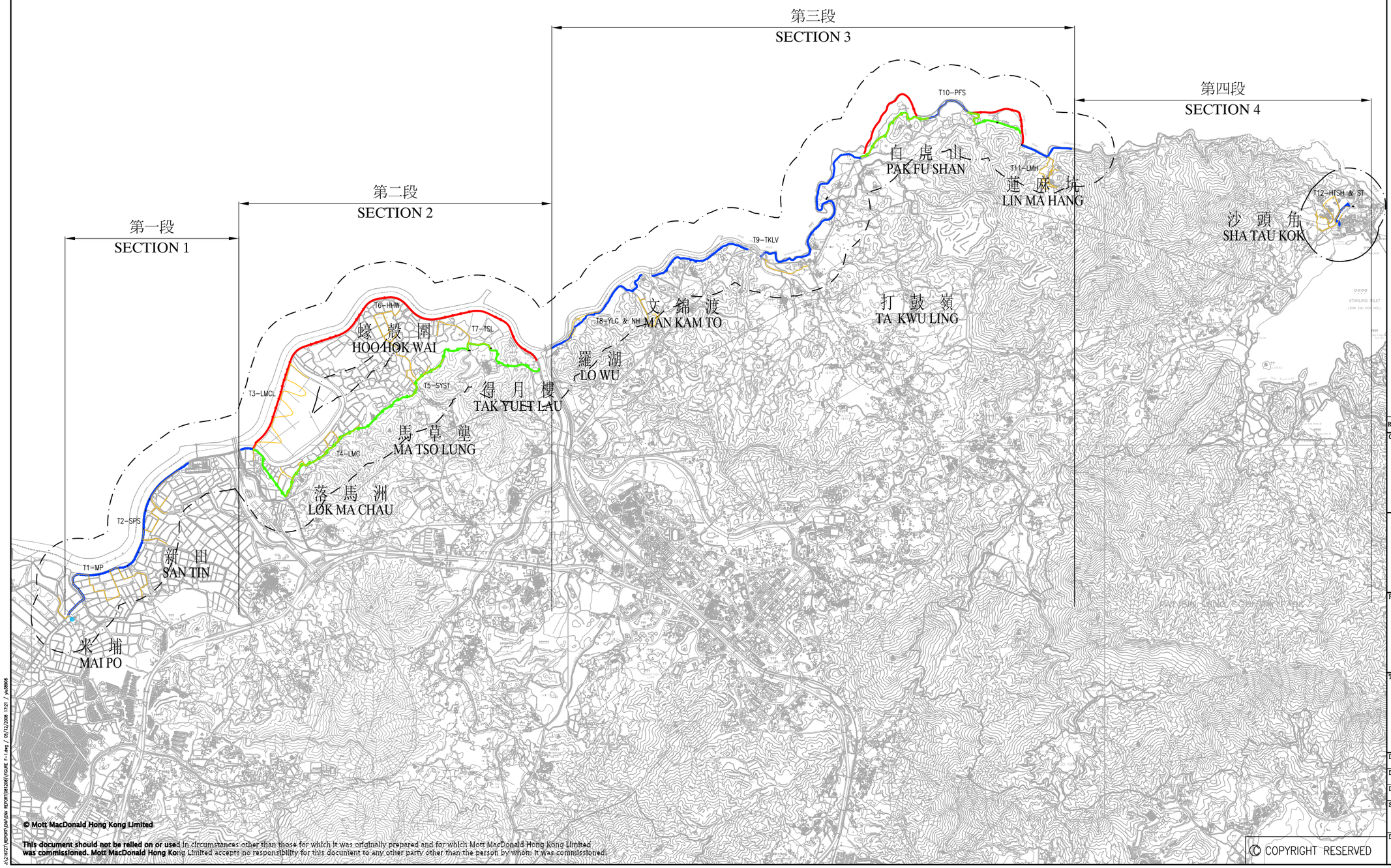


圖 例 :
LEGEND:

- 建議於現有邊界巡邏通路興建的輔助邊界圍網
  PROPOSED SECONDARY BOUNDARY FENCE ALONG EXISTING BOUNDARY PATROL ROAD
- 建議的主要及輔助邊界圍網及新邊界巡邏通路
  PROPOSED NEW BOUNDARY PATROL ROAD WITH PRIMARY AND SECONDARY BOUNDARY FENCES
- 擬將移除的現有邊界圍網
  EXISTING BOUNDARY FENCE TO BE REMOVED
- LIMIT OF ASSESSMENT AREA
- T1 TRANSECT ROUTES FOR FAUNA SURVEY

Rev	Date	Drawn	Description	Ch'k'd	App'd

Client

ARCHITECTURAL SERVICES DEPARTMENT

Mott MacDonald

Mott MacDonald Hong Kong Ltd
7th Floor
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Project

CONSTRUCTION OF A SECONDARY BOUNDARY FENCE AND NEW SECTIONS OF PRIMARY BOUNDARY FENCE AND BOUNDARY PATROL ROAD

Title

TRANSECT ROUTES FOR FAUNA SURVEY AREA

Designed	PW		Eng.Chk.	AFK	
Drawn	——		Coordination	AFK	
Dwg.Chk.	PW		Approved	——	

Scale	Project	Status
N.T.S.	216727	INF
	CAD File: J:\216727\REPORT\ENV\ENV REPORT(081208)\FIGURE F-1.dwg	

Drawing No. Figure F1 — Rev –

J:\216727\REPORT\ENV\ENV REPORT(081208)\FIGURE F-1.dwg / 05/12/2008 17:21 / ka3908

Appendix F-1 Ecological Survey Methodology (Terrestrial and Aquatic)

The ecological surveys were conducted in accordance with the guidelines set out in Annex 8 "Criteria for Evaluation Ecological Impact" and Annex 16 "Guidelines for Ecological Assessment" of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), "Ecological Baseline Survey for Ecological Assessment (EIAO Guidance Note No. 7/2002)" and "Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys (EIAO Guidance Note No. 10/2004)".

The Assessment Area for the construction of a secondary boundary fence is defined as the areas within 500m from the proposed 21.7km alignment and the alternative alignments. Relevant literature within the Assessment Area was reviewed to identify information gaps relating to the ecological characteristics of the aquatic and terrestrial environment. Ecological field surveys were conducted between November 2007 to October 2008 covering wet and dry seasons for 12 months to fill the information gaps identified during the desktop study, with special attention paid to the ecologically sensitive areas. Details of the field survey programme are described below.

Habitat Survey

Habitat maps with suitable scale (1:1000 to 1:5000) showing the types and locations of habitats in the Assessment Area with the overlay plot of the Project boundary were produced.

Recent aerial photos were studied to identify the general land use/ habitat type of the Assessment Area. A preliminary habitat map was generated through translating the visualized condition in the aerial photos and the detailed habitats were marked during ground truthing exercise.

Ground truthing studies were conducted on-site to verify and delineate the habitat type that were identified or missing during desktop study. All ecological resources within habitats were recorded and a more focused survey on those identified important habitats were conducted to collect further information.

Vegetation Survey

Vegetation surveys were conducted quarterly along the proposed boundary fencing alignments where the vegetation was directly impacted.

The survey routes are distributed on the following four regions based on the assigned sections of the alignment.

- Section 1 – from Pak Hok Chau Check Point at Mai Po to Lok Ma Chau Control Point near Lok Ma Chau railway station (Blue Alignment);
- Section 2 – from Lok Ma Chau Control Point to Ng Tung River near Tak Yuet Lau (Red, Blue and Green Alignment);
- Section 3 – from Ng Tung River to Lin Ma Hang (Red, Blue and Green Alignment); and
- Section 4 – from Sha Tau Kok Town to Sha Tau Kok Control Point (Blue Alignment).

All the flora species observed along the survey routes were recorded and their relative abundance encountered through visual observation was also recorded.

Bird Survey

Nine bird surveys were conducted in 12-month period for each transect by walking through transects at areas of ecological importance. Bird species within 30m of the transect were identified visually by using a pair of binoculars or aurally by listening to their calls. The behaviour and number of birds

encountered were noted. Birds using the proposed works area and the adjacent area other than the sampling transect for feeding, nesting and roosting were also recorded to form a complete species list. Special attention was given to wetland birds and birds of conservation importance with reference to Note 3 Annex 16 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) (EPD, 1997) and Fellowes *et al.* (2000).

Herpetofauna (Amphibians and Reptiles) Survey

Nine herpetofauna surveys were conducted for a 12-month period by active searching in conjunction with mammal survey and insect surveys during daytime. Fishponds, wet agricultural lands, marshes and natural stream courses were actively searched for potential breeding areas of amphibians and reptiles. Microhabitats like stones, crevices, leaf litter/debris, rotten log and abandoned cardboard were also examined or uncovered to search for the eggs and tadpoles of amphibians in aquatic habitats or to reveal the presence of the amphibians and reptiles hiding under these covers. Ad hoc records during other faunal group surveys were also included in the report to form a complete species list.

Two night surveys were conducted in the wet season during April to September 2008 to search for nocturnal species of amphibians and reptiles in their active stage. Hand and head torches were used to assist active searching in exposed areas of their potential habitats. Auditory detection of mating calls at their breeding sites was also recorded during night survey. Species identified, number and habitat use were included in the report.

Butterflies and Dragonflies Survey

The surveys for butterflies and dragonflies were conducted by visual observation and photography. Survey were conducted once a month during the wet season in their most active stage (April to September 2008) by walking through transect routes along the alignment and at major habitats including mature woodlands, natural stream courses, fishponds, wet agricultural lands, marshes and mangroves within the 500m assessment boundary (**Figure F1**). Hand net was used to collect live specimens for in-situ identification of adult butterflies and dragonflies and species collected were released upon examination. Butterflies and dragonflies encountered outside the transect routes but within the Assessment Area were also recorded to produce a complete species list.

Freshwater Fish Survey

Freshwater fish surveys were carried out once in dry season and three replicates in wet season at stream courses and freshwater marsh within the Assessment Area that may be impacted by the proposed development especially in Lin Ma Hang Stream SSSI and ecological mitigation areas near Yuen Leng Chai and Nam Hang. Fish surveys were conducted in fine weather avoiding too cold or just after heavy rainfall that the fishes become inactive or stream flow too fast for observation.

<u>Bankside Counting</u>

Bankside counting of freshwater fish species in clear, shallow and slow flow stream and at surface water level of freshwater marsh and fishpond were performed by observation with the aids of short focal length binoculars along the embankment. Species observed and the estimated abundance were recorded. The surrounding environment such as the substratum environment (e.g. sandy, muddy or rocky) and microhabitats observed (e.g. pools or riffles) were also recorded for facilitating the identification of freshwater fish species.

Pot trapping

Pot traps with baits were used for fish trapping. The traps were placed at deep water pool and around areas with riparian vegetation extending to the stream and marsh for 20 minutes. Disturbance to the area of traps deployed were avoided during the survey. The species and number of fish trapped were recorded. Live fish samples caught were released as soon as possible to avoid adverse impact on the fish species.

Netting

D-framed hand net was used for active searching of fish species hiding in microhabitats or in turbid water. Hand netting was performed at 50m intervals of the downstream and upstream portion of each stream section and at periphery of freshwater marsh. Live fish samples caught were released as soon as possible to avoid adverse impact on the fish species.

Mammal Survey

Mammal surveys were conducted in conjunction with herpetofauna surveys during daytime and at night time just after dusk. Any sighting and sign of traits (footprints, faeces or burrows) were recorded. The plantation woodland, secondary woodland, muddy areas adjacent to the streams were actively searched for mammal tracks where animals come to feed or drink. Feeding signs such as partially eaten vegetation or carcasses may provide evidence of traits of mammals. Habitat types, measurement and photographs were taken for signs of tracks to aid the identification works. Ad hoc sighting during other faunal group surveys were marked to produce a full species list. In view of the extensive information on bat colony recorded in Lin Ma Hang Lead Mine SSSI and no construction will be implemented close to this SSSI, field survey for bats in this SSSI was not carried out to avoid disturbance to the roost. Bat surveys were conducted by active searching of potential roosting site (e.g. rock crevices, bamboo stems, fronds of palm trees and buildings) during daytime supplemented with literature review of published information made available by government and non-government bodies.

Night surveys were conducted to search for nocturnal species of mammals. Hand and head torches were used to assist active searching in exposed areas of their potential habitats.

References

AFCD & EPD, 2002. Environmental Impact Assessment Ordinance, Cap. 499 Guidance Note No. 7/2002: *Ecological Baseline Survey for Ecological Assessment.*

AFCD & EPD, 2004. Environmental Impact Assessment Ordinance, Cap. 499 Guidance Note No. 10/2004: *Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys.*

Hong Kong Environmental Protection Department, 1997. *Technical Memorandum on Environmental Impact Assessment Process.* Printing Department, Hong Kong Government.

Table F-1a Plant Species recorded at Section 1

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Acacia auriculiformis	No	NA	+
Acanthus ilicifolius	Yes	Common	+
Albizia lebbeck	No	NA	+
Alocasia odora	Yes	Very Common	+++
Alternanthera sessilis	Yes	Common	+
Alysicarpus vaginalis	Yes	Very Common	++
Amaranthus spinosus	No	Common	+
Amaranthus viridis	No	Very Common	+
Bidens alba	No	Very Common	+++
Bothriochloa bladhii	Yes	Very Common	++
Brachiaria mutica	No	Common	+++
Bridelia tomentosa	Yes	Very Common	+
Cajanus scarabaeoides	Yes	Common	++
Calliandra haematocephala	No	NA	+
Canavalia maritima	Yes	Common	+
Canna indica	No	NA	+
Casuarina equisetifolia	No	Common	+++
Celtis sinensis	Yes	Common	+
Chloris barbata	Yes	Very Common	+
Cinnamomum camphora	Yes	Common	+
Cleistocalyx operculatus	Yes	Common	+++
Clerodendrum inerme	Yes	Common	+
Cocculus orbiculatus	Yes	Common	+
Conyza bonariensis	No	Very Common	+
Crotalaria pallida	No	Common	+
Cynodon dactylon	Yes	Very Common	+++
Dactyloctenium aegyptium	Yes	Common	+
Desmodium tortuosum	No	Common	+
Eleusine indica	Yes	Very Common	++
Emilia sonchifolia	Yes	Very Common	+
Euphorbia hirta	No	Very Common	+
Ficus microcarpa	Yes	Common	+
Hedyotis corymbosa	Yes	Very Common	+
Hibiscus rosa-sinensis	No	NA	+
Hibiscus tiliaceus	Yes	Very Common	+++
Ilex rotunda	No	Common	+
Imperata koenigii	Yes	Very Common	+
Ipomoea aquatica	No	Very Common	+
Ipomoea cairica	No	Very Common	+++
Kyllinga brevifolia	Yes	Common	+
Lagerstroemia speciosa	No	NA	+
Lantana camara	No	Very Common	+
Leucaena leucocephala	No	Common	+++
Litsea glutinosa	Yes	Very Common	+
Macaranga tanarius	Yes	Common	++
Macroptilium atropurpureum	No	Common	+
Malvastrum coromandelianum	Yes	Common	+
Melastoma sanguineum	Yes	Common	+
Melia azedarach	No	Common	++
Merremia hederacea	Yes	Restricted	+
Mikania micrantha	No	Very Common	+++
Murraya paniculata	No	NA	+
Musa x paradisiaca	No	NA	+
Neyraudia reynaudiana	Yes	Very Common	++
Oxalis corymbosa	No	Common	+

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Paederia scandens	Yes	Very Common	+++
Panicum maximum	No	Very Common	+++
Passiflora foetida	No	Common	+
Pennisetum purpureum	No	Very Common	+++
Polygonum chinense	Yes	Very Common	++
Portulaca oleracea	Yes	Very Common	+
Psidium guajava	No	Common	+
Rhus chinensis	Yes	Common	+
Rhynchelytrum repens	No	Very Common	++
Sapium sebiferum	Yes	Common	++
Schefflera arboricola	No	NA	+
Sida rhombifolia	Yes	Common	+
Solanum nigrum	Yes	Very Common	++
Sonchus arvensis	Yes	Very Common	+
Spathodea campanulata	No	NA	+
Syzygium cumini	No	NA	+
Tridax procumbens	No	Very Common	+
Vernonia cinerea	Yes	Very Common	+
Wedelia trilobata	No	Common	+

Note: * Status (source from Corlett *et al,* 2000. Hong Kong Vascular Plants: Distribution and Status):
N*A =weed, introduced, cultivated or landscaping species not covered by Corlett's study;*
Protected = protected under Forestry Regulations (Cap. 96 sub. Leg.)

** Rank of Abundance: + = uncommon; ++ = fairly common; +++ = very common.

Table F-1b Bird Species recorded at Section 1

Common Name	Level of Concern	Wetland-dependent	Mean#
Little Grebe *Tachybaptus ruficollis*	LC	Y	3.11
Great Cormorant *Phalacrocorax carbo*	PRC	Y	29.67
Grey Heron *Ardea cinerea*	PRC	Y	21.00
Great Egret *Egretta alba*	PRC(RC)	Y	40.78
Intermediate Egret *Egretta intermedia*	RC	Y	0.11
Little Egret *Egretta garzetta*	PRC(RC)	Y	40.00
Cattle Egret *Bubulcus ibis*	(LC)	Y	0.11
Chinese Pond Heron *Ardeola bacchus*	PRC(RC)	Y	7.00
Black-crowned Night Heron *Nycticorax nycticorax*	(LC)	Y	0.44
Black-faced Spoonbill *Platalea minor*	PGC	Y	1.00
Eurasian Wigeon *Anas penelope*	RC	Y	18.11
Common Teal *Anas crecca*	RC	Y	1.56
Northern Pintail *Anas acuta*	RC	Y	33.33
Northern Shoveler *Anas clypeata*	RC	Y	0.11
Osprey *Pandion haliaetus*	RC	Y	0.11
Black Kite *Milvus migrans*	(RC)	N	6.00
White-breasted Waterhen *Amaurornis phoenicurus*	-	Y	1.44
Common moorhen *Gallinula chloropus*	-	Y	4.22
Little Ringed Plover *Charadrius dubius*	(LC)	Y	2.22
Green Sandpiper *Tringa ochropus*	-	Y	0.44
Wood Sandpiper *Tringa glareola*	LC	Y	2.44
Common Sandpiper *Actitis hypoleucos*	-	Y	7.44
Spotted Dove *Streptopelia chinensis*	-	N	12.11
Common Koel *Eudynamys scolopacea*	-	N	1.11
Greater Coucal *Centropus sinensis*	-	N	0.56
Lesser Coucal *Centropus bengalensis*	-	N	0.44
Pacific Swift *Apus pacificus*	(LC)	N	0.33
Little Swift	-	Y	0.56

Common Name	Level of Concern	Wetland-dependent	Mean#
Apus affinis			
Pied Kingfisher *Ceryle rudis*	(LC)	Y	0.33
Common Kingfisher *Alcedo atthis*	-	Y	1.11
White-throated Kingfisher *Halcyon smyrnensis*	(LC)	Y	0.89
Barn Swallow *Hirundo rustica*	-	Y	20.00
Yellow Wagtail *Motacilla flava*	-	Y	3.78
Grey Wagtail *Motacilla cinerea*	-	Y	1.00
White Wagtail *Motacilla alba*	-	Y	9.78
Richard's Pipit *Anthus richardi*	-	N	0.11
Red-whiskered Bulbul *Pycnonotus jocosus*	-	N	4.33
Chinese Bulbul *Pycnonotus sinensis*	-	N	10.22
Long-tailed Shrike *Lanius schach*	-	N	2.56
Oriental Magpie Robin *Copsychus saularis*	-	N	3.33
Common Stonechat *Saxicola torquata*	-	N	0.78
Masked Laughingthrush *Garrulax perspicillatus*	-	N	3.00
Yellow-bellied Prinia *Prinia flaviventris*	-	N	10.44
Plain Prinia *Prinia inornata*	-	N	5.67
Common Tailorbird *Orthotomus sutorius*	-	N	0.11
Dusky Warbler *Phylloscopus fuscatus*	-	N	1.33
Yellow-browed Warbler *Phylloscopus inornatus*	-	N	0.11
Great Tit *Parus major*	-	N	0.11
Japanese White-eye *Zosterops japonicus*	-	N	6.00
Chestnut Bunting *Emberiza rutila*	-	N	1.67
White-rumped Munia *Lonchura striata*	-	N	0.11
Scaly-breasted Munia *Lonchura punctulata*	-	N	0.11
Eurasian Tree Sparrow *Passer montanus*	-	N	11.78
Red-billed Starling *Sturnus sericeus*	GC*	Y	33.33
Black-collared Starling *Sturnus nigricollis*	-	N	15.33
Common Myna *Acridotheres tristis*	-	N	0.44
Crested Myna	-	N	9.89

Common Name	Level of Concern	Wetland-dependent	Mean#
Acridotheres cristatellus			
Black Drongo *Dicrurus macrocercus*	-	N	0.89
Common Magpie *Pica pica*	-	N	1.22
Large-billed Crow *Corvus macrorhynchos*	-	N	0.22
Collared Crow *Corvus torquatus*	LC	Y	0.22
Azure-winged Magpie *Cyanopica cyanus*	-	N	1.89

*Red-billed Starling is considered by Fellows *et al.* (2002) to be of Global Concern. Since then, the global population has been increasing and the species is not now considered globally threatened (BirdLife International 2008). A listing of Regional Concern (RC), based on the importance of the large roosts present near Deep Bay, is considered to be more appropriate.

#Mean values given are the mean number recorded on all transects. This is included to reflect the regularity of a species in the study area.

Table F-2a Plant Species recorded at Section 2 (Blue and Green Alignments)

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Acacia confusa	No	NA	+
Achyranthes aspera	Yes	Common	+
Adiantum capillus	Yes	Common	+
Ageratum conyzoides	No	Common	+
Albizia lebbeck	No	NA	+
Alchornea trewioides	Yes	Common	+
Alocasia odora	Yes	Very Common	++
Alternanthera sessilis	Yes	Common	+
Alysicarpus vaginalis	Yes	Very Common	+
Amaranthus viridis	Yes	Very Common	+
Annona squamosa	No	NA	+
Antidesma ghaesembilla	Yes	NA	+
Apluda mutica	Yes	Very Common	+
Aporusa dioica	Yes	Very Common	+
Aquilaria sinensis	Yes	Common	+
Averrhoa carambola	No	NA	+
Axonopus compressus	No	Common	+
Bambusa chungii	No	NA	+
Bambusa multiplex	No	NA	+
Bambusa ventricosa	No	NA	+
Berchemia lineata	Yes	**Rare**	+
Bidens alba	No	Very Common	+++
Blechnum orientale	Yes	Very Common	+
Blumea clarkei	Yes	Common	+
Bombax ceiba	No	NA	+
Bothriochloa bladhii	Yes	Very Common	++
Brachiaria mutica	No	Common	+++
Breynia fruticosa	Yes	Very Common	+
Bridelia tomentosa	Yes	Very Common	+
Broussonetia papyrifera	Yes	Very Common	+
Brucea javanica	Yes	Common	+
Cajanus scarabaeoides	Yes	Common	+
Callicarpa nudiflora	Yes	Common	+
Canna indica	No	NA	+
Cansjera rheedii	Yes	Restricted	+
Capillipedium parviflorum	Yes	Very Common	+
Capsicum annuum	No	NA	+
Carica papaya	No	NA	+
Caryota mitis	No	NA	+
Cassytha filiformis	Yes	Very Common	+
Casuarina equisetifolia	No	Common	+
Celtis sinensis	Yes	Common	+++
Cenchrus echinatus	No	Common	+
Chenopodium ambrosiodides	No	Common	+
Chloris barbata	Yes	Very Common	++
Cinnamomum camphora	Yes	Common	+
Citrus maxima	No	NA	+
Citrus sinensis	No	NA	+
Clausena lansium	No	NA	+
Cleistocalyx operculatus	Yes	Common	+
Cleome gynandra	No	NA	+
Clerodendrum cyrtophyllum	Yes	Common	+
Cocculus orbiculatus	Yes	Common	++
Colocasia esculenta	Yes	NA	+
Commelina nudiflora	Yes	Common	+

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Conyza bonariensis	No	Very Common	+
Cordyline fruticosa	No	NA	+
Cratoxylum cochinchinense	Yes	Very Common	+
Crinum asiaticum	Yes	Restricted	+
Crotalaria pallida	No	Common	+
Croton crassifolius	Yes	Very Common	+
Cuscuta australis	Yes	NA	+
Cyclosorus interruptus	Yes	Common	++
Cymbopogon caesius	Yes	Very Common	+
Cynodon dactylon	Yes	Very Common	+++
Cyperus malaccensis	Yes	Common	+
Cyperus rotundus	Yes	Very Common	+
Cyrtococcum patens	Yes	Very Common	+
Dactyloctenium aegyptium	Yes	Common	++
Daphniphyllum calycinum	Yes	Common	+
Delonix regia	No	NA	+
Desmodium heterocarpon	Yes	Very Common	+
Desmodium tortuosum	No	Common	+
Desmos chinensis	Yes	Common	++
Dianella ensifolia	Yes	Very Common	+
Dicranopteris pedata	Yes	Very Common	+++
Dieffenbachia seguine	No	NA	+
Digitaria longiflora	Yes	Very Common	+
Dimocarpus longan	No	Restricted	++
Dioscorea fordii	Yes	Common	+
Diospyros kaki	Yes	NA	+
Dracaena fragrans	No	NA	+
Echinochloa crusgalli	Yes	Common	+
Elephantopus tomentosus	Yes	Common	+
Eleusine indica	Yes	Very Common	+++
Eleutherococcus trifoliatus	Yes	Restricted	+
Embelia laeta	Yes	Very Common	+
Embelia ribes	Yes	Common	+
Emilia sonchifolia	Yes	Very Common	++
Eragrostis unioloides	Yes	Common	+
Erigeron karvinskianus	No	Restricted	+
Eriobotrya japonica	No	NA	+
Euphorbia antiquorum	No	NA	+
Euphorbia hirta	No	Very Common	+
Eurya sp	Yes	NA	+
Ficus elastica	No	NA	+
Ficus hirta	Yes	Common	++
Ficus hispida	Yes	Very Common	+++
Ficus microcarpa	Yes	Common	+
Ficus superba	Yes	NA	+
Ficus variegata	Yes	Common	+
Ficus virens	Yes	Common	+
Glochidion eriocarpum	Yes	Very Common	+
Glochidion lanceolarium	Yes	Common	+
Glochidion puberum	Yes	Restricted	+
Glochidion wrightii	Yes	Very Common	+
Glochidion zeylanicum	Yes	Common	+
Hedychium coronarium	No	NA	++
Hedyotis auricularia	Yes	Common	++
Hedyotis corymbosa	Yes	Very Common	++
Hedyotis hedyotidea	Yes	Very Common	+

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Helicteres angustifolia	Yes	Very Common	+
Heterosmilax japonica	Yes	Common	+
Hibiscus tiliaceus	Yes	Very Common	++
Hymenocallis littoralis	No	NA	+
Ilex asprella	Yes	Very Common	++
Ilex pubescens	Yes	Very Common	+
Imperata koenigii	Yes	Very Common	+
Ipomoea aquatica	No	Very Common	+
Ipomoea batatas	No	NA	+
Ipomoea cairica	No	Very Common	+++
Ipomoea pes-caprae	Yes	Common	+
Ipomoea triloba	Yes	Common	+
Ischaemum aristatum	Yes	Common	+
Itea chinensis	Yes	Very Common	+
Kyllinga monocephala	Yes	NA	+
Lagerstroemia speciosa	No	NA	+
Lantana camara	No	Very Common	++
Leucaena leucocephala	No	Common	++
Ligustrum sinense	Yes	Common	+++
Lindera communis	Yes	Very Common	+
Lindernia crustacea	Yes	Restricted	+
Lindsaea orbiculata	Yes	Very Common	+
Liriope spicata	Yes	Very Common	+
Litchi chinensis	No	Restricted	+
Litsea cubeba	Yes	Common	+
Litsea cubeba	Yes	Common	+
Litsea glutinosa	Yes	Very Common	+++
Litsea rotundifolia	Yes	Very Common	+
Lonicera japonica	Yes	Restricted	+
Lophostemon confertus	No	NA	+
Ludwigia octovalvis	Yes	Common	+
Ludwigia perennis	Yes	Restricted	+
Lygodium japonicum	Yes	Very Common	+++
Macaranga tanarius	Yes	Common	+++
Macroptilium atropurpureum	No	Common	+
Mallotus apelta	Yes	Common	+
Mallotus paniculatus	Yes	Very Common	+
Mangifera indica	No	NA	+
Melaleuca quinquenervia	No	NA	+
Melastoma candidum	Yes	Common	++
Melastoma dodecandrum	Yes	Common	+
Melia azedarach	No	Common	+
Melicope pteleifolia	Yes	Common	+
Merremia hederacea	Yes	Restricted	+
Microcos paniculata	Yes	Common	+++
Microstegium ciliatum	Yes	Very Common	+++
Mikania micrantha	No	Very Common	+++
Mimosa diplotricha	No	Rare#	+
Mimosa pudica	No	Very Common	++
Miscanthus floridulus	Yes	Common	+
Miscanthus sinensis	Yes	Very Common	+
Morus alba	Yes	Common	+
Murraya paniculata	No	NA	+
Musa x paradisiaca	No	NA	+
Mussaenda pubescens	Yes	Very Common	++
Neyraudia reynaudiana	Yes	Very Common	++

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Oxalis corniculata	Yes	Very Common	+
Oxalis corymbosa	No	Common	+
Paederia scandens	Yes	Very Common	+++
Palhinhaea cernua	Yes	Very Common	++
Pandanus tectorius	Yes	Very Common	+
Panicum brevifolium	Yes	Very Common	+
Panicum maximum	No	Very Common	+++
Panicum repens	Yes	Very Common	+
Paspalum conjugatum	No	Common	+
Passiflora foetida	No	Common	+
Pennisetum alopecurodies	Yes	Common	+
Pennisetum purpureum	No	Very Common	++
Phragmites australis	Yes	Very Common	+
Phragmites karka	Yes	Very Common	+
Phyllanthus cochinchinensis	Yes	Very Common	+
Phyllanthus emblica	Yes	Very Common	+
Phyllanthus reticulatus	Yes	Common	++
Pilea microphylla	No	Very Common	+
Pistia stratiotes	Yes	Common	+
Plumeria rubra	No	NA	+
Polygonum chinense	Yes	Very Common	+
Pouzolzia zeylanica	Yes	Common	+
Prunus persica	No	NA	+
Psidium guajava	No	Common	+
Psychotria asiatica	Yes	Very Common	+
Psychotria serpens	Yes	Very Common	+
Pteris semipinnata	Yes	Very Common	+
Pueraria lobata	Yes	Common	+
Pueraria phaseoloides	Yes	Very Common	+
Rhaphiolepis indica	Yes	Very Common	+
Rhodomyrtus tomentosa	Yes	Very Common	+++
Rhus chinensis	Yes	Common	+
Rhus hypoleuca	Yes	Common	++
Rhus succedanea	Yes	Common	+
Rhynchelytrum repens	No	Very Common	+++
Richardia scabra	No	Common	+
Ricinus communis	No	Restricted	+
Rorippa indica	Yes	Common	+
Rosa laevigata	Yes	Common	+
Rubus parvifolius	Yes	Common	+
Saccharum officinarum	No	NA	+
Sageretia thea	Yes	Very Common	+
Sansevieria trifasciata	No	NA	+
Sapium sebiferum	Yes	Common	+
Schefflera heptaphylla	Yes	Very Common	+
Scoparia dulcis	No	Common	++
Senecio scandens	Yes	Common	+
Sesbania javanica	Yes	NA	+++
Setcreasea purpurea	No	NA	+
Sida rhombifolia	Yes	Common	+
Smilax china	Yes	Very Common	+
Smilax glabra	Yes	Very Common	+
Solanum nigrum	Yes	Very Common	+
Solanum torvum	No	Common	+
Sphenomeris chinensis	Yes	Very Common	+
Sporobolus fertilis	Yes	Very Common	++

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Stachytarpheta jamaicensis	No	Common	+
Stephania longa	Yes	Common	++
Sterculia lanceolata	Yes	Very Common	+
Tadehagi triquetrum	Yes	Very Common	+
Tithonia diversifolia	No	Common	+
Trema tomentosa	Yes	Common	+
Urena lobata	Yes	Common	+
Uvaria macrophylla	Yes	Common	+
Vernonia cinerea	Yes	Very Common	+
Wedelia trilobata	No	Common	++
Wikstroemia indica	Yes	Common	+
Wikstroemia nutans	Yes	Common	+
Zanthoxylum nitidum	Yes	Very Common	+
Zea mays	No	NA	+

Note: * Status (source from Corlett *et al,* 2000. Hong Kong Vascular Plants: Distribution and Status):

NA =*weed, introduced, cultivated or landscaping species not covered by Corlett's study;*
 # it is an introduced species rarely occur in Hong Kong but not native rare species of conservation interest
Protected = protected under Forestry Regulations (Cap. 96 sub. Leg.)

** Rank of Abundance: + = uncommon; ++ = fairly common; +++ = very common.

Table F-2b Plant Species recorded at Section 2 (Red Alignment)

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Alysicarpus vaginalis	Yes	Very Common	++
Apluda mutica	Yes	Very Common	+
Bidens alba	No	Very Common	+++
Bombax ceiba	No	NA	+
Bothriochloa bladhii	Yes	Very Common	+++
Brachiaria mutica	No	Common	++
Cajanus scarabaeoides	Yes	Common	++
Cassia tora	No	Common	+
Chloris barbata	Yes	Very Common	++
Microstegium ciliatum	Yes	Very Common	+
Cynodon dactylon	Yes	Very Common	+++
Dactyloctenium aegyptium	Yes	Common	+
Digitaria sanguinalis	Yes	Very Common	+
Euphorbia hirta	No	Very Common	++
Hibiscus tiliaceus	Yes	Very Common	+
Imperata koenigii	Yes	Very Common	+++
Ipomoea cairica	No	Very Common	+
Ischaemum aristatum	Yes	Common	++
Lantana camara	No	Very Common	+
Leucaena leucocephala	No	Common	+
Lygodium japonicum	Yes	Very Common	++
Macroptilium atropurpureum	No	Common	+
Melia azedarach	No	Common	+
Mikania micrantha	No	Very Common	++
Mimosa diplotricha	No	Rare#	+
Mimosa pudica	No	Very Common	+++
Miscanthus sinensis	Yes	Very Common	++
Neyraudia reynaudiana	Yes	Very Common	++
Paederia scandens	Yes	Very Common	+
Panicum maximum	No	Very Common	++
Passiflora foetida	No	Common	+
Rhynchelytrum repens	No	Very Common	+++
Scoparia dulcis	No	Common	++
Sesbania javanica	Yes	NA	+++
Sida acuta	Yes	Common	+
Sonchus arvensis	Yes	Very Common	+
Sporobolus fertilis	Yes	Very Common	++
Tridax procumbens	No	Very Common	++
Urena lobata	Yes	Common	+
Wedelia trilobata	No	Common	+++

Note: * Status (source from Corlett *et al,* 2000. Hong Kong Vascular Plants: Distribution and Status):

NA =weed, introduced, cultivated or landscaping species not covered by Corlett's study;
 # it is an introduced species rarely occur in Hong Kong but not native rare species of conservation interest
Protected = protected under Forestry Regulations (Cap. 96 sub. Leg.)

** Rank of Abundance: + = uncommon; ++ = fairly common; +++ = very common.

Table F-2c Bird Species recorded at Section 2

Common Name	Level of Concern	Wetland-dependent	Mean#
Little Grebe *Tachybaptus ruficollis*	LC	Y	5.22
Great Crested Grebe *Podiceps cristatus*	RC	Y	0.11
Great Cormorant *Phalacrocorax carbo*	PRC	Y	66.11
Grey Heron *Ardea cinerea*	PRC	Y	7.89
Purple Heron *Ardea purpurea*	RC	Y	0.22
Great Egret *Egretta alba*	PRC(RC)	Y	10.44
Little Egret *Egretta garzetta*	PRC(RC)	Y	13.78
Cattle Egret *Bubulcus ibis*	(LC)	Y	1.00
Chinese Pond Heron *Ardeola bacchus*	PRC(RC)	Y	10.11
Striated Heron *Butorides striatus*	(LC)	Y	0.11
Black-crowned Night Heron *Nycticorax nycticorax*	(LC)	Y	6.56
Yellow Bittern *Ixobrychus sinensis*	(LC)	Y	0.33
Cinnamon Bittern *Ixobrychus cinnamomeus*	LC	Y	0.11
Great Bittern *Botaurus stellaris*	RC	Y	0.22
Eurasian Wigeon *Anas penelope*	RC	Y	0.22
Common Teal *Anas crecca*	RC	Y	3.00
Northern Pintail *Anas acuta*	RC	Y	0.33
Tufted Duck *Aythya fuligula*	LC	Y	2.78
Osprey *Pandion haliaetus*	RC	Y	0.11
Black Kite *Milvus migrans*	(RC)	N	1.11
White-bellied Sea Eagle *Haliaeetus leucogaster*	(RC)	Y	7.78
White-breasted Waterhen *Amaurornis phoenicurus*	-	Y	0.11
Common moorhen *Gallinula chloropus*	-	Y	2.56
Eurasian Coot *Fulica atra*	RC	Y	2.44
Black-winged Stilt *Himantopus himantopus*	RC	Y	0.22
Little Ringed Plover *Charadrius dubius*	(LC)	Y	0.11
Green Sandpiper *Tringa ochropus*	-	Y	10.11
Wood Sandpiper	LC	Y	2.00

Common Name	Level of Concern	Wetland-dependent	Mean#
Tringa glareola			
Common Sandpiper *Actitis hypoleucos*	-	Y	0.78
Common Snipe *Gallinago gallinago*	-	Y	2.11
Rock Dove *Columba livia*	-	N	1.89
Spotted Dove *Streptopelia chinensis*	-	N	1.22
Common Koel *Eudynamys scolopacea*	-	N	10.11
Greater Coucal *Centropus sinensis*	-	N	1.56
Lesser Coucal *Centropus bengalensis*	-	N	2.78
Little Swift *Apus affinis*	-	Y	0.11
Pied Kingfisher *Ceryle rudis*	(LC)	Y	7.11
Common Kingfisher *Alcedo atthis*	-	Y	2.00
White-throated Kingfisher *Halcyon smyrnensis*	(LC)	Y	0.67
Barn Swallow *hirundo rustica*	-	Y	4.22
Red-rumped swallow *Hirundo daurica*	-	Y	3.78
Yellow Wagtail *Motacilla flava*	-	Y	1.67
Grey Wagtail *Motacilla cinerea*	-	Y	4.44
White Wagtail *Motacilla alba*	-	Y	0.78
Olive-backed Pipit *Anthus hodgsoni*	-	N	7.56
Red-throated Pipit *Anthus cervinus*	LC	N	0.11
Red-whiskered Bulbul *Pycnonotus jocosus*	-	N	9.56
Chinese Bulbul *Pycnonotus sinensis*	-	N	12.33
Sooty-headed Bulbul *Pycnonotus aurigaster*	-	N	4.22
Brown Shrike *Lanius cristatus*	-	N	0.11
Long-tailed Shrike *Lanius schach*	-	N	4.22
Oriental Magpie Robin *Copsychus saularis*	-	N	3.78
Common Stonechat *Saxicola torquata*	-	N	2.00
Masked Laughingthrush *Garrulax perspicillatus*	-	N	3.89
Hwamei *Garrulax canorus*	-	N	0.11
Pallas's Grasshopper Warbler *Locustella certhiola*	LC	Y	0.11
Zitting Cisticola	LC	N	1.11

Common Name	Level of Concern	Wetland-dependent	Mean#
Cisticola juncidis			
Yellow-bellied Prinia *Prinia flaviventris*	-	N	16.22
Plain Prinia *Prinia inornata*	-	N	7.56
Common Tailorbird *Orthotomus sutorius*	-	N	0.22
Dusky Warbler *Phylloscopus fuscatus*	-	N	3.11
Yellow-browed Warbler *Phylloscopus inornatus*	-	N	1.44
Asian Brown Flycatcher *Muscicapa dauurica*	-	N	0.22
Japanese White-eye *Zosterops japonicus*	-	N	0.11
Scaly-breasted Munia *Lonchura punctulata*	-	N	16.11
Eurasian Tree Sparrow *Passer montanus*	-	N	9.89
Red-billed Starling *Sturnus sericeus*	GC*	Y	18.67
White-cheeked Starling *Sturnus cineraceus*	PRC	N	1.56
Black-collared Starling *Sturnus nigricollis*	-	N	16.89
White-shouldered Starling *Sturnus sinensis*	(LC)	N	17.00
Crested Myna *Acridotheres cristatellus*	-	N	33.11
Black Drongo *Dicrurus macrocercus*	-	N	2.44
Ashy Drongo *Dicrurus leucophaeus*	LC	N	0.11
Common Magpie *Pica pica*	-	N	2.00
Collared Crow *Corvus torquatus*	LC	Y	0.44

*Red-billed Starling is considered by Fellows *et al.* (2002) to be of Global Concern. Since then, the global population has been increasing and the species is not now considered globally threatened (BirdLife International 2008). A listing of Regional Concern (RC), based on the importance of the large roosts present near Deep Bay, is considered to be more appropriate.

#Mean values given are the mean number recorded on all transects. This is included to reflect the regularity of a species in the study area.

Table F-3a Plant Species recorded at Section 3 (Blue and Green Alignments)

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Abutilon indicum	Yes	Restricted	+
Acacia auriculiformis	No	NA	+
Acacia confusa	No	NA	+
Acacia farnesiana	No	NA	+
Ageratum conyzoides	No	Common	+
Aglaia odorata	No	NA	+
Alangium chinense	Yes	Common	+
Albizia chinensis	Yes	NA	+
Albizia lebbeck	No	NA	+
Alchornea trewioides	Yes	Common	+
Aleurites moluccana	No	NA	+
Alocasia odora	Yes	Very Common	+
Alternanthera philoxeroides	No	Common	
Alternanthera sessilis	Yes	Common	+
Alysicarpus vaginalis	Yes	Very common	++
Amaranthus spinosus	No	Common	+
Amaranthus viridis	Yes	Very common	+
Anisomeles indica	Yes	Common	+
Annona squamosa	No	NA	+
Antidesma bunius	Yes	Common	+
Antidesma ghaesembilla	Yes	NA	++
Apluda mutica	Yes	Very Common	+
Aporusa dioica	Yes	Very Common	+
Aquilaria sinensis	Yes	Common, protected (2)	++
Artocarpus macrocarpon	No	NA	+
Asparagus cochinchinensis	Yes	Common	+
Athyriopsis japonica	Yes	Very common	+
Axonopus compressus	No	Common	+
Bauhinia variegata	No	NA	+
Berchemia floribunda	Yes	Common	+
Bidens alba	No	Very Common	+++
Bidens pilosa	No	Very Common	+++
Bischofia javanica	Yes	Common	+
Blechnum orientale	Yes	Very Common	+
Boehmeria nivea	No	Restricted	+
Bothriochloa ischaemum	Yes	Common	+
Brachiaria mutica	No	Common	++
Breynia fruticosa	Yes	Very Common	+
Bridelia tomentosa	Yes	Very Common	+
Broussonetia papyrifera	Yes	Very Common	+
Brucea javanica	Yes	Common	+
Byttneria aspera	Yes	Very Common	+

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Cajanus scarabaeoides	Yes	Common	++
Callicarpa nudiflora	Yes	Common	+
Canna indica	No	NA	+
Capillipedium parviflorum	Yes	Very Common	+
Capsicum annuum	No	NA	+
Cardiospermum halicacabum	Yes	Restricted	+
Cassytha filiformis	Yes	Very Common	+
Catharanthus roseus	No	Common	+
Celosia argentea	Yes	Very Common	+
Celtis sinensis	Yes	Common	++
Cenchrus echinatus	No	Common	+
Centella asiatica	Yes	Very Common	+
Chenopodium album	Yes	Restricted	+
Chloris barbata	Yes	Very Common	++
Ciliate Microstegium	Yes	NA	++
Cinnamomum burmannii	Yes	NA	+
Cinnamomum camphora	Yes	Common	+
Citrus limon	No	NA	+
Citrus maxima	No	NA	+
Citrus reticulata	No	NA	+
Clausena lansium	No	NA	+
Cleistocalyx operculatus	Yes	Common	+
Cleome rutidosperma	No	NA	+
Clerodendrum cyrtophyllum	Yes	Common	++
Cocculus orbiculatus	Yes	Common	+
Colocasia esculenta	Yes	NA	+
Commelina diffusa	Yes	Common	+
Conyza bonariensis	No	Very Common	+
Corchorus aestuans	Yes	Common	+
Cratoxylum cochinchinense	Yes	Very Common	+
Crotalaria pallida	No	Common	+
Cuscuta australis	Yes	NA	++
Cyclosorus interruptus	Yes	Common	+
Cynodon dactylon	Yes	Very Common	+++
Cyperus distans	Yes	Common	+
Cyperus flabelliformis	No	NA	+
Cyperus haspan	Yes	Common	+
Cyperus imbricatus	Yes	Common	+
Cyperus rotundus	Yes	Very Common	+
Cyrtococcum patens	Yes	Very Common	+
Dactyloctenium aegyptium	Yes	Common	++
Delonix regia	No	NA	+
Derris trifoliata	Yes	Common	+

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Desmodium heterocarpon	Yes	Very Common	++
Desmodium tortuosum	No	Common	++
Desmodium triflorum	Yes	Very common	++
Desmos chinensis	Yes	Common	+
Dicliptera chinensis	Yes	Restricted	++
Dicranopteris pedata	Yes	Very Common	++
Digitaria longiflora	Yes	Very Common	+
Digitaria sanguinalis	Yes	Very Common	++
Dimocarpus longan	No	Restricted	+
Dioscorea bulbifera	Yes	Common	+
Dioscorea fordii	Yes	Common	+
Diospyros morrisiana	Yes	Very Common	+
Echinochloa crusgalli	Yes	Common	+
Eclipta prostrata	Yes	Common	+
Elephantopus tomentosus	Yes	Common	+
Eleusine indica	Yes	Very Common	++
Eleutherococcus trifoliatus	Yes	Restricted	+
Embelia laeta	Yes	Very Common	+
Embelia ribes	Yes	Common	+
Emilia sonchifolia	Yes	Very Common	+
Eragrostis unioloides	Yes	Common	+
Eranthemum nervosum	No	NA	+
Eriobotrya japonica	No	NA	+
Eucalyptus robusta	No	NA	++
Eupatorium catarium	No	Very Common	++
Euphorbia hirta	No	Very common	+
Euphorbia thymifolia	Yes	Very Common	+
Eurya nitida	Yes	Very Common	+
Ficus formosana	Yes	Restricted	+
Ficus hirta	Yes	Common	+
Ficus hispida	Yes	Very Common	++
Ficus microcarpa	Yes	Common	+
Ficus pumila	Yes	Very Common	+
Ficus superba	Yes	NA	+
Ficus variegata	Yes	Common	+
Fimbristylis thomsonii	Yes	Very common	+
Flueggea virosa	Yes	Common	++
Gardenia jasminoides	Yes	Common	++
Glochidion zeylanicum	Yes	Common	+
Gnaphalium affine	Yes	Common	+
Gnetum parvifolium	Yes	Common	+
Grewia biloba	Yes	Common	+
Gymnema sylvestre	Yes	Very Common	+

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Hedychium coronarium	No	NA	++
Hedyotis auricularia	Yes	Common	+
Hedyotis corymbosa	Yes	Very Common	+
Hedyotis diffusa	Yes	Very Common	+
Hedyotis hedyotidea	Yes	Very Common	+
Heterosmilax japonica	Yes	Common	+
Hibiscus mutabilis	No	NA	+
Ilex asprella	Yes	Very Common	+
Ilex rotunda	No	Common	+
Imperata koenigii	Yes	Very Common	++
Ipomoea cairica	No	Very Common	++
Ipomoea triloba	Yes	Common	+
Kyllinga brevifolia	Yes	Common	+++
Kyllinga monocephala	Yes	Very Common	+
Lagenaria siceraria	No	NA	*+++*
Lantana camara	No	Very Common	++
Lespedeza formosa	Yes	Common	+
Leucaena leucocephala	No	Common	+
Ligustrum sinense	Yes	Common	+
Lindernia crustacea	Yes	Restricted	+
Litchi chinensis	No	Restricted	+
Litsea cubeba	Yes	Common	++
Litsea glutinosa	Yes	Very Common	+
Litsea rotundifolia	Yes	Very Common	+
Ludwigia octovalvis	Yes	Common	+
Ludwigia perennis	Yes	Restricted	+
Luffa aegyptiaca	No	NA	+
Lygodium japonicum	Yes	Very Common	++
Lygodium scandens	Yes	Common	+
Macaranga tanarius	Yes	Common	++
Machilus chekiangensis	Yes	Very Common	+
Maesa perlarius	Yes	Common	+
Mallotus apelta	Yes	Common	+++
Mallotus paniculatus	Yes	Very Common	+
Malvastrum coromandelianum	Yes	Common	+
Mangifera indica	No	NA	+
Maranta arundinacea	No	NA	+
Mariscus umbellatus	Yes	Very Common	+
Melastoma candidum	Yes	Common	+
Melia azedarach	No	Common	+
Melicope pteleifolia	Yes	Common	+
Microcos paniculata	Yes	Common	+
Microstegium ciliatum	Yes	Very Common	++

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Microstegium vagans	Yes	Common	+
Mikania micrantha	No	Very Common	+++
Millettia reticulata	Yes	Common	+
Mimosa diplotricha	No	Rare#	+
Mimosa pudica	No	Very Common	++
Miscanthus floridulus	Yes	Common	+
Miscanthus sinensis	Yes	Very Common	+
Morinda parvifolia	Yes	Very Common	+
Morinda umbellata	Yes	Common	+
Morus alba	Yes	Common	+
Murraya paniculata	No	NA	+
Musa balbisiana	Yes	Common	++
Musa x paradisiaca	No	NA	+
Mussaenda pubescens	Yes	Very Common	+
Neyraudia reynaudiana	Yes	Very Common	++
Ophiopogon japonicus	Yes	Common	+
Opuntia stricta	No	Common	+
Oxalis corniculata	Yes	Very Common	+
Oxalis corymbosa	No	Common	+
Pachira macrocarpa		NA	+
Paederia scandens	Yes	Very Common	+++
Panicum maximum	No	Very Common	+++
Panicum repens	Yes	Very Common	+
Paspalum conjugatum	No	Common	++
Paspalum orbiculare	Yes	Very Common	+
Paspalum paspaloides	Yes	Common	+
Paspalum scrobiculatum	Yes	Common	++
Paspalum vaginatum	Yes	Common	+++
Passiflora foetida	No	Common	+
Pennisetum purpureum	No	Very Common	+++
Peperomia pellucida	No	Common	+
Phyllanthus emblica	Yes	Very Common	+
Phyllanthus reticulatus	Yes	Common	+
Phyllanthus urinaria	Yes	Common	++
Phyllodium pulchellum	Yes	Very Common	+
Pilea microphylla	No	Very Common	++
Plantago major	Yes	Very Common	+
Polygonum chinense	Yes	Very Common	+
Polygonum hydropiper	Yes	Common	+
Polygonum perfoliatum	Yes	Common	+
Portulaca pilosa	Yes	NA	+
Pouzolzia zeylanica	Yes	Common	+
Psidium guajava	No	Common	+

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Psychotria asiatica	Yes	Very Common	+
Pteris semipinnata	Yes	Very Common	+
Pterocypsela indica	Yes	Common	+
Pueraria lobata	No	NA	+
Pueraria lobata	Yes	Common	+
Rhaphiolepis indica	Yes	Very Common	+
Rhus chinensis	Yes	Common	+
Rhus hypoleuca	Yes	Common	++
Rhynchelytrum repens	No	Very Common	+
Ricinus communis	No	Restricted	+
Rubus parvifolius	Yes	Common	+
Rumex trisetifer	Yes	Common	+
Sacciolepis indica	Yes	Very Common	+
Sageretia thea	Yes	Very Common	+
Sapium discolor	Yes	Very Common	+
Sapium sebiferum	Yes	Common	+
Schefflera heptaphylla	Yes	Very Common	+
Scoparia dulcis	No	Common	+
Scurrula parasitica	Yes	Restricted	+
Senecio scandens	Yes	Common	+
Sesbania cannabina	No	Common	++
Sesbania javanica	Yes	NA	+
Sida acuta	Yes	Common	+
Sida rhombifolia	Yes	Common	++
Sinobambusa tootsik	No	NA	+
Smilax china	Yes	Very Common	+
Solanum americanum	No	Very Common	+
Solanum nigrum	Yes	Very Common	+
Solanum torvum	No	Common	+
Solena amplexicaulis	Yes	Very Common	+
Sonchus arvensis	Yes	Very Common	+
Sonchus oleraceus	No	Very Common	+
Sporobolus fertilis	Yes	Very Common	++
Stachytarpheta jamaicensis	No	Common	+
Stephania longa	Yes	Common	+
Sterculia lanceolata	Yes	Very Common	+
Synedrella nodiflora	No	Very Common	+
Syzygium cumini	No	NA	+
Tadehagi triquetrum	Yes	Very Common	+
Tetradium glabrifolium	Yes	Common	+
Thysanolaena maxima	Yes	Common	+
Tinospora sinensis	Yes	Common	+
Tithonia diversifolia	No	Common	++

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Trema orientalis	Yes	Common	+
Trema tomentosa	Yes	Common	+
Tridax procumbens	No	Very Common	+
Triumfetta rhomboidea	Yes	Common	+
Uraria crinita	Yes	Common	+
Urena lobata	Yes	Common	+
Uvaria macrophylla	Yes	Common	+
Vernonia cinerea	Yes	Very Common	+
Vitex negundo	Yes	Common	+
Wedelia trilobata	No	Common	++
Youngia japonica	Yes	Very Common	+
Zanthoxylum avicennae	Yes	Common	+
Zanthoxylum nitidum	Yes	Very Common	+

Note: * Status (source from Corlett *et al,* 2000. Hong Kong Vascular Plants: Distribution and Status):

N*A =weed, introduced, cultivated or landscaping species not covered by Corlett's study;*

 # it is an introduced species rarely occur in Hong Kong but not native rare species of conservation interest

Protected (1) = protected under Forestry Regulations (Cap. 96 sub. Leg.)

Protected (2) = scheduled under Protection of Endangered Species of Animals and Plants Ordinance (Cap 586)

** Rank of Abundance: + = uncommon; ++ = fairly common; +++ = very common.

Table F-3b Plant Species recorded at Section 3 (Red Alignment)

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Pennisetum purpureum	No	Very Common	+++
Ricinus communis	No	Restricted	++
Bidens alba	No	Very Common	+++
Eleusine indica	Yes	Very Common	++
Panicum maximum	No	Very Common	+++
Cynodon dactylon	Yes	Very Common	++
Ipomoea cairica	No	Very Common	+
Paspalum orbiculare	Yes	Very Common	+
Sesbania javanica	Yes	NA	+
Tithonia diversifolia	No	Common	+
Alocasia odora	Yes	Very Common	++
Ficus hispida	Yes	Very Common	+
Mikania micrantha	No	Very Common	+++
Melia azedarach	No	Common	+
Celtis sinensis	Yes	Common	+
Ficus hirta	Yes	Common	+
Paederia scandens	Yes	Very Common	++
Microstegium ciliatum	Yes	Very Common	++
Litsea glutinosa	Yes	Very Common	+
Rhus chinensis	Yes	Common	+
Lygodium japonicum	Yes	Very Common	++
Macaranga tanarius	Yes	Common	+
Inula cappa	Yes	Common	+
Mussaenda pubescens	Yes	Very Common	+
Breynia fruticosa	Yes	Very Common	+
Mallotus apelta	Yes	Common	+
Lantana camara	No	Very Common	+
Musa x *paradisiaca*	No	NA	+
Solanum erianthum	No	Common	+
Ficus microcarpa	Yes	Common	+
Amaranthus viridis	Yes	Very Common	+
Bischofia javanica	Yes	Common	+

Note: * Status (source from Corlett *et al,* 2000. Hong Kong Vascular Plants: Distribution and Status):
NA *=weed, introduced, cultivated or landscaping species not covered by Corlett's study;*
 # it is an introduced species rarely occur in Hong Kong but not native rare species of conservation interest
Protected = protected under Forestry Regulations (Cap. 96 sub. Leg.)

** Rank of Abundance: + = uncommon; ++ = fairly common; +++ = very common.

Table F-3c Bird Species recorded at Section 3

Common Name	Level of Concern	Wetland-dependent	Mean#
Grey Heron *Ardea cinerea*	PRC	Y	1.11
Great Egret *Egretta alba*	PRC(RC)	Y	1.22
Little Egret *Egretta garzetta*	PRC(RC)	Y	5.22
Cattle Egret *Bubulcus ibis*	(LC)	Y	0.44
Chinese Pond Heron *Ardeola bacchus*	PRC(RC)	Y	5.11
Black-crowned Night Heron *Nycticorax nycticorax*	(LC)	Y	0.56
Yellow Bittern *Ixobrychus sinensis*	(LC)	Y	0.11
Cinnamon Bittern *Ixobrychus cinnamomeus*	LC	Y	0.11
Black Kite *Milvus migrans*	(RC)	N	0.89
Common buzzard *Buteo buteo*	-	Y	0.11
Greater Spotted Eagle *Aquila clanga*	GC	Y	0.11
White-breasted Waterhen *Amaurornis phoenicurus*	-	Y	0.89
Little Ringed Plover *Charadrius dubius*	(LC)	Y	3.78
Common Greenshank *Tringa nebularia*	RC	Y	0.11
Green Sandpiper *Tringa ochropus*	-	Y	1.78
Wood Sandpiper *Tringa glareola*	LC	Y	1.56
Common Sandpiper *Actitis hypoleucos*	-	Y	1.67
Common Snipe *Gallinago gallinago*	-	Y	0.11
Spotted Dove *Streptopelia chinensis*	-	N	24.33
Common Koel *Eudynamys scolopacea*	-	N	2.22
Greater Coucal *Centropus sinensis*	-	N	0.89
Lesser Coucal *Centropus bengalensis*	-	N	0.56
Pacific Swift *Apus pacificus*	(LC)	N	0.44
Little Swift *Apus affinis*	-	Y	1.56
Pied Kingfisher *Ceryle rudis*	(LC)	Y	0.11
Common Kingfisher *Alcedo atthis*	-	Y	0.44
White-throated Kingfisher *Halcyon smyrnensis*	(LC)	Y	1.00
Barn Swallow	-	Y	7.44

Common Name	Level of Concern	Wetland-dependent	Mean#
H irundo rustica			
Yellow Wagtail *Motacilla flava*	-	Y	1.00
Grey Wagtail *Motacilla cinerea*	-	Y	0.56
White Wagtail *Motacilla alba*	-	Y	9.33
Richard's Pipit *Anthus richardi*	-	N	0.11
Olive-backed Pipit *Anthus hodgsoni*	-	N	0.33
Red-throated Pipit *Anthus cervinus*	LC	N	0.33
Red-whiskered Bulbul *Pycnonotus jocosus*	-	N	26.00
Chinese Bulbul *Pycnonotus sinensis*	-	N	18.89
Sooty-headed Bulbul *Pycnonotus aurigaster*	-	N	2.00
Long-tailed Shrike *Lanius schach*	-	N	2.78
Oriental Magpie Robin *Copsychus saularis*	-	N	7.22
Common Stonechat *Saxicola torquata*	-	N	3.33
Blue Whistling Thrush *Myophonus caeruleus*	-	N	0.11
Masked Laughingthrush *Garrulax perspicillatus*	-	N	5.56
Hwamei *Garrulax canorus*	-	N	0.11
Japanese Bush Warbler *Cettia diphone*	-	N	0.22
Oriental Reed Warbler *Acrocephalus orientalis*	-	Y	0.11
Zitting Cisticola *Cisticola juncidis*	LC	N	0.22
Yellow-bellied Prinia *Prinia flaviventris*	-	N	11.44
Plain Prinia *Prinia inornata*	-	N	6.78
Common Tailorbird *Orthotomus sutorius*	-	N	0.33
Dusky Warbler *Phylloscopus fuscatus*	-	N	0.44
Pallas's Leaf Warbler *Phylloscopus proregulus*	-	N	0.11
Yellow-browed Warbler *Phylloscopus inornatus*	-	N	0.11
Arctic Warbler *Phylloscopus borealis*	-	N	0.11
Great Tit *Parus major*	-	N	0.33
Japanese White-eye *Zosterops japonicus*	-	N	3.00
Chestnut Bunting *Emberiza rutila*	-	N	0.11
Scaly-breasted Munia	-	N	3.56

Common Name	Level of Concern	Wetland-dependent	Mean#
Lonchura punctulata			
Eurasian Tree Sparrow *Passer montanus*	-	N	54.56
Red-billed Starling *Sturnus sericeus*	GC*	Y	0.22
Black-collared Starling *Sturnus nigricollis*	-	N	5.00
Crested Myna *Acridotheres cristatellus*	-	N	15.67
Black Drongo *Dicrurus macrocercus*	-	N	1.78
Blue Magpie *Urocissa erythrorhyncha*	-	N	1.67
Common Magpie *Pica pica*	-	N	1.22
Large-billed Crow *Corvus macrorhynchos*	-	N	1.00
Collared Crow *Corvus torquatus*	LC	N	0.11

*Red-billed Starling is considered by Fellows *et al*. (2002) to be of Global Concern. Since then, the global population has been increasing and the species is not now considered globally threatened (BirdLife International 2008). A listing of Regional Concern (RC), based on the importance of the large roosts present near Deep Bay, is considered to be more appropriate.

#Mean values given are the mean number recorded on all transects. This is included to reflect the regularity of a species in the study area.

Table F-4a Plant Species recorded at Section 4

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Acacia confusa	No	NA	+
Ageratum conyzoides	No	Common	+
Alysicarpus vaginalis	Yes	Very Common	+
Aporusa dioica	Yes	Very Common	+
Bauhinia blakeana	Yes	NA	+
Bidens alba	No	Very Common	++
Bridelia tomentosa	Yes	Very Common	+++
Bryophyllum pinnatum	No	Common	+
Callistemon viminalis	No	NA	++
Carica papaya	No	NA	+
Celtis sinensis	Yes	Common	+
Cinnamomum camphora	Yes	Common	+
Cynodon dactylon	Yes	Very Common	+
Delonix regia	No	NA	+
Digitaria sanguinalis	Yes	Very Common	+
Elaeocarpus hainanensis	No	NA	+
Eleusine indica	Yes	Very Common	+
Eleutherococcus trifoliatus	Yes	Restricted	+++
Emilia sonchifolia	Yes	Very Common	+
Eragrostis tenella	Yes	Very Common	+
Euphorbia hirta	No	Very Common	+
Ficus hispida	Yes	Very Common	+
Ficus pumila	Yes	Very Common	++
Grevillea robusta	No	NA	+
Hedyotis diffusa	Yes	Very Common	+
Imperata koenigii	Yes	Very Common	+++
Ipomoea cairica	No	Very Common	+++
Lagerstroemia speciosa	No	NA	+
Lantana camara	No	Very Common	++
Leucaena leucocephala	No	Common	++
Liquidambar formosana	Yes	Common	+
Macaranga tanarius	Yes	Common	+
Malvastrum coromandelianum	Yes	Common	++
Melaleuca quinquenervia	No	NA	+
Melastoma candidum	Yes	Common	++
Mikania micrantha	No	Very Common	++
Mimosa pudica	No	Very Common	++
Murraya paniculata	No	NA	+
Mussaenda pubescens	Yes	Very Common	+
Neyraudia reynaudiana	Yes	Very Common	+
Oxalis corymbosa	No	Common	+
Paederia scandens	Yes	Very Common	+
Panicum maximum	No	Very Common	++
Paspalum vaginatum	Yes	Common	+++
Phyllanthus niruri	Yes	Common	+
Phyllanthus reticulatus	Yes	Common	+++
Pterocypsela indica	Yes	Common	+
Pueraria lobata	Yes	Common	+
Rhus chinensis	Yes	Common	++
Schefflera arboricola	No	NA	+
Schefflera heptaphylla	Yes	Very Common	+
Sonchus oleraceus	No	Very Common	+
Sporobolus fertilis	Yes	Very Common	+
Sterculia lanceolata	Yes	Very Common	+
Tradescantia zebrina	No	NA	+

Scientist Name	Native to Hong Kong	Status*	Relative Abundance**
Vernonia cinerea	Yes	Very Common	+
Wedelia trilobata	Yes	Common	+++

Note: * Status (source from Corlett *et al,* 2000. Hong Kong Vascular Plants: Distribution and Status):
N*A =weed, introduced, cultivated or landscaping species not covered by Corlett's study;*
Protected = protected under Forestry Regulations (Cap. 96 sub. Leg.)

** Rank of Abundance: + = uncommon; ++ = fairly common; +++ = very common.

Table F-4b Bird Species recorded at Section 4

Common Name	Level of Concern	Wetland-dependent	Mean#
Black-crowned Night Heron *Nycticorax nycticorax*	(LC)	Y	0.25
Black Kite *Milvus migrans*	(RC)	N	0.25
White-breasted Waterhen *Amaurornis phoenicurus*	-	Y	0.13
Spotted Dove *Streptopelia chinensis*	-	N	5.75
Common Koel *Eudynamys scolopacea*	-	N	0.13
Lesser Coucal *Centropus bengalensis*	-	N	0.38
Pacific Swift *Apus pacificus*	(LC)	N	0.25
Little Swift *Apus affinis*	-	Y	2.13
White-throated Kingfisher *Halcyon smyrnensis*	(LC)	Y	0.75
Barn Swallow *hirundo rustica*	-	N	5.38
White Wagtail *Motacilla alba*	-	Y	0.13
Richard's Pipit *Anthus richardi*	-	N	0.13
Red-whiskered Bulbul *Pycnonotus jocosus*	-	N	14.75
Chinese Bulbul *Pycnonotus sinensis*	-	N	6.00
Sooty-headed Bulbul *Pycnonotus aurigaster*	-	N	2.25
Long-tailed Shrike *Lanius schach*	-	N	0.63
Oriental Magpie Robin *Copsychus saularis*	-	N	2.00
Common Stonechat *Saxicola torquata*	-	N	0.25
Masked Laughingthrush *Garrulax perspicillatus*	-	N	3.25
Yellow-bellied Prinia *Prinia flaviventris*	-	N	2.50
Plain Prinia *Prinia inornata*	-	N	2.50
Japanese White-eye *Zosterops japonicus*	-	N	0.75
Scaly-breasted Munia *Lonchura punctulata*	-	N	0.88
Eurasian Tree Sparrow *Passer montanus*	-	N	7.38
Red-billed Starling *Sturnus sericeus*	GC*	Y	0.50
Black-collared Starling *Sturnus nigricollis*	-	N	2.88
Crested Myna *Acridotheres cristatellus*	-	N	8.63

Common Name	Level of Concern	Wetland-dependent	Mean#
Common Magpie *Pica pica*	-	N	0.25

*Red-billed Starling is considered by Fellows *et al* (2002) to be of Global Concern. Since then, the global population has been increasing and the species is not now considered globally threatened (BirdLife International 2008). A listing of Regional Concern (RC), based on the importance of the large roosts present near Deep Bay, is considered to be more appropriate.

#Mean values given are the mean number recorded on all transects. This is included to reflect the regularity of a species in the study area.

Table F-5 Ecological Evaluation of Woodland Habitats

Criteria	**Woodland**	**Fung Shui Woods**
Naturalness	Natural with minor human disturbance	Natural with minor human disturbance
Size	Medium	Medium to small
Diversity	Moderate	Moderate
Rarity	Not rare	Not common
Re-creatability	Re-creatable in long term (over 30 years)	Difficult to be re-created
Fragmentation	No fragmentation	No fragmentation
Ecological linkage	Ecologically linked with adjacent shrubland, hillside grassland, low-lying grassland etc.	Ecologically linked with adjacent shrubland, hillside grassland, low-lying grassland etc.
Potential value	Moderate-high	High
Nursery/ breeding ground	The woodland potentially provides breeding ground for birds, butterflies, and reptiles.	The woodland potentially provides breeding ground for birds, butterflies, and reptiles.
Age	30 to 50 years	Old
Abundance/ Richness of wildlife	Moderate	Moderate
Ecological value	**Moderate**	**Moderate** to **Moderate-high**

Table F-6 Ecological Evaluation of Shrubland Habitats

Criteria	
Naturalness	Natural habitat
Size	Large
Diversity	Moderate-low
Rarity	Not rare
Re-creatability	Re-creatable
Fragmentation	No fragmentation
Ecological linkage	Ecologically linked with the adjacent natural habitats.
Potential value	Could develop to woodland if hill fires are prevented.
Nursery/ breeding ground	Potential breeding ground for birds and reptiles.
Age	Young
Abundance/ Richness of wildlife	Moderate-low fauna abundance
Ecological value	**Moderate-low**

Table F-7 Ecological Evaluation of Plantation Habitats

Criteria	
Naturalness	Man-made habitat
Size	Medium
Diversity	Low
Rarity	Common
Re-creatability	Easy to be re-created
Fragmentation	N/A
Ecological linkage	No significant ecological linkage with other habitats
Potential value	Low
Nursery/ breeding ground	Low potential for nursery or breeding grounds
Age	Young
Abundance/ Richness of wildlife	Low fauna abundance
Ecological value	**Low**

Table F-8 Ecological Evaluation of Gei Wai Habitats

Criteria	
Naturalness	Originated from gei wai shrimp aquaculture ponds; semi-natural; Currently managed by WWF for the roosting and feeding sites for Black-faced Spoonbill.
Size	Medium
Diversity	High diversity in fauna species
Rarity	Many rare wetland-dependent bird species are found in this type of habitat. Important to the globally threatened Black-faced Spoonbill *Platalea leucorodia.*
Re-creatability	Re-creatable
Fragmentation	No fragmentation
Ecological linkage	Ecologically linked with nearby wetlands such as fishponds, mangrove and Inner Deep Bay mudflat.
Potential value	High
Nursery/ breeding ground	Potential breeding ground for mammals, amphibians, dragonflies and wetland birds.
Age	Young
Abundance/ Richness of wildlife	High abundance of migratory birds during winter; medium abundance of other fauna groups.
Ecological value	**High**

Table F-9 Ecological Evaluation of Mangrove Habitats

Criteria	
Naturalness	Natural habitats
Size	Small
Diversity	Low in flora species; Moderate-high in fauna species
Rarity	Not rare
Re-creatability	Re-creatable in long term (over 30 years)
Fragmentation	No fragmentation
Ecological linkage	Ecologically linked with adjacent ponds and wetlands
Potential value	High
Nursery/ breeding ground	Potential breeding grounds for inter-tidal fauna
Age	Medium
Abundance/ Richness of wildlife	Moderate for wetland species.
Ecological value	**High**

Table F-10 Ecological Evaluation of Marsh Habitats

Criteria	
Naturalness	Originated from abandoned agricultural lands; semi-natural
Size	Medium
Diversity	Moderate
Rarity	Not rare
Re-creatability	Re-creatable
Fragmentation	No fragmentation
Ecological linkage	Ecologically linked with nearby wetlands such as fishponds, wet agricultural lands
Potential value	Moderate
Nursery/ breeding ground	Potential breeding ground for amphibians, dragonflies and wetland birds.
Age	Young
Abundance/ Richness of wildlife	Moderate for freshwater wetland species.
Ecological value	**Moderate**

Table F-11 Ecological Evaluation of Wet Agricultural Land Habitats

Criteria	
Naturalness	Man-made habitat
Size	Small
Diversity	Low
Rarity	Not rare
Re-creatability	Re-creatable
Fragmentation	N/A
Ecological linkage	Ecologically linked with nearby wetlands such as marshes and fishponds.
Potential value	Can develop to marsh with proper habitat management
Nursery/ breeding ground	Potential breeding ground for amphibians.
Age	Young
Abundance/ Richness of wildlife	Moderate fauna abundance
Ecological value	**Moderate-low**

Table F-12 Ecological Evaluation of Dry Agricultural Land Habitats

Criteria	
Naturalness	Man-made habitat
Size	Medium
Diversity	Low
Rarity	Not rare
Re-creatability	Re-creatable
Fragmentation	Fragmented by infrastructures and villages
Ecological linkage	No significant ecological linkage
Potential value	Low
Nursery/ breeding ground	Low potential for nursery or breeding grounds
Age	Young
Abundance/ Richness of wildlife	Moderate-low fauna abundance
Ecological value	**Low**

Table F-13 Ecological Evaluation of Abandoned Agricultural Land / Low-lying Grassland Habitats

Criteria	
Naturalness	Semi-natural
Size	Large
Diversity	Low
Rarity	Common
Re-creatability	Re-creatable
Fragmentation	Fragmented by infrastructures and villages
Ecological linkage	potential ecological linkage with nearby natural and semi-natural habitats
Potential value	Moderate-low
Nursery/ breeding ground	Potential breeding ground for reptiles
Age	Young
Abundance/ Richness of wildlife	Low fauna abundance
Ecological value	**Low**

Table F-14 Ecological Evaluation of Pond Habitats

Criteria	
Naturalness	Man-made habitat
Size	Large
Diversity	Low flora diversity; High-Moderate fauna species diversity
Rarity	Common habitat in NWNT. Uncommon bat species were recorded around this habitat.
Re-creatability	Re-creatable
Fragmentation	No significant fragmentation
Ecological linkage	Ponds in Assessment Area around Section 1 and 2 are ecologically linked with various types of wetlands nearby including *Gei-Wai* in Mai Po Nature Reserve and marshes at Hoo Hok Wai. Ponds in Section 1 are located either in WCA or WBA.
Potential value	High as high variety of bird species can be found at this habitat. Birds of different forage groups including ducks, grebes, cormorant, bitterns, spoonbills, ardeids, waders and waterhens utilize different niches in fishponds. The fishponds at Mai Po, Sam Po Shui, San Tin and Lok Ma Chau are of high ecological importance due to its good ecological linkage to Inner Deep Bay wetland ecosystem. The ponds in Mai Po Nature Reserve are part of gei wai ecosystem which is of internationally important to migratory waterbird species. This habitat also important to odonate.
Nursery/ breeding ground	Nursery / breeding grounds for commercial fisheries, amphibians and odonates.
Age	Over 30 years

Criteria	
Abundance/ Richness of wildlife	High abundance of wetland fauna species.
Ecological value	**High**

Table F-15 Ecological Evaluation of Stream / River Habitats

Criteria	
Naturalness	Semi-natural
Size	Small
Diversity	Low diversity for flora but Moderate for fauna diversity at the unchannelised Shenzhen River; while High for the Lin Ma Hang Stream
Rarity	Number of this habitat type is declining in Hong Kong. Rare and uncommon fish species *Rasbora steineri*, *Pseudorasbora parva* and *Mastacembelus armatus* were recorded in Lin Ma Hang Stream
Re-creatability	Can only be re-created under suitable hydrological condition
Fragmentation	N/A
Ecological linkage	The Shenzhen River has limited ecological linkage with other habitats for its heavy pollution; The Lin Ma Hang Stream is ecologically linked with the nearby marshes and grasslands.
Potential value	Low for Shenzhen River; High for Lin Ma Hang Stream.
Nursery/ breeding ground	Lin Ma Hang Stream is a breeding and nursery grounds for some native fish species.
Age	Old
Abundance/ Richness of wildlife	Low for Shenzhen River; Moderate for Lin Ma Hang Stream
Ecological value	**Moderate** for unchannelised Shenzhen River; **High** for Lin Ma Hang Stream

Table F-16 Ecological Evaluation of Drainage Channel Habitats

Criteria	
Naturalness	Man-made habitat
Size	Large
Diversity	Low for flora species; The channelized Shenzhen River is rich in waterbird diversity due to its good ecological linkage to the Inner Deep Bay ecosystem.
Rarity	Common
Re-creatability	Re-creatable
Fragmentation	N/A
Ecological linkage	Ecologically linked with the surrounding natural and semi-natural habitats particularly the wetland habitats at Mai Po, San Tin, Lok Ma Chau and Hoo Hok Wai.

Criteria	
Potential value	Low
Nursery/ breeding ground	Breeding ground for odonates, the exotic Tilapia and Mosquito Fish.
Age	Young
Abundance/ Richness of wildlife	Moderate-low for odonates, High-moderate for other bird fauna.
Ecological value	**Moderate** for the lower section of channalized Shenzhen River**;** **Moderate-low** for all other channalized river

Table F-17 Ecological Evaluation of Hillside Grassland Habitats

Criteria	
Naturalness	Natural but disturbed by hillfires
Size	Large
Diversity	Low
Rarity	Not rare
Re-creatability	Maintained by hillfires
Fragmentation	Continuous along hillsides
Ecological linkage	Not ecologically linked with area or species of conservation concern
Potential value	Low
Nursery/ breeding ground	Potential for breeding ground is low
Age	No available information
Abundance/ Richness of wildlife	Low
Ecological value	**Low**

Table F-18 Ecological Evaluation of Open Field Habitats

Criteria	
Naturalness	Disused man-made habitat
Size	Small
Diversity	Low
Rarity	Not rare
Re-creatability	Re-creatable
Fragmentation	N/A
Ecological linkage	No significant ecological linkage
Potential value	Low
Nursery/ breeding ground	Low potential for breeding or nursery ground
Age	Young
Abundance/ Richness of wildlife	Low
Ecological value	**Low**

Table F-19 Ecological Evaluation of Developed Area Habitats

Criteria	
Naturalness	Man-made habitat
Size	Large
Diversity	Low
Rarity	Not rare; Only species adapted to anthropogenic environment could be found in this habitat, all of those are common and widespread in Hong Kong
Re-creatability	Re-creatable
Fragmentation	N/A
Ecological linkage	No ecological linkage
Potential value	Low
Nursery/ breeding ground	Low potential as breeding / nursery grounds
Age	N/A
Abundance/ Richness of wildlife	Low
Ecological value	**Very Low**

Plate F1 Woodland

Plate F2 Shrubland

Plate F3 Plantation

Plate F4 Gei Wai

Plate F5 Mangrove

Plate F6 Pond

Plate F7 Marsh

Plate F8 Wet Agricultural Land

Plate F9 Dry Agricultural Land

Plate F10 Abandoned Agricultural Land / Low Lying Grassland

Plate F11 Hillside Grassland

Plate F12 Stream / River

Plate F13 Drainage Channel

Plate F14 Open Field

Plate F15 Developed Area

Plate F16 Burmese Python *Python molurus* recorded on 14 February 2008 at riparian vegetation along fishpond bund of Lok Ma Chau in vicinity to the Project Area

Plate F17 Chinese Cobra *Naja atra* recorded on 5 September 2008 at riparian vegetation along a stream in Lok Ma Chau off-site from the Project Area

Plate F18 Burmese Python *Python molurus* recorded on 10 September 2008 at riparian vegetation along Tam Shui Hang Channel off-site from the Project Area

Plate F19 Sample of Plant Protective Fencing

APPENDIX G

(Not Used)

APPENDIX H

Cultural Heritage

Location: Liu Pok	Project: Construction of a Secondary Boundary Fence and New Sections of Primary Boundary Fence and Boundary Control Road	Ref # BF-HB1

Title: Shrine 神龕	**Date Recorded: 03/10/2008**
Original Usage: Religious	**Current Usage: Religious**
Construction Date: Unknown	**Address: N/A**
Orientation: Northeast	**Ownership: Private**
Setting: At the base of a hill to the of Liu Pok Village	**Degree of Modification: Modern rebuilt structure**
General Condition: Good	**Historical Associations: None**
Description: Concrete armchair style shrine with brown stone covering. Curved sides with moulded top surface. Rounded burner beside shrine.	
Inscriptions: None	
Additional Notes: None **Photo Ref# Plate H1**	

Location: Chuk Yuen	Project: Construction of a Secondary Boundary Fence and New Sections of Primary Boundary Fence and Boundary Control Road	Ref # BF-HB2

Title: Village House 村屋	**Date Recorded: 03/10/2008**
Original Usage: Residential	**Current Usage: Abandoned**
Construction Date: Unknown	**Address: N/A**
Orientation: Southwest	**Ownership: Private**
Setting: In overgrown wooded area to the west of the currently inhabited Chuk Yuen Village	**Degree of Modification: Low**
General Condition: Ruin	**Historical Associations: None**
Description: Pitched roof single storey structure with brick and pounded earth walls covered in render on the exterior. The roof has collapsed and the interior gutted and overgrown. Cut granite door frame with lintel and threshold stone. Wooden door in frame rotted and collapsing.	
Inscriptions: None	
Additional Notes: None **Photo Ref# Plate H2**	

Location: Chuk Yuen	Project: Construction of a Secondary Boundary Fence and New Sections of Primary Boundary Fence and Boundary Control Road	Ref # BF-HB3

Title: Village House 村屋	**Date Recorded: 03/10/2008**
Original Usage: Residential	**Current Usage: Abandoned**
Construction Date: Unknown	**Address: N/A**
Orientation: Southwest	**Ownership: Private**
Setting: : In overgrown wooded area to the west of the currently inhabited Chuk Yuen Village	**Degree of Modification: Low**
General Condition: Ruin	**Historical Associations: None**
Description: Single storey green brick and pounded earth structure. Roof has completely collapsed. Interior gutted and overgrown with vegetation. Cut granite lintel at entrance with carving. Door missing. More ruins are attached to the building in similar state of decay.	
Inscriptions: None	
Additional Notes: None **Photo Ref# Plate H3**	

Location: Kong Ha	Project: Construction of a Secondary Boundary Fence and New Sections of Primary Boundary Fence and Boundary Control Road	Ref # BF-HB4

Title: Village House 村屋	**Date Recorded: 03/10/2008**
Original Usage: Residential	**Current Usage: Residential**
Construction Date: Pre-1950	**Address: No address available**
Orientation: South	**Ownership: Private**
Setting: To the west of the village, beside retaining wall for the border crossing road	**Degree of Modification: Low**
General Condition: Good	**Historical Associations: None**

Description:

Two storey detached rectangular structure with pitched Hakka tile roof. Façade has recessed central section with entrance. Large double panel wooden door set into cut granite door frame with traditional metal bar gate intact.

There are small metal barred windows at corners of the façade. There is a painted frieze panel around the top of the entrance section on the façade.

Exterior walls are render covered with concrete corner panels designed to imitate cut granite corner stones.

Gable frieze panels painted with moulding and moulded decoration under the eaves on the rear wall.

Inscriptions:

Additional Notes: None

Photo Ref# Plate H4

Ref. #: G1	Project: Boundary Fence	Location: near Liu Pok
Date: 19.09.09	Orientation: Northwest	Date of original burial: Ming Dynasty Renovations: 18th year of Guangxu (1892); 丙子年
Family: Fung	Generation: 6th, 9th, 10th, 11th generations	
Dimensions: Height: 260 cm Width: 850 cm Depth: 300 cm Description: Large concrete armchair style grave placed on a low hillside. There are four plaques, each with metal incense holder placed directly in front of the plaque. Additional Notes: None **Photo Ref# Plate H5**		Inscription: (first right) 祖妣利氏乃孟賢公之原配孺人也鄭氏迺十一世 祖維俸公之原配孺人也今二氏合葬於本山土名 員嶺仔形喚鱟地原葬卯山西兼乙辛今改乙山辛 兼卯西分經之原誌之爲春禋秋祀長發其祥奕世 其昌立石永垂不朽云尔 江 右吉龍明亮宗先生定針 初九 利氏孺人 明 世妣馮母 墓 十一 鄭氏孺人 英偉繼昌 安樂德業 東保宏業 德信金保 奉祀十九傳孫有福 廿傳孫加樂英祿 仝立 占魁南仔 天生富貴 品魁興福 光緒十八年歲次壬辰仲冬吉旦重修 丙子年仲秋吉日再重修馮光裕祖司理 榮桂興發 立石 座生 漢光

(second left)

公諱一元號遠澗迺寧揚公之子也原配孺人黃氏
所生二子長賡野次樂野公與黃氏仝葬於本山土
名員嶺仔形喚鱟地原葬卯山西兼乙辛今改乙山辛
兼卯西分經之原誌之爲春禋秋祀長發其祥奕
世其昌立石永垂不朽云尔　江
右 吉龍明亮宗先生定針

考遠澗公府君
明十世　墓
妣淑德黃氏孺人

飲發全
賓廷相
奉祀十九傳孫啓仁二十傳孫曰亨等仝立

光　祖穩
作

光緒十八年歲次壬辰仲冬月吉旦重修
丙子年仲秋吉日再重修馮光裕祖司理　榮桂 興發 立石
座生 漢光

(second right)

祖妣黃氏世傳乃光裕祖之孺人也生三子永昌
次永諾三永興祖葬於王里土名魚仔坑白坟
前蜈公形妣葬於本山土名員嶺仔形喚鱟地原
葬卯山西兼乙辛今改乙山辛兼卯西分經之原
誌之爲春禋祀長發其祥奕世其昌立石永垂不朽云

江
右 吉龍明亮宗先生定針

明六世祖妣馮母黃氏孺人墓

奉祀三大房眾子裔孫等仝立
光緒十八年歲次壬辰仲冬月吉旦重修
丙子年仲秋吉日再重修馮光裕祖司理　榮桂 興發 立石
座生 漢光

(first left)

公諱繼通字統達原配孺人陳氏所生二子長士田
次敬田今公與妣仝葬於本山土名員嶺仔形喚鱟
地原葬卯山西兼乙辛今改乙山辛兼卯西分經之
原誌之享祀千秋長發其祥奕世其昌茲立石碑以
永垂不朽云尔　江
右 吉龍明亮宗先生定針

考冠帶維
明十一世祖太祖　之墓
妣淑德彌人陳氏

德昌
奉祀十九世孫　二十世孫 士發等仝立
承昌

光緒十八年歲次壬辰仲冬月吉旦重修
丙子年仲秋吉日再重修馮光裕祖司理　榮桂 興發 立石
座生 漢光

Ref. #: BF-G2	Project: NDS Phase 2	Location: Lin Ma Hang Road
Date: 10.10.08	Orientation: North	Date of original burial: N/A Renovation: 3rd year of Chinese Republic (1914)
Family: NA	Generation: N/A	
Dimensions: Height: 120 cm Width: 210 cm Depth: 290 cm Description: Small concrete armchair style grave with single plaque in the centre. Set into low hillside at the side of the existing road. Additional Notes: There are three small chunam incense (shrine) holders in the vicinity of the grave **Photo Ref# Plate H6**		Inscription: 民國三年×月吉旦重修 清顯……太公母二位之墓 姚淑德 清香毓 奉祀男章孫×馨曾孫等仝立 德芬芳

Plate H1 BF-HB1 Shrine

Plate H2 BF-HB2 Village House

Plate H3 BF-HB3 Village House

Plate H4 BF-HB4 Village House

Plate H5 BF-G1 Grave

Plate H6 BF-G2 Grave