

Hong Kong Housing Authority

Agreement No. CB20120293

**Planning and Engineering Study
for the Public Housing Site and
Yuen Long Industrial Estate
Extension at Wang Chau**

**Final Technical Report No.1 (TR-1)
Baseline Review**

March 2013

IMPORTANT – CONFIDENTIALITY

This project and study shall be kept confidential and any information contained in and/or related to the project/study shall not be disclosed to any person not involved in the project/study.

Ove Arup & Partners Hong Kong Ltd
Level 5 Festival Walk
80 Tat Chee Avenue
Kowloon Tong
Kowloon
Hong Kong
www.arup.com

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 226464

ARUP

Document Verification



Job title		Agreement No. CB20120293 Planning and Engineering Study for the Public Housing Site and Yuen Long Industrial Estate Extension at Wang Chau		Job number 226464	
Document title		Final Technical Report No.1 (TR-1) - Baseline Review		File reference REP-002-01	
Document ref		REP-002-00			
Revision	Date	Filename	REP-002-01_Final TR-1 Baseline Review		
0	11 Mar 2013	Description	Final		
			Prepared by	Checked by	Approved by
		Name	██████████	██████████	██████████
		Signature	██████████	██████████	██████████
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			

Issue Document Verification with Document



Contents

	Page
1 INTRODUCTION	1
1.1 Project Background	1
1.2 Objectives of the Assignment	1
1.3 The Study Area	3
1.4 The Study Assignment	3
1.5 Purpose of this Report	5
1.6 Structure of this Report	5
1.7 Nomenclature and Abbreviations	6
2 BASELINE CONDITIONS OF THE STUDY AREA	13
2.1 Land Use Planning	13
2.2 Urban Design	24
2.3 Landscape Design	26
2.4 Land Matter	28
2.5 Traffic & Transport	29
2.6 Geotechnics	35
2.7 Drainage	40
2.8 Sewerage	42
2.9 Water Supply and Utilities	43
2.10 Ecology and Fisheries	44
2.11 Cultural Heritage	56
2.12 Other Environmental Aspects	73
2.13 Air Ventilation	134
2.14 Socio-Economics	136
3 KEY ISSUES, DEVELOPMENT CONSTRAINTS AND OPPORTUNITIES	140
3.1 Land Use Planning	140
3.2 Urban Design	141
3.3 Landscape Design	142
3.4 Lands Matter	144
3.5 Traffic & Transport	144
3.6 Geotechnics	148
3.7 Drainage	150
3.8 Sewerage	150
3.9 Water Supply and Utilities	151
3.10 Ecology and Fisheries	153
3.11 Cultural Heritage	154
3.12 Other Environmental	160
3.13 Air Ventilation	169

3.14	Socio-Economics	169
3.15	Community Engagement	170
4	SUMMARY OF DEVELOPMENT OPPORTUNITIES AND CONSTRAINTS	171
5	REFERENCE	180

Figures

Appendices

1 INTRODUCTION

1.1 Project Background

As stated in the Chief Executive's 2011-12 Policy Address, the Administration is committed to expanding the land resources and increasing housing land supply. To meet this policy objective, the Planning Department (PlanD) has carried out a comprehensive review of the areas zoned "Green Belt" (GB) on the Outline Zoning Plans (OZPs) focusing on sites which are no longer green or spoiled. A number of "GB" and "Open Storage" (OS) sites in Wang Chau, Yuen Long were identified as having potential for public housing development (PHD).

Subsequently, the Innovation and Technology Commission (ITC) and the Hong Kong Science and Technology Parks Corporation (HKSTP) advised of the need to expand the Yuen Long Industrial Estate (YLIE), in addition to the existing three Industrial Estates (IEs) at Tai Po, Tseung Kwan O and Yuen Long. It was requested to use a portion of the Wang Chau potential housing site for this purpose.

After due consideration, an agreement was reached between the Housing Department (HD) and ITC to share the 34.4 hectares (ha) site (the Site), tentatively with the northerly portion, around 16 ha in size, to be allocated for the YLIE extension (YLIEE), while the remaining 18.4 ha in the south would be developed for public housing use (**Figure 1.1.1**). It was further agreed that no Potential Hazardous Installations (PHIs) would be located at the YLIEE so as to minimize the potential adverse impact on the neighbouring PHD.

Ove Arup & Partners Hong Kong Limited (Arup) was commissioned by Hong Kong Housing Authority (HKHA) under entrustments from the Government of the Hong Kong Special Administrative Region (HKSAR) & Hong Kong Science and Technology Parks Corporation (HKSTP) to conduct the Planning and Engineering Study for Public Housing Site and YLIEE at Wang Chau (the Study), which will examine the feasibility on developing public housing and YLIEE at Wang Chau by conducting planning, engineering and environmental assessments to formulate proposal for the PHD and YLIEE, and the implementation strategies and programme for the PHD. The consultancy has commenced on 31 July 2012 and is scheduled for a period of 36 months.

1.2 Objectives of the Assignment

The overall objective of the Study is to examine the feasibility of PHD and YLIEE at Wang Chau, taking into account the environmental, planning, urban design, traffic and transport, geotechnical, foundation, landscaping, sewerage, drainage, water supply and other engineering/infrastructure matters, air ventilation, socio-economic, financial, provision of Government/Institutional and Community (G/IC) facilities, open space, recreation and retail facilities; formulate and evaluate different development options as well as identify the preferred option; recommend optimal and practicable development schemes with parameters; propose necessary infrastructure upgrading works with schematic design; and prepare an implementation programme.

The Study will form the basis for implementation of the PHD and YLIEE under the rezoning and Environmental Impact Assessment Ordinance (EIAO) (Cap. 499) processes.

Specifically, the objectives of the Study are set out as follows:

- a) identify opportunities, constraints and key issues confronting the public housing project and YLIEE, and highlight the problems that might affect their overall development;
- b) formulate development options and carry out preliminary feasibility assessments to derive practicable development parameters and schemes for the public housing project and YLIEE;
- c) formulate land use proposals and delineate development boundaries for the PHD, YLIEE and other associated infrastructures and facilities;
- d) evaluate the development options against a set of clearly defined principles, objectives and associated performance criteria as agreed with the Director's Representative;
- e) confirm the feasibility of the public housing project and YLIEE and associated infrastructures and facilities by undertaking a series of technical assessments including traffic and transport, sewerage, drainage, water supply, utilities, geotechnical, slope stability and site formation works, foundation, urban design, landscape and visual, air ventilation, natural terrain landslide hazard, hazard potential of industrial installation, land contamination, ecology and cultural heritage etc;
- f) confirm the environmental acceptability of the PHD and YLIEE as well as the associated infrastructure works by conducting comprehensive environmental studies which shall include (i) Environmental Assessment Study (EAS) for confirming the environmental acceptability of the proposed developments, particularly the proposed housing development which is subject to environmental impact from the existing and planned developments and environment in the vicinity, (ii) Land Contamination and Remediation Assessment with carrying out the necessary site investigation (SI) and laboratory testing (LT) for the assessment; and (iii) Environmental Impact Assessment (EIA) for confirming the environmental acceptability of the impact arising from the proposed developments, particularly YLIEE on the existing developments and proposed developments, including the proposed housing development, in the vicinity; whereas the EIA shall include, inter alia, cultural heritage impact assessment and ecological impact assessment; the EIA shall be carried out for, but not limited to, the following designated projects:
 - (i) this planning and engineering study for the Site under Schedule 3 of EIAO;
 - (ii) YLIEE under Schedule 2 of EIAO; and
 - (iii) any other facilities, works and projects identified in the Study for supporting the PHD and/or YLIEE and falling within Schedule 2 or 3 of EIAO.
- g) formulate a strategy for public consultation/engagement and undertake the public consultation/engagement accordingly; explore good development concepts from the community, and gauge public feedback through the public consultation/engagement activities;
- h) recommend practicable and cost effective measures to mitigate the constraints and problems identified, including but not limited to environmental mitigation,

geotechnical works, slope works, site formation works, natural terrain hazard mitigation works, road and infrastructural works required for the proposed PHD and YLIEE, as well as innovative approaches to deal with the interface problem between public housing and YLIEE;

- i) provide recommendations on site formation works, natural terrain hazard mitigation works, slope works, road works and other infrastructure works, G/IC facilities as well as alternative mitigation measures to suit the proposed schemes with schematic design to be shown on plans and sections in enough details to demonstrate their feasibility to the satisfaction of the relevant departments and authorities;
- j) carry out preliminary design of the engineering works to cope with the development of the Site with preparation of schematic layout plans and preliminary engineering study to facilitate detailed design of these engineering works to proceed after this Study;
- k) carry out SI and LT where necessary and conduct preliminary engineering study, geotechnical assessment, natural terrain hazard study and the necessary mitigation measures for the proposed development and the required infrastructure so that the detailed design can be proceeded immediately after this Study;
- l) facilitate timely implementation of the sites and infrastructure developments by recommending a suitable implementation programme/framework including implementation packages, land requirement and rehousing;
- m) examine and advise the financial implications of the site developments, including land resumption and clearance costs, as well as infrastructure costs;
- n) facilitate rezoning of the sites for public housing use and IE use;
- o) provide support to fulfill the requirement of EIAO for implementation of the engineering feasibility study and designated projects under EIAO and to prepare all necessary reports, documents and materials for the EIAO process and associated public consultation and presentations.

1.3 The Study Area

The PHD site and YLIE Extension at Wang Chau are zoned GB and OS on the Ping Shan OZP No. S/YL-PS/14. It is currently occupied by OS, vehicle parks, farmland, fallow land, grassland, rural residential dwellings and temporary structures.

The Study Area is bounded by Shan Pui River to the east, Wang Tat Road and Long Tin Road to the south, covering Kai Shan in the west, and Ng Uk Tsuen in the north as indicated in **Figure 1.1.1**. The boundaries for feasibility assessments may not be confined to the Study Area and may need to extend to take account of the relevant conditions/impacts outside the Study Area for the satisfactory completion of the Study. The exact boundary and coverage of the sites for the PHD and YLIEE and the associated infrastructures/facilities for the developments (i.e. the Project site) will be reviewed and defined in the Study.

1.4 The Study Assignment

The Study is divided into two phases, namely Phase 1- Technical Feasibility Study Stage and Phase 2 - Public Consultation, Rezoning and EIAO Stage. Phase 2 Study will have two options, namely Phase 2A - Public Consultation, Rezoning and EIAO Stage

for both PHD site and YLIEE site and Phase 2B – Public Consultation, Rezoning and EIAO Stage for PHD site only.

Phase 2A Study covers the services for the overall development option that both PHD site and YLIEE site will proceed for further study at a later stage of or after Phase 1 Study. Phase 2B Study is for the overall development option that only PHD will proceed for further study at a later stage of or after Phase 1 Study, i.e. study for YLIEE will not be further pursued.

The assignment of the Study will include the following main tasks at each phase:

Phase 1 - Technical Feasibility Study Stage

- a) Task 1 – prepare an inception report for the Study;
- b) Task 2 – establish a baseline profile of the Study Area and its relationship with the adjoining areas and conduct a review of the issues that affect the sites;
- c) Task 3 – establish guiding principles and formulate initial options for the public housing project and YLIEE with reference to the baseline profile under Task 2 above and target industry sectors;
- d) Task 4 – carry out preliminary feasibility assessments of various aspects to demonstrate the feasibility of the initial development options;
- e) Task 5 – evaluate the initial development options against the pre-determined criteria and derive a preferred development option for the public housing project and the YLIEE;
- f) Task 6 – update/undertake planning and technical assessments as well as EAS and EIA to confirm the feasibility of the preferred development option;
- g) Task 7 – conduct a financial assessment/appraisal of the development, comprising separately for the housing development and YLIEE; and to give an recommendation on whether each portion of the project is viable;
- h) Task 8 – prepare the Preliminary Outline Development Plan (PODP) together with the Preliminary Urban Design and Landscape Plan (PUDLP) and Preliminary Master Layout Plan (PMLP) for the proposed developments with recommended plot ratio, population, height restriction, block no. and storeys etc.;

Phase 2A or Phase 2B- Public Consultation, Rezoning and EIAO Stage

- a) Task 9 - conduct a public consultation/engagement on the PODP;
- b) Task 10 – refine relevant assessments conducted in Phase 1 in the light of the outcome of the public consultation/engagement giving rise to a revised development options and prepare the Recommended Outline Development Plan (RODP) together with the Recommended Urban Design and Landscape Plan (RUDLP) and Recommended Master Layout Plan (RMLP) for the proposed developments;
- c) Task 11 – examine the implementation mechanism, approaches and framework for the implementation of the proposed developments, provide details of land requirement to assess the broad cost and revenue for the developments, associated infrastructure/facilities and land acquisition and prepare outline development programme;

- d) Task 12 – facilitate rezoning of the sites for public housing use, IE use and other associated uses (for Phase 2A or 2B Study where applicable);
- e) Task 13 – advise and assist the Employer to fulfill the requirement of EIAO for implementation of the engineering feasibility study and designated projects under EIAO;
- f) Provide the required technical input for Government to prepare the project definition statement(s) and technical feasibility statement(s) to create Category C and/or B items for individual associated/infrastructural projects for implementing the developments; conduct preliminary environmental review of non-designated projects;
- g) Task 14 – prepare a Final Report, Executive Summary for the Study.

1.5 Purpose of this Report

This Technical Report establishes a baseline profile of the Study Area, identifies key issues and examines the development opportunities and constraints of the Project. According to Clause 5.3 of the Brief, this report should comprise the following aspects:

- (i) review of relevant policy objectives and relevant strategic planning studies; collect, assemble, assess and interpret the baseline conditions of the Study Area and the adjoining areas;
- (ii) examine the development opportunities and constraints with due regard given to factors like the site conditions, physical developments/activities, land/lease status, accessibility, pedestrian link and road capacity, cultural heritage value, ecological impact, existing and planned land uses, existing and planned public and private developments, existing and planned infrastructural projects, property market conditions, provision/reprovision of welfare and G/IC facilities, environmental conditions, geotechnical, foundation, drainage, sewerage and water supply conditions, urban design, landscape qualities, air ventilation, Fung Shui Corridor (if applicable), building separation, building setback and site coverage of greenery, recreation potential, community and economic activities, and the demographic and socio-economic characteristics of the existing population in and around the Study Area; and
- (iii) identify key issues having regard to above.

1.6 Structure of this Report

The structure of this Technical Report is as follows:

- | | |
|-----------|---|
| Section 1 | Introduces the project background, objectives and the main tasks of the Study, as well as the purpose of this report. |
| Section 2 | Reviews the baseline conditions of the Study Area for different aspects including planning, urban design, engineering, geotechnical, transport and traffic, land matter, ecology, cultural heritage, environmental, air ventilation and socio-economic etc. |
| Section 3 | Identifies the key issues and development constraints of the Project. |

Section 4 Provides a summary of development opportunities and constraints of the Project.

1.7 Nomenclature and Abbreviations

The following section lists out the abbreviated titles of Government bureaux, departments, offices, statutory bodies and public organizations mentioned in this report:

AFCD	Agriculture, Fisheries and Conservation Department
AMO	Antiquities and Monuments Office
BD	Buildings Department
BGS	British Geological Survey
CEDD	Civil Engineering and Development Department
CLP	China Light and Power
DC	District Council
DLO	District Land Office
DO	District Office
DSD	Drainage Services Department
EPD	Environmental Protection Department
ETWB	Environmental, Transport and Works Bureau
FSD	Fire Services Department
GEO	Geotechnical Engineering Office
GFS	Government Flying Services
GIU	Geotechnical Information Unit
HD	Housing Department
HGC	Hutchison Global Communications
HKBN	Hong Kong Broadband
HKCG	Hong Kong and China Gas Company
HKHA	Hong Kong Housing Authority
HKHS	Hong Kong Housing Society
HKO	Hong Kong Observatory
HKSAR	Hong Kong Special Administration Region
HKSTP	Hong Kong Science and Technology Parks Corporation
HyD	Highways Department
IUCN	International Union for Conservation of Nature

ITC	Innovation and Technology Commission
LegCo	Legislative Council
MTRCL	Mass Transit Railway Corporation Limited
PLA	People's Liberation Army
PRC	People's Republic of China
PRDEZ	Pearl River Delta Economic Zone
PlanD	Planning Department
TD	Transport Department
TPB	Town Planning Board
USEPA	United States Environmental Protection Agency
WSD	Water Supplies Department

The following section lists out the meaning of abbreviation for expressions adopted in this report:

AADT	Annual Average Daily Traffic
AAP	Assessment Point for Air Quality
ADWF	Average Dry Water Flow
ANL	Acceptable Noise Level
APCO	Air Pollution Control Ordinance
API	Aerial Photograph Interpretation
AQMS	Air Quality Monitoring Station
AQO	Air Quality Objective
ASR	Air Sensitive Receiver
ATWTW	Au Tau Water Treatment Works
AVA	Air Ventilation Assessment
BDTM	Base District Traffic Model
BFI	Boulder Field Inventory
BHIA	Built Heritage Impact Assessment
BOD	Biological Oxygen Demand
C&D	Construction and Demolition
CA	Conservation Area
CDA	Comprehensive Development Area
CHIA	Cultural Heritage Impact Assessment

CNP	Construction Noise Permit
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
DFC	Design Flow to Capacity
DG	Dangerous Goods
DM	Declared Monuments
DMP	Drainage Master Plan
DO	Dissolved Oxygen
DPA	Development Permission Area
EAS	Environmental Assessment Study
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
ENTLI	Enhanced Natural Terrain Landslide Inventory
FB	Franchised Bus
FSP	Fine Suspended Particulates
EP	Environmental Permit
EPS	Effluent Polishing Scheme
EVA	Emergency Vehicular Access
FAI	Fresh Air Intake
FSP	Fine Suspended Particulates
GB	Green Belt
GB	Graded Buildings [in Cultural Heritage Section]
GFA	Gross Floor Area
GI	Ground Investigation
G/IC	Government/Institution and Community
GLA	Government Land Allocation
GLL	Government Land Licences
GMB	Green Mini-Bus
GMP	Greening Masterplan Proposals
HGV	Heavy Goods Vehicle
HIA	Heritage Impact Assessment
HK2030	Hong Kong 2030 Planning Vision and Strategy

HKGS	Hong Kong Geological Survey
HKPSG	Hong Kong Planning Standards and Guidelines
HOS	Home Ownership Scheme
IE	Industrial Estate
IF	Influencing Factor
IL	Invert Level
IR	Industrial/Residential
LAOI	Land Administration Office Instruction
LCA	Landscape Character Area
LFS	Lau Fau Shan
LLS	Large Landslide Study
LR	Landscape Resources
LRT	Light Rail Transit
LT	Laboratory Testing
L.V.	Low Voltage
mbgl	Metres Below Ground Level
MLD	Million Litres per Day
MLP	Master Layout Plan
MM5	Fifth-Generation NCAR / Penn State Mesoscale Model
MTR	Mass Transit Railway
NAP	Assessment Point for Noise
NCO	Noise Control Ordinance
NDA	New Development Area
NENT NDA	North East New Territories New Development Areas
NNG	New Grant Lot
NO ₂	Nitrogen Dioxide
NSR	Noise Sensitive Receiver
NTHS	Natural Terrain Hazard Study
NTMFWPSR	Ngau Tam Mei Fresh Water Primary Service Reservoir
NTMWTW	Ngau Tam Mei Water Treatment Works
NWNT	North West New Territories
ODP	Outline Development Plan

OS	Open Storage
OSL	Old Schedule Lots
OU	Other Uses
OZP	Outline Zoning Plan
PATH	Pollutants in the Atmosphere and the Transport over Hong Kong
Pb	Lead
PCB	Polychlorinated biphenyl
PCW	Prescribed Construction Work
PHI	Potential Hazardous Installation
PME	Powered Mechanical Equipment
PMLP	Preliminary Master Layout Plan
PODP	Preliminary Outline Development Plan
PRD	Pearl River Delta
PRH	Public Rental Housing
PUDLP	Preliminary Urban Design and Landscape Plan
QPME	Quality Powered Mechanical Equipment
R(A)	Residential (Group A)
RBRGs	Risk-Based Remediation Goals
RC	Reserved Capacity
RMLP	Recommended Master Layout Plan
RODP	Recommended Outline Development Plan
RSP	Respirable Suspended Particulates
RUDLP	Recommended Urban Design and Landscape Plan
SAB	Single Aspect Block
SI	Site Investigation
SIS	Slope Information System
SO ₂	Sulphur Dioxide
SP	Specified Processes
SPE	Specified Powered Mechanical Equipment
SS	Suspended Solid
SSSI	Sites of Special Scientific Interest
STT	Short Term Tenancies

TIN	Total Inorganic Nitrogen
TKTNFWSR	Tan Kwai Tsuen North Fresh Water Service Reservoir
TM-DA	Technical Memorandum on Noise from Construction Work in Designated Areas
TM-DSS	Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems Inland and Coastal Waters
TM-GW	Technical Memorandum on Noise from Construction Work other than Percussive Piling
TM-PP	Technical Memorandum on Noise from Percussive Piling
TM-Places	Technical Memorandum on Noise from Places other than Domestic Premises, Public Places or Construction Sites
TM-EIAO	Technical Memorandum on Environmental Impact Assessment Process
TPO	Town Planning Ordinance
TPU	Tertiary Planning Units
TSP	Total Suspended Particulates
TWL	Top Water Level
UIA	Unionized Ammonia
V	Village
VC	Volume to Capacity
VE	Visual Envelope
VEP	Variation of Environmental Permits
VOC	Volatile Organic Compound
VSR	Visually Sensitive Receiver
WBA	Wetland Buffer Area
WCA	Wetland Conservation Area
WCFWSR	Wang Chau Fresh Water Service Reservoir
WCZ	Water Control Zone
WPCO	Water Pollution Control Ordinance
WQO	Water Quality Objective
WR	West Rail Line
WTW	Water Treatment Works
YLIE	Yuen Long Industrial Estate
YLIEE	Yuen Long Industrial Estate Extension

YLS

Yuen Long South

YLSTW

Yuen Long Sewage Treatment Works

2 BASELINE CONDITIONS OF THE STUDY AREA

2.1 Land Use Planning

2.1.1 Relevant Planning Proposals/ Studies

2.1.1.1 Territorial Level

In relevance to the proposed housing and industrial development at Wang Chau, a number of territorial, regional and district planning studies and topical reports were reviewed. The documents provide useful background information for the future planning and development of the Project site.

The 2011-2012 Policy Address

In the 2011-2012 Policy Address, in response to the surging demand for land supply for housing developments, the Government proposed to look into the use of “GB” areas that are devegetated, deserted or formed and thus no longer perform their original functions in the New Territories, and convert them into housing sites. The Government also proposed to explore the possibility of converting into housing land some 150 ha of agricultural land in North District and Yuen Long currently used mainly for industrial purposes or temporary storage, or which is deserted. In parallel, ways to appropriately increase the densities and plot ratios of public rental housing (PRH) projects without compromising the living environment is proposed in an attempt to boost the PRH production.

The Study is therefore a positive response to the *Policy Address* by examining the housing development potentials of some “GB” areas and agricultural land in the New Territories that no longer serve their original purposes. Increasing the densities and plot ratios of PRH projects without the urban-rural and the urban-natural interfaces should also be considered as a way to increase PRH production.

HK2030: Planning Vision and Strategy (HK2030 Study) (2007)

The *HK2030 Study* is a long-term land use-transport-environmental planning strategy. It guides Hong Kong’s future developments, provisions of strategic infrastructures, and implementation of government policy targets up to 2030. The study proposed to develop “Northern Development Axis” as non-intensive technology and business zones and for such uses that capitalise on the strategic advantage of its boundary location (**Figure 2.1.1** refers). This development direction with wider dispersal of employment opportunities to the New Territories could result in a more balanced employment distribution and help reduce long journeys to work for residents living in the New Territories. Regarding industrial estates, the study states that the occupancy rates of the existing industrial estates are relatively high and the provision of a fourth industrial estate should be examined to accommodate the future demand.

The development of “Northern Development Axis” as recommended in the *HK2030 Study* could provide more job opportunities to the residents living in the New Territories. The current Study can be seen as the continuation of this concept by examining the provision of a new industrial estate in view of the current high

occupancy rates of the existing ones in Hong Kong as stated in the *HKSTP Annual Report 2010/2011* (see **Section 2.1.1.3** below).

2.1.1.2 Regional and District Level

Planning and Development Study in North West New Territories (NWNT) (2003)

The study identified the development potentials of the NWNT and its territorial position in particular with Shenzhen in view of increasing cross-boundary activities. The study recommended to coordinate the NWNT with its surrounding regional redevelopments to provide more diversified employment opportunities. In view of persisting demand on special industries, including port back-up and logistic uses, the study stated that there is a need to reserve land in the NWNT for such development where appropriate. Meanwhile, integration of future developments with existing villages, cultural heritage sites and the natural environment in the NWNT is of paramount importance in future planning processes.

Planning and Development Study in NWNT identified the development potentials in the region and highlighted the importance of integrated planning and comprehensive developments between the existing and future developments in the NWNT. Experience from the study is expected to shed light on the potential issues and the corresponding solutions that the current Study will likely encounter.

Green Belt Review

In response to the *2011-12 Policy Address*'s commitment of expanding land resources for housing developments, the PlanD has carried out a comprehensive review of the areas zoned "GB" on the OZPs, with focuses on sites which are no longer green or spoiled. The aim is to identify sites with housing development potentials for further feasibility studies. This Project site can be regarded as a direct consequent of this *Review*.

Hung Shui Kiu New Development Area (NDA) Planning and Engineering Study (On-going)

The NDA, with a site area of about 450 ha, is proposed to accommodate a population of 160,000 and to provide 48,000 jobs upon its full development. Being located between Tuen Mun and Tin Shui Wai New Towns, the study suggested integrating the NDA with these new towns to achieve economies of scale in social and infrastructure planning. The study proposed the NDA to be developed as a 'gateway town' to achieve synergy with the existing and planned developments in Shenzhen in view that the NDA will be well connected with the proposed Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities and the Kong Sham Western Highway.

Study on Enhancement of Lau Fau Shan Rural Township (2012)

Lau Fau Shan (LFS) is a rural township in the NWNT, having much potential for being developed into a major tourism and recreational attraction. The study covers 565 ha of land, including LFS and the coastal areas of Deep Bay, stretching from the Kong Sham Western Highway in the south to Tsim Bei Tsui in the north. The study recommended a range of improvement schemes and it is envisaged that with the implementation of the schemes, the tourism potential of LFS could be greatly enhanced, making it an appealing tourist attraction for both overseas tourists and locals. This in turn will have a positive effect on the social and economic development of the NWNT.

Planning and Engineering Study for Housing Sites in Yuen Long South (YLS) – Investigation (To be commenced)

The study aims to review the development potential of an area in YLS, with a view to identifying housing sites for private and public housing purposes with associated infrastructure works.

The area in YLS is about 200 ha in size, which is located to the south of Yuen Long Highway next to Kung Um Road. The site is generally characterised by haphazard low-density housing, informal industrial activities and open storage. The site is close to Yuen Long Town, Tuen Mun and Tin Shui Wai new towns and the future Hung Shui Kiu NDA. The site is also well connected by strategic road links, including Route 3 and Yuen Long Highway. There are potentials to accommodate more housing developments with higher development intensity in the area, with adequate provisions of infrastructures such as drainage, sewerage, water, etc.

Since Hung Shui Kiu NDA, LFS and YLS are in close proximity to the Project site, any proposed developments in these areas would have impacts on the subject Site. The planning studies on the three areas provide an important future context for the planning of the Project site.

Pedestrian Environment Improvement Scheme in Yuen Long Town (On-going)

The objectives of the Improvement Scheme are to minimise vehicle-pedestrian conflicts, improve connectivity arrangement and pedestrian safety of Yuen Long Town. The improvement work covers four categories - new footbridges connection, improvement of Castle Peak Road (Yuen Long Section), improvement of inner roads and; greening and beautification. According to the programme of the study, construction is scheduled to commence in end 2015/early 2016.

Yuen Long Town is a major civic and commercial hub within walking distance from part of the Project site. The proposed pedestrian environment improvement work could improve connectivity of the area and benefit Yuen Long residents. Opportunities could therefore be sought to take advantage of the system to enhance the accessibility of the Site.

2.1.1.3 Topical Studies

Hong Kong Science and Technology Parks Corporation (HKSTP) Annual Report 2010/2011

At present, there are three Industrial Estates in Hong Kong and they are all managed by HKSTP. They are located in Tai Po, Yuen Long and Tseung Kwan O, and they all provide essential infrastructure for skill-intensive manufacturing and service industries. The three estates are almost fully occupied during the year of 2010-2011, with occupancy rates reaching 98-100%. The occupancy rate of the YLIE alone reached 99%. The HKSTP will work closely with the government in exploring the possibility of establishing a new industrial estate to support specialised and high-value added industries to meet the new economy needs. As mentioned in **Section 2.1.1.1**, it provides a strong justification for the intended industrial estate extension by making use of the Project site.

2.1.2 Planning Context

The Project site falls on the Ping Shan OZP while the Study Area falls on the Ping Shan, Yuen Long and Lau Fau Shan & Tsim Bei Tsui OZPs (**Figure 2.1.2** refers). This section reviews the planning context of the Project site and the Study Area in relation to the planning status and intention as prescribed in the relevant OZPs and the Town Planning Board (TPB) documents.

2.1.2.1 Statutory Planning Context

Project site

The land area of the Project site was previously covered by the Ping Shan Development Permission Area (DPA) Plan. The draft Ping Shan DPA Plan No. DPA/YL-PS/1 was first exhibited for public inspection under section 5 of the Town Planning Ordinance (TPO) on 18.6.1993. It was revised as DPA/YL-PS/2 after the approval of the draft plan by the then Governor in Council under section 9(1) (a) of the TPO on 28.5.1996.

On 13.3.1995, an OZP to cover the Ping Shan area was prepared by the TPB under section 3(1)(a) of the TPO. The first draft Ping Shan OZP No. S/YL-PS/1 was exhibited for public inspection under section 5 of the TPO on 14.6.1996. Along the years, the draft OZP was amended and exhibited several times to reflect the changing circumstances. On 8.5.2012, the draft Ping Shan OZP was approved by the Chief Executive in Council under section 9(1) (a) of the TPO. It was re-numbered as S/YL-PS/14 and gazetted on 18.05.2012.

According to the approved Ping Shan OZP No. S/YL-PS/14 currently in effect, the YLIEE and the PHD sites are zoned “GB” or “OS”. According to the Schedule of Uses, “GB” is presumably unintended for development. It is primarily for the definition of limits of urban and sub-urban development areas by natural features as well as for the containment of urban sprawl and the provision of passive recreational outlets. On the other hand, while “OS” is primarily intended to provide land for appropriate open storage uses and to regularize the already haphazard proliferation of open storage uses, it also provides land for the orderly development of open storage uses that cannot be accommodated in conventional godown premises.

A significant amount of rural areas in Ping Shan including the YLIEE Site are of limited infrastructures and they have been undergoing urban transition by uses including vehicle parks, open storage, godowns and workshops. There is a general planning intention that with improvements in transport links and accessibility, these areas could be used for more integrated and orderly sub-urban development in the long run.

Study Area

The Study Area is currently covered by the approved Ping Shan OZP No. S/YL-PS/14, approved Yuen Long OZP No. S/YL/21 and approved Lau Fau Shan & Tsim Bei Tsui OZP No. S/YL-LFS/7. Apart from the “OS” and “GB” zones in the Project site, areas zoned “Conservation Area” (“CA”), “Green Belt” (“GB”), “Village Type Development” (“V”), “Other Specified Uses” (“OU”), “Residential (Group A)” (“R(A)”), “Comprehensive Development Area” (“CDA”) and “Government, Institution or Community” (“G/IC”) can be found within the Study Area.

The hilly areas of Kai Shan and some permitted burial grounds to the immediate west of the Project site are zoned “CA”. This zone is intended to protect and retain the

existing natural landscape, ecological or topographical features of the area for conservation, educational and research purposes. There is a general presumption against development in this zone. In general, only developments that are needed to support the conservation of the existing natural landscape or scenic quality of the area or are essential infrastructure projects with overriding public interest may be permitted.

A small portion of land in the northern tip of the Study Area is also zoned “CA”. The land is located to the immediate south of the Inner Deep Bay Sites of Special Scientific Interest (SSSI) with contiguous and continuous fish ponds. The ecological value of the land, as an integral part of the wetland ecosystem in the Deep Bay Area, should be conserved under the “no-net-loss in wetland” principle.

The Study Area mainly include three “GB” zones – the vegetated knolls to the west of the Yuen Long Sewage Treatment Works (YLSTW), the foothills and lowlands to the south of Kai Shan and the vegetated knolls at Chu Wong Ling. The “GB” zone is primarily intended to define the limits of urban and sub-urban development areas by natural features and to contain urban sprawl, as well as to provide passive recreational outlets. There is a general presumption against development within this zone. However, limited developments may be permitted with or without conditions on application to the Town Planning Board.

There are several “V” zones within the Study Area and they are all located adjacent to the Project site. Within the “V” zones, there are many well-established recognised villages such as Tai Tseng Wai, Ng Uk Tsuen, Shing Uk Tsuen, Wang Chau Fuk Hing Tsuen, Chung Sam Wai, Tung Tau Wai San Tsuen, Tung Tau Wai, Lam Uk Tsuen, Yeung Uk Tsuen, Sai Tau Wai, Yeung Uk San Tsuen, Fung Chi Tsuen, Shui Tin Tsuen and Chun Hing San Tsuen. The zoning is to reflect existing recognized and other villages and to provide land considered suitable for village expansion and re-provisioning of village houses affected by Government projects.

Two adjoining land parcels in the eastern part of the Study Area are zoned “OU” to reflect the existing land uses of YLSTW and the YLIE. Within the “OU” zone for the YLIE, the maximum total GFA of all developments or redevelopments is 1,687,625m² which is equivalent to a plot ratio of 2.5 for the industrial development area and a plot ratio of 5 for the estate centre site, as set out in the lease for the YLIE. Meanwhile, the concerned OZP stipulates that the building height is restricted to a maximum of 8 storeys excluding basement(s) for an area designated for industrial development and of 10 storeys excluding basement(s) for a site designated for estate centre.

Long Ping Estate to the south of the Project site is zoned “R(A)”. This zone is intended for high-density residential developments with permitted commercial uses on the lowest three floors or in the purpose-designed non-residential portion of the estate. No new development for a domestic or non-domestic building shall exceed a maximum domestic plot ratio of 5 or a maximum non-domestic plot ratio of 9.5 and a maximum building height of 30 storeys excluding basement(s).

The area at the southern tip of the Study Area is zoned “CDA”. Dominated by temporary open storage, workshops as well as scattered and disordered residential dwellings, the planning intention of the zone is to encourage upgrading of the environment through comprehensively planned low-rise low-density development. Any developments in the zone are restricted by the maximum plot ratio of 0.4 and building height of 3 storeys including car park.

2.1.2.2 Non-Statutory Planning Context

The area zoned “OS” within the Project site is identified by the PlanD as Category 1 Area for open storage and port back-up uses, which means that the area is suitable for the above uses while mitigation measures to prevent environmental degradation arising from the uses are required. On the other hand, the areas zoned “GB” at the northern tip and the southern part of the Project Site are identified as Category 4 Area for open storage and port back-up uses. In these areas, mitigation measures are required while the phasing out of the concerned uses is generally encouraged as early as possible.

In addition to the zonings mentioned above, the northern part of the Study Area is designated by the TPB as Wetland Buffer Area (WBA) and the northern tip of the Study Area zoned “CA” as Wetland CA (WCA). The WBA and WCA boundaries are indicated in **Figure 2.1.2**. The planning intention of WCA is to conserve the ecological value of the fish ponds which forms an integral part of the wetland ecosystem in the Deep Bay Area. The planning intention of WBA, on the other hand, is to protect the ecological integrity of the fish ponds and wetland and prevent development that would have negative off-site disturbance impacts on the ecological value of fish ponds.

After identifying the planning context relevant to the Study Area and Project site, the baseline conditions on the physical, social, economic and environmental aspects were reviewed as background information for future planning considerations.

2.1.3 Existing and Planned Land Uses & Developments

The Project site and its neighbouring areas are characterised by mixed land uses. They are elaborated in **Figure 2.1.3** and summarized in **Table 2.1.1**.

Open Storage and Port Back-Up Uses

The Project site is primarily occupied by temporary open storage, vehicle parks and informal industrial workshops, etc. Some of the uses are located within the Category 1 Area, which is identified by the PlanD as suitable for the above uses.

New Towns and High-Rise Residential Developments

The Study Area is located within Yuen Long New Town. Long Ping Estate, located to the south of the Project site with an area of 12.34 ha, comprises 15 domestic blocks of 8,483 flats with a total population of 26,640^[1]. There is a commercial centre, a public transport interchange and other ancillary facilities within the estate and Long Ping Mass Transit Railway (MTR) Station is located next to the estate.

Around the MTR Station, there are several planned residential developments. The site of the former Yuen Long Estate, to the southeast of the station, is planned for PRH and private residential development. 400 PRH units will be provided on 0.43 ha of land with design population of approximately 1,100^[2]. The private residential development, covering 1.23 ha of land, will provide a minimum of 960 flats in which 800 flats will be restricted to a saleable area from 35m² to 40m² and 160 flats to a saleable area from 40 m² to 60 m² (Development Bureau, 2011).

Another development is bounded by Kwong Yip Street, Wang Yip Street East and Fo Yip Street to the north of Long Ping MTR Station. The development will provide 832

^[1] Planning Brief of Long Ping Estate

^[2] Planning Brief of Public Housing Development at the former Yuen Long Estate Site

flats of which 75% should not exceed 50 m² (TPB, 2011; The Standard, 2012). Another proposal, to the south of the station at Ping Shun Street and Po Lok Square, will provide 720 flats (TPB, 2011; The Standard, 2012).

To the southeast of the Study Area across Shan Pui River is the Tung Tau Industrial Area. There is a general planning intention to phase out the existing polluting and hazardous industrial uses in the area. A planned Home Ownership Scheme (HOS) project at Wang Yip Street, Tung Tau, with site area of 0.48 ha, is planned to provide 210 housing units^[3].

Tin Shui Wai New Town, with an area of 488 ha, is located to the west of the Study Area. It has a population of about 280,000 (Yuen Long District Council, 2011). A 6.4-hectare land parcel next to the Hong Kong Wetland Park in Tin Shui Wai is being developed by the Hong Kong Housing Society (HKHS) for a resort-style housing for the elderly retirees with financial capacity. The development will provide 1,000 residential units with diversified and integrated facilities serving the residents and the community. The project will be completed in 2 phases in 2014 and 2018 respectively.

Villages and Low-Rise Residential Developments

Village houses and low-rise residential developments can be found in the villages adjacent to the Project site. These dwellings, to the east of the Project site, include Yeung Uk Tsuen, Sai Tau Wai, Lam Uk Tsuen, Ting Fook Villas, Chung Sam Wai, Tung Tau Wai, Fuk Hing Tsuen and Tung Tau Wai San Tsuen. To the south of the Project site, there are Fung Chi Tsuen, Shui Tin Tsuen and Chun Hing San Tsuen. Tai Tseng Wai, Ng Uk Tsuen and Shing Uk Tsuen are located to the north of the Project site. There are also some permanent and temporary houses scattered within the PHD Site.

Green Areas and Wetland Areas

Kai Shan and the adjacent vegetated knolls zoned “CA” to the west of the Project site, Chu Wong Ling as well as several pieces of lowlands zoned “GB” to the north and west of the Project site all provide an extensive greenery backdrop to the vicinity.

To the east of the Study Area across Shan Pui River is Nam Sang Wai. It is an identified wetland area with high ecological value. To the north of the Study Area are the Inner Deep Bay SSSI and land area largely zoned as “Other Specified Uses (Comprehensive Development and Wetland Enhancement Area)”^[7]. They are being credited for the unique international and regional importance of the fish pond system particularly for ardeids. To the northwest of the Study Area is the 61ha Hong Kong Wetland Park which comprises conservation, education and tourism facilities.

Yuen Long Industrial Estate

The YLIE is located to the east of the Project site, with site area of about 67 ha. It is separated from the YLIEE Site by a nullah (HKSTP, 2012). The YLIE houses a wide variety of industries such as food & beverage, mechanical engineering & raw materials, manufacturing, printing & publishing, and medical laboratories. The current industrial establishments along the western periphery of the YLIE facing the YLIEE site include

^[3] Planning Brief of New HOS at Tung Tau, Yuen Long

^[7] The zone of “Other Specified Uses (Comprehensive Development and Wetland Enhancement Area) is primarily intended to conserve and enhance ecological value and functions of the existing fish ponds or wetland through consideration of application for development or redevelopment under the “private-public partnership approach”.

DCH Food Processing & Logistics Centre, Yuen Long Textile Company Limited and China Inspection Company Limited, etc.

Table 2.1.1 Key features of major existing land uses

Existing land uses	Locations	Conditions/characteristics	Remarks
Open Storage and Port Back-Up Uses	Within the Project site	<ul style="list-style-type: none"> - Mainly consisted of industrial activities such as vehicle/repair maintenance facilities, container storage areas, waste recycling workshops and open storage areas; - Some falls within the Category 1 Area as suitable for OS uses. 	For details, please refer to Table 2.12.23 under Section 2.12.4.5 which summarises the existing OS, workshops and open car parks uses of the 98 identified industrial sites. Their locations are shown in Figure 2.12.12.
Vegetated land and cultivated land	Within the Project site	<ul style="list-style-type: none"> - Some agricultural land and ruderal vegetation is found in the northern portion of the proposed YLIEE; - An area of agricultural land at the northern part of the Project site is mainly occupied by dryland agricultural crops; - Wooded areas were also found at the fringe of the proposed YLIEE. 	For details please refer to Section 2.10.1.3. Locations are shown in Figure 2.10.1.
		Wooded areas are present in the southern portion of the PHD site and patches of agricultural land and ruderal vegetation are found in the central portion of the PHD site.	
High-rise residential developments	To the south of the Project site	<p>Long Ping Estate</p> <ul style="list-style-type: none"> - 12.34 ha; - 15 domestic blocks; - 8,483 flats; - total population of 26,640; - includes a commercial centre, a public transport interchange and other ancillary facilities. 	Figure 2.1.3 refers
Village houses and historic villages	Within the Project site	Some permanent and temporary houses scattered within the PHD Site can be found.	Please refer to Figure 2.1.3 and Appendix 2.12.9 for details.
	In the vicinity of the Project site	There are Yeung Uk Tsuen, Yeung Uk San Tsuen, Sai Tau Wai, Lam Uk Tsuen, Ting Fook Villas, Chung Sam Wai, Tung Tau Wai, Wang Chau Fuk Hing Tsuen, Tung Tau Wai San Tsuen, Fung Chi Tsuen, Shui Tin Tsuen, Chun Hing San Tsuen, Tai Tseng Wai, Ng Uk Tsuen and Shing Uk Tsuen etc.	Please refer to Section 2.11.4 for details and Figures 2.11.3-2.11.3c for their distributions.
Industrial area	To the east of the Project site	<p>Yuen Long Industrial Estate</p> <ul style="list-style-type: none"> - site area of about 67 ha; - houses a wide variety of industries such as food & beverage, mechanical 	Figure 2.1.3 refers.

Existing land uses	Locations	Conditions/characteristics	Remarks
		engineering & raw materials, manufacturing, printing & publishing, and medical laboratories.	
	To the southeast of the Study Area	Tung Tau Industrial Area	Figure 2.1.3 refers.
Green areas and wetland areas	To the west of the Project site	Kai Shan and the adjacent vegetated knolls zoned as "CA".	Figure 2.1.2 refers.
	To the east and west of the Project site	Chu Wong Ling and several pieces of lowlands zoned as "GB".	Figure 2.1.2 refers.
	To the east of the Study Area across Shan Pui River	Nam Sang Wai, which is an identified wetland area with high ecological value.	Figure 2.1.2 refers.
	To the north of the Study Area	Inner Deep Bay SSSI and areas largely zoned as "Other Specified Uses (Comprehensive Development and Wetland Enhancement Area)", which has unique international and regional importance of the fish pond system.	Figure 2.1.3 refers.
	To the northwest of the Study Area	A 61-ha Hong Kong Wetland Park which comprises conservation, education and tourism facilities	Figure 2.1.3 refers.
Graves and burial grounds	In the middle portion of the proposed PHD site	A small piece of land falls within the boundary of gazetted burial grounds on Kai Shan.	Please refer to Section 2.4 for details and Figure 2.4.2 for distributions.
	Within the Project site (in particular at the southern tip and the burial ground area at the PHD site, and close to the northwestern boundary of the YLIEE site)	Some graves including historical clan graves are found.	

2.1.4 Demographic and Housing Characteristics of the Study Area and its Adjoining Areas

There are no census data specifically designated for the Study Area and the Project site. In order to understand their demographic and housing characteristics in favour of the future planning, statistics on several Tertiary Planning Units (TPUs) in the latest 2011 Population Census were combined and then examined (Census and Statistics Department, 2012). In view of the geographical extents of the Study Area, TPU 5.1.5, 5.1.6, 5.1.7 and 5.2.8^[8] (TPU Areas) covering Ng Uk Tsuen, Wang Chau, Ping Shan

^[8] According to Census and Statistics Department, due to the consideration of data precision, a TPU with less than 1000 persons is merged with adjacent TPU (s) for production of the fact sheet. As a result, statistics of TPU 5.1.7 (Wang Chau) is merged with TPU 5.1.5 (Ping Shan). It should thus be highlighted

and the YLIE are employed. Statistics on Long Ping Estate are also taken into account when relevant data are available. **Figure 2.1.4** shows the geographical coverage of the TPU Areas.

Existing and Planned Population

There is a total population of 45,005^[9] in Long Ping Estate and the TPU Areas. Based on the PlanD's "Projections of Population Distribution, 2010-2019", the projected population of the TPU Areas will increase from 18,365 in 2011 to 28,900 in 2015, an increase of about 57.4%. This significant increase is mainly due to a PHD at Hung Shui Kiu Area 13, located to the south of Shek Po Tsuen.

Age Characteristics

The percentage of youth population (aged 15-24) in the TPU Areas is relatively low. It only occupies 10.4% of its total population as compared with 14.7% for Yuen Long and Tin Shui Wai and 12.4% for the whole territory. The percentage of population aged 25-44 in the TPU Areas is 39.5%. This percentage is relatively high compared with 32.6% for Yuen Long and Tin Shui Wai and 31.4% for Hong Kong as a whole. The percentage of population aged 65 or above in the TPU Areas is 8.4%, which is low as compared with 9.5% for Yuen Long and Tin Shui Wai and 13.3% for the whole territory. This reflects that the percentage of elderly population in the TPU Areas is relatively low although there are considerable numbers of villages in the areas.

Education Characteristics

The population in the TPU Areas generally possesses a lower education attainment as compared with both Yuen Long and Tin Shui Wai as well as the whole territory. There are only 15.4% of population in the TPU Areas receiving higher education (diplomas or above), compared with 18.5% and 24.1% in Yuen Long and Tin Shui Wai and the whole territory, respectively. On the contrary, the percentage of population with secondary education in the TPU Areas is 54.5%, which is higher than 51.8% for Yuen Long and Tin Shui Wai and 46.6% for Hong Kong. Regarding the percentages of population receiving no schooling/ pre-primary education, there is no major differences among them.

Economic Characteristics

The median range of monthly domestic household income in the TPU Areas is HKD\$19,747, which is higher than the HKD\$18,000 in Yuen Long and Tin Shui Wai but is slightly lower than the territorial level of HKD\$20,500. There are a total of 9,407 working population in the TPU Areas, and around 10% (926) of them work in the same district^[10]. This means that most of the working population in the TPU Areas travel outside for employment. Kowloon is their most common place of work, with 36.9% or 3,471 persons being employed there. This information reflects the fact that proximity to a major employment centre (i.e. YLIE) does not guarantee that residents would work in the same district.

that the statistics presented under this baseline review remain as reference purpose and serve as indicative rather than definitive.

^[9] The population of Long Ping Estate is 26,640 (Source: Planning Brief of Long Ping Estate)

^[10] Defined as persons whose place of work and place of residence are both in the same new town or both in areas other than new towns areas of the same District Council District. Persons who work at home are excluded.

Housing Characteristics

There are a total of 6,307 occupied housing units in the TPU Areas. 95.6% of them are private permanent housing and 4.4% are temporary housing. When taking into account Long Ping Estate, which has 8,483 domestic units, there are a total of 14,790 residential units and among them, 42.6 % are private housing and 57.4% are public housing^[11].

2.1.5 Provision of Government, Institutional and Community (G/IC) Facilities and Open Space

This section provides a general review on the existing provisions of G/IC facilities and open space within the Study Area and its neighbouring regions (**Figure 2.1.5** refers).

Within the Study Area, G/IC facilities are basically concentrated at Long Ping Estate. Long Ping Sports Centre, Long Ping Community Hall, schools, facilities for rehabilitation and elderly services, sports and recreational facilities e.g. ball courts, children play areas, roller skating rink and amphitheatre, etc. are provided within the estate. G/IC facilities in other areas are relatively limited. A ball court can be found at Shing Uk Tsuen to the north of the Project site.

Within Long Ping Estate, there are provisions of open space and Rest Gardens. Regarding other areas within the Study Area, a small park along Wang Lok Street next to Yeung Uk San Tsuen and an open space in Tung Tau Wai San Tsuen can be found. To a certain extent, villagers need to rely on some informal open space within the villages for enjoyment.

In the neighbouring regions outside the Study Area, there are other G/IC facilities and open space and they are mainly concentrated at Yuen Long Town. Major G/IC facilities and open space are listed as follows:

Recreational Facilities

- Yuen Long Swimming Pool Complex, Yuen Long Stadium and Tung Tau Industrial Area Playground

Community Facilities

- Yuen Long Theatre, Yuen Long Town Hall, Government offices

Fire, Ambulance and Police Services

- Yuen Long Police Station, Yuen Long Fire Station

Medical and Health Services

- Government clinics and Pok Oi Hospital

Educational Facilities

- Secondary schools, primary schools and kindergartens

Major District and Regional Open Space

- Yuen Long Park and Yuen Long Jockey Club Town Square

^[11] 3,834 flats/ 45.2% of flats in Long Ping Estate were sold out as at 4 September 2012. They are defined as public housing in the Study (Source : Planning Brief of Long Ping Estate)

In these circumstances, although the Project site and its surrounding villages do not have much G/IC facilities and open space, the population in the areas can get access to the provisions in Long Ping Estate and Yuen Long Town to satisfy their needs/ part of their needs. In order to ensure adequate provisions in the future, a quantitative analysis on the current provision levels and the future requirements of the proposed developments will be carried out at the later stages of the Study.

2.2 Urban Design

Urban design analyses were conducted to review the physical setting of the Study Area in order to formulate better land use layout and urban design framework in the stage of Formulation of Initial Options. District character, site dimensions, existing landform and building height profiles, and major vistas and potential visual corridors are covered below.

2.2.1 District Characters

The Project Site comprises primarily the GB and the OS zones. Village houses and a small number of industrial activities are found within the GB while the OS zone is filled with workshops and warehouses. However, upon the re-development of the Project Site, these uses are likely to be replaced and therefore will not form part of the environment of the future development.

Surrounding the Project Site within the Study Area include four major types of townscapes as shown in **Figure 2.2.1** and **Figure 2.2.2**. They are natural landscape, village-style residential clusters, industrial landscape and high-rise residential clusters (in descending order of the lengths of their interfaces with the Project Site). The natural landscape is mainly being found on the west side of the Project Site while the rest are found on the east side, and hence creates clear “urban front” and “natural back” for the site. On the urban front, the presence of the trucks driving to and from the industrial estate, together with the existing operation of workshops and open storages, has created a light industrial atmosphere in the vicinity of the Project Site.

The presence of low-to-medium rise village houses and industrial buildings retain the openness of the area in general. The southern portion of the Project Site faces Ping Shan Estate where high-rise residential buildings and medium-rise government, institute and community facilities intertwine with each other and hence creates a high-rise yet visually permeable residential cluster.

On the southern tip of the Project Site, there exists an interface with the elevated railway track. In addition to the consideration of potential noise impact that is subject to further investigation, its interface with any proposed housing development will need to be ameliorated in order to create a better visual environment.

To the north of the Study Area, there are fishponds, wetland and the Hong Kong Wetland Park. Although they are outside the Study Area further away from the Project Site, they are also important visual elements in the vicinity so they would be taken into consideration in the urban design of the Project Site where appropriate.

2.2.2 Appreciation of Site Dimensions

While the Project Site has a total area of approx. 34.5 ha with approx. 16 ha tentatively designated for YLIEE and approx. 18.4 ha for public housing development, the

irregularity of the site geometry may render part of it inefficient for new development. On the north, a pocket of land is semi-enclosed by the CA of Kai Shan hill with a highly irregular shape and an opening of less than 90m connecting to the main portion of the Site. Considering the protective nature of the CA, it is unlikely that this pocket can be reshaped for more rational development. The development intensity of any parcels falling onto this pocket hence needs to be carefully considered. In addition, adequate buffer will be considered as far as possible between development and the sensitive CA and areas of high landscape value.

On the south, there exists an elongated strip of land with a minimum width of less than 50m, which renders the use of regular shaped public housing blocks along Long Ping Road impracticable. The inset of **Figure 2.2.1** shows an overlay of the Project Site boundary with the northern part of the Tin Shui Wai New Town. It illustrates that the New Cruciform Block can barely fit onto the elongated strip especially when pedestrian circulation and landscaping are considered. The development intensity of this portion of the site needs to be carefully determined in order to allow for design flexibility. Visual implications of the development will also be examined to avoid undesirable visual impacts as far as possible.

For the dimensions of future industrial development, reference can be taken to the existing YLIE development, which has a maximum height limit of 8 storeys (with an exception of a small area north of Chu Wong Ling bearing a height limit of 10 storeys) and an average net site plot ratio of 2.5 for the area designated for industrial development and a plot ratio of 5 for a site designated for the estate centre. Emergency vehicular accesses (EVAs) for industrial buildings are another consideration in planning for future industrial developments. According to the *Code of Practice for Fire Safety in Buildings 2011* by Buildings Department, EVAs within Industrial Estate should be provided to serve two opposite facades that are remote from each other and each having a length of not less than one-fourth of the total length of all perimeter walls of the building. The EVA should be in the form of a two-way carriageway and the width of the carriageway should be not less than 13.5m if there is no central divider, otherwise, 7.3m for each carriageway.

2.2.3 Existing Landform and Building Height Profiles

The Project Site is mainly flat on its northern and central portion and has a slightly hilly terrain on the south strip. Since most of the western edge of the Project Site is fronted by a hilly terrain, the need of buffer areas between any proposed building and the site boundary will need to be investigated based on both visual and geotechnical considerations.

The Project Site is surrounded by both hilly terrain and flat areas as shown in **Figure 2.2.3**. Kai Shan is located on its west side with a ridgeline of 50mPD on the north, 110mPD in the middle and 50mPD on the south. It can be seen from both the Project Site and the built area on its east. Chu Wong Ling is located on its east side with a ridgeline of 40-50mPD. Due to its shorter height, it is mainly seen from or through the air space of the villages on its south. Further north away from the Project Site is a hill on the north-eastern side of Ng Uk Tsuen with two knolls of 50mPD and 60mPD. Due to the presence of the YLIE, it can only be seen from the northern tip of the Project Site through the air space of Tai Tseng Wai and Ng Uk Tsuen.

The built area generally exhibits a low to medium height profile with 3-storey village and small houses on the north and east and 8-storey factory buildings on the northeast. Long Ping Estate is the tallest development in the vicinity with Double H blocks of

approx. 28 storeys, New Slab blocks of approx. 23 storeys, and Trident 2 (i.e. Y-shape) blocks of approx. 35 storeys. The interweaving of residential towers and G/IC facilities allows a certain level of visual permeability across the site.

In determining the building height for future development of the Project Site, compatibility to the surrounding built environment, together with the preservation of a reasonable level of visual connection to the natural terrain, should be duly considered when initial options are formulated.

2.2.4 Vistas and Visual Corridors

Since the Project Site is sandwiched between Kai Shan and the existing built area and will potentially be developed with high-rise residential towers, the preservation of visual corridors are paramount for preserving visual connections to the Kai Shan. As shown in **Figure 2.2.4**, strategic locations are identified from which visual corridors through the Project Site can be selectively preserved. They include the pedestrian pathway along the existing nullah at Tai Tseng Wai, the pedestrian pathway between Dah Chong Hong and China Inspection, the hillside of Chu Wong Ling, the main pedestrian access to villages, the intersection of Fuk Hi Street and Long Ping Road and the residential units in Long Ping Estate.

In addition, a cluster of villages comprising Fuk Hing Tsuen, Chung Sam Wai, Tung Tau Wai, Tung Tau Wai San Tsuen, Sai Tau Wai, Lam Uk Tsuen and Yeung Uk Tsuen is found on the east side of the Project Site, from which Kai Shan can clearly be seen. It is anticipated that blockage of view to Kai Hill from these villages may result in disagreement by villagers living there. In response to this, a significant height limit or preservation of visual corridor would be required in order to preserve visual connections between Kai Shan and these villages.

In addition to views to Kai Shan, views from Kai Shan are also important considerations in determining the layout of future development on the Project Site. As shown in **Figure 2.2.4**, graves are currently found along the edge of the Project Site on the north, and within the Project Site boundary on the south. In addition, a major portion of Kai Shan and Chu Wong Ling are designated by Lands Department as burial grounds for indigenous villagers. When the initial options are being developed, these graves should either be respected by preserving a reasonable buffer distance or be relocated away from the Project Site.

2.3 Landscape Design

2.3.1 Policy Objectives

The landscape policy objectives for the site are set out in the approved Ping Shan OZP No. S/YL-PS/14. The majority of the proposed YLIEE is designated as OS. This zoning type is intended for the provision of land for appropriate OS uses to rationalize and condense its establishment. Given the poor physical condition of the landscape currently within this zone, it is considered that this land would lend itself to development for industrial purposes. Comprehensive landscape integration and aesthetic design measures would be required to deal with the increased footprint of industrial land uses (built form and external functions).

The land proposed for residential development sits within both GB and OS. Current landuses within GB include car parking, mixed agricultural land and scattered rural

settlements. The intention of GB zone is to define the limits of urban and sub-urban development by natural features and to contain urban sprawl as well as to provide passive recreation outlets; generally there is a presumption against development within this zone.

The site boundary interfaces with two areas of land designated as CA associated with the Kai Shan hill range. This zoning type is intended to protect and retain the existing natural landscape, ecological or topographical features of the area for conservation, educational and research purposes. There is a general presumption against development; in general only developments that are needed to support the conservation of the existing natural landscape, scenic quality or provide essential infrastructure projects with overriding public interest may be permitted. Whilst the proposed development area would not require any change to this zoning type, adjacent landuses need to take the sensitivity of this landscape interface into consideration within the design.

In line with the Governments Greening Masterplan Proposals (GMP) for Hong Kong, the Project site should integrate with the wider landscape and streetscape greening objectives for Yuen Long (currently under consultation). The landscape design will consider the location and connectivity between existing local neighborhoods (villages and the Long Ping Estate), municipal parks, squares, trails and green space including the thematic approach to landscape planting to be provided in the GMP.

2.3.2 Existing Site Conditions

The receiving landscape has been heavily degraded and altered through current land uses, predominantly associated with OS functions. The key factors influencing this are the clearance of vegetation (trees and shrubs), formation of access routes, channelization of the Shan Pui River (and other minor watercourses) and encroachment into Kai Shan CA by informal burial plots. The open storage areas are predominantly hard standing or un-made surfaces, subdivided with makeshift boundary fencing and temporary accommodation.

Generally the landscape within the site boundary, comprising the OS and GB zoned land, is level with no major natural topographical features. Ground elevation gradually increases to the west of the site as a result of Kai Shan hill, reaching a high point of 122.3mPD. Topography to the south of the hill range consists of several smaller hills at around 50mPD.

The eastern boundary of the site is formed by the alignments of Long Ping Road and Fuk Hi Street. The interface along the road is predominant residential however at the northern extent of the site, the boundary is shared with industrial units within the YLIE. The quality of the landscape along these routes varies, generally this is a low landscape amenity route and the quality drops closer to the Industrial uses.

The landscape zoned as GB within the site boundary has also seen significant development and vegetation clearance as a result of village house construction, access routes (pedestrian and vehicular) and construction of informal and extensive burial plots on the elevated ground.

Several small watercourses enter the site from the west (Kai Shan), however these have been heavily altered and redirected to irrigate agricultural plots, severed by road formation or directed into concrete surface water drainage channels.

Several small pockets of mature trees and shrubs exist within the OS area; they are of varying condition and their overall contribution to landscape amenity is limited. Tree and shrub cover within the GB designated area is higher with numerous mature species, and these assist within minimising the visibility of built form and provide a level of landscape integration.

2.4 Land Matter

The baseline condition of the current land status of the Project site has been established through desktop review of the latest aerial photos, B1000 topographic maps, C1000 land boundary maps and OZPs. Aerial photographs provide a source of up-to-date ground condition of the area; B1000 maps provide the existing ground features such as houses, graves, open storage, foot paths etc; C1000 maps provide the existing land status such as graphical location, land ID, land current status etc; and OZPs provide the land use status of the area.

Figure 2.4.1 illustrates the type of current land records within the Project site and in the surrounding areas. It is found that about 60% of the land within the Project site is old schedule lots (OSL). The remaining comprises mainly the government land with only one new grant lot (NNG) on the northern portion of the YLIEE site, a few short term tenancies (STT) on the southern portion of the YLIEE site, as well as a few government land licences (GLL) and permanent government land allocation (GLA) on the southern portion of the PHD site. In terms of the land use, about 50% of the Project site is currently occupied by open storages / workshops and they are mostly distributed at the proposed YLIEE site (~33%) and the northern part of the PHD site (~17%). The southern part of the PHD site mainly comprises village houses with a few schools. Some lands found at the northern part of both YLIEE site and PHD site are used for agriculture. Based on preliminary site walk, there are no playgrounds, refuse collection points and public toilets identified within the Project site.

A small piece of land on the middle portion of the proposed PHD site falls within the boundary of gazetted burial grounds on Kai Shan (**Figure 2.4.2**). These permitted burial grounds are dedicated to the indigenous residents from the nearby recognized villages. Due consideration should be taken to avoid developments within this area as far as possible when formulating the development proposals.

Some graves are found within the Project site, in particular at the southern tip and the burial ground area of the PHD site, as well as the area close to the northwestern boundary of the YLIEE site (**Figure 2.4.2**). Some of these are known to be historical clan graves with potential 'Fung Shui' issues. The presence of graves does not constitute a no-go area for development. However, it is still recommended that these graves shall be retained in-situ as far as possible. Should developments at these locations be unavoidable, the grave must be properly recorded and consultation with District Office (DO) and District Land Office (DLO) on the relocation matter would be required.

A number of Tso and Tong lots are identified and scattered within the Project site (**Figure 2.4.3**). These land lots are owned by traditional family organisations and are held in common ownership for the benefit of the whole lineage. The presence of Tso and Tong lots does not constitute a no-go area for development. However, these lands would impose potential constraints on the development due to the more complicated land resumption issues, and hence developments on these locations shall also be avoided as far as possible.

2.5 Traffic & Transport

2.5.1 Existing Road Network

The existing major transportation linkages are shown in **Figure 2.5.1**. The main road network in the vicinity includes Yuen Long Highway, Long Tin Road and Castle Peak Road – Yuen Long Section. These roads would serve as the main external road access for the potential PHD site. In addition, Fuk Hi Street, Long Ping Road and Wang Lok Street would serve as the connections between the PHD site and Yuen Long Town.

Yuen Long Highway

Yuen Long Highway is an expressway in a dual-3 configuration, running in the east-west direction at the south of Yuen Long Town. It connects Tsing Long Highway in the east and Tuen Mun Road in the west. It caters mainly for traffic between New Territories West and Kowloon. Pok Oi Interchange is located at the junction amongst Yuen Long Highway and Castle Peak Road – Yuen Long Section, whereby majority of the traffic to Yuen Long Town from Kowloon will utilise this interchange. Pok Oi Interchange is currently operating over its capacity. Traffic queues are generally observed on the slip roads between Yuen Long Highway and Pok Oi Interchange. Tong Yan San Tsuen Interchange is located at the junction amongst Yuen Long Highway and Long Tin Road, whereby majority of the traffic to Yuen Long Town from Tuen Mun will utilise this interchange. Tong Yan San Tsuen Interchange is currently operating well within its capacity during normal peaks hours.

Long Tin Road

Long Tin Road is a primary distributor in dual carriageway configuration with 2 traffic lanes running in northbound and 3 traffic lanes running in southbound. It spans from Long Ping Road in the north near Tin Tsz Estate and Yuen Long Highway in the south near The Eldorado. It currently serves as a major connector road between Yuen Long Highway, Castle Peak Road – Ping Shan, Wang Tat Road, Ma Wang Road, Long Ping Road as well as Tin Tsz Road in Tin Shui Wai.

Castle Peak Road – Yuen Long Section

Castle Peak Road – Yuen Long (Yuen Long Main Road) is a district distributor in dual carriageway configuration with one traffic lane running in each direction. It is the traditional main road in Yuen Long running in the middle of the town. Over the decades, Yuen Long expanded and Castle Peak Road was evolved as a main traffic street characterised with heavy people movements and immense kerb side activities. Most of the traffic was diverted to use Long Yip Road/Ma Wang Road/Wang Tat Road and Yuen Long Highway instead leaving most of the public transport services behind. Providing the Light Rail Transit (LRT) in the middle of the carriageway further pushed the motorized traffic away from the Castle Peak Road and thus public transport services dominate traffic on it.

Fuk Hi Street

Fuk Hi Street is a local distributor in single-2 configuration with one traffic lane running in each direction. It is the key western access to YLIE. It connects Long Ping Road to the south, which links to Long Tin Road and eventually to Yuen Long Highway. Numerous frontal vehicular accesses can be found along Fuk Hi Street with frequent on-street loading / unloading activities.

Long Ping Road

Long Ping Road is a district distributor in dual-2 configuration. It connects Fuk Hi Street in the north at the northern end of Long Ping Estate and Long Tin Road in the south near Chun Hing San Tsuen. It currently serves as a major connecting road between YLIE, Long Ping Estate, Tin Shui Wai and Yuen Long Highway.

Wang Lok Street

Wang Lok Street is a local distributor in dual-2 configuration. It is the key vehicular access to YLIE in the east. It connects Wang Tat Road / Long Yip Street in the south near Long Ping Station of West Rail. Wang Lok Street also provides access to Tung Tau Industrial Estate via Fu Yip Street. Numerous frontal vehicular accesses can be found along Wang Lok Street with frequent on-street loading / unloading activities.

Wang Tat Road / Long Yip Street

Wang Tat Road / Long Yip Street is a primary distributor in single-3 configuration running in the eastbound direction only. It connects Shui Pin Wai Interchange in the west and Castle Peak Road – Yuen Long in the east. It serves as a key traffic corridor in Yuen Long complementing Castle Peak Road.

Yuen Long On Lok Road / Ma Wang Road

Yuen Long On Lok Road / Ma Wang Road is a primary distributor in single-3 configuration running in the westbound direction only. It connects Shui Pin Wai Interchange in the west and Castle Peak Road – Yuen Long in the east. It also serves as a key traffic corridor connecting Yuen Long Highway and the northern part of Yuen Long. Three intersections can be found between Wang Tat Road / Long Yip Street and Yuen Long On Lok Road / Ma Wang Road which enable the access between YLIE, Tung Tau Industrial Estate, Yuen Long Town as well as Yuen Long Highway.

2.5.2 Existing Road Network Performance

The 2012 peak hour flows in pcu/hr of the above road network and their link performance are shown in **Table 2.5.1** below. Volume to Capacity (VC) Ratio indicates the proportion of peak hour traffic flow to the capacity of a road link. A higher VC ratio of a road indicates a heavy usage of the road link in concern, inter alia. Reviewing the VC ratio of major road link in the area helps identify the spare capacity in the existing road network. Making a better use of the road network helps minimise the additional capital investment for further development in Yuen Long. It can be seen that all the road links are currently operating within capacity during the peak hours.

Table 2.5.1 Peak hour flow and link performance of the major links

Key Corridors	Road Type	Configuration	Design Capacity	2012 Peak Hour Flow (pcu/hour) [#]		2012 Peak Hour V/C Ratio [#]	
				AM	PM	AM	PM
Yuen Long Highway – Hung Tin Road Interchange & Tong Yan San Tsuen Interchange*	EB	EX	6,100	3,510	3,230	0.58	0.53
	WB			3,290	3,410	0.54	0.56
Yuen Long Highway – Tong Yan San Tsuen	EB	EX	6,100	4,300	3,950	0.70	0.65

Key Corridors	Road Type	Configuration	Design Capacity	2012 Peak Hour Flow (pcu/hour) [#]		2012 Peak Hour V/C Ratio [#]		
				AM	PM	AM	PM	
Interchange & Shap Pat Heung Interchange*	WB			4,030	4,180	0.66	0.68	
Long Tin Road (At-grade) – Castle Peak Road – Yuen Long & Yuen Long Highway	SB	PD	D3	6,100	3,470	2,470	0.57	0.40
	NB				2,130	2,750	0.35	0.45
Long Tin Road (Elevated) – Long Ping Road & Castle Peak Road	SB	PD	D2	3,600	2,270	1,570	0.63	0.44
	NB				1,420	1,990	0.39	0.55
Long Ping Road – Shui Pin Wai Interchange & Fung Chi Road	EB	DD	D2	2,850	600	660	0.21	0.23
	WB				750	800	0.26	0.28
Long Ping Road – Fung Chi Road & Fuk Hi Street	EB	DD	D2	2,850	640	480	0.22	0.20
	WB				790	770	0.28	0.27

Note:

[#] A V/C ratio below 1.0 is considered acceptable. A V/C ratio above 1.0 indicates the onset of mild congestion and a V/C ratio between 1.0 and 1.2 would indicate a manageable degree of congestion. A V/C ratio above 1.2 indicates the onset of more serious congestion.

* Calculated traffic flow with reference to Annual Traffic Census 2011.

The key junctions which fall within the Study Area have been identified. **Table 2.5.2** and **Table 2.5.3** shows the existing reserved capacity of the major junctions/interchanges.

Table 2.5.2 Assessment of existing major signal-controlled junctions

Junction		Type	2012 RC / DFC	
			AM	PM
J1	Fuk Hi Street / Long Ping Road	Signal	>50%	>50%
J2	Fuk Hi Street / Wang Lok Street	Signal	>50%	>50%
J3	Long Ping Road / Fung Chi Road	Signal	>50%	>50%
J4	Fung Chi Road / Wang Tat Road / Ma Wang Road / Ping Wui Street	Signal	9.6%	20%
J5	Wang Lok Street / Wang Tat Road / Long Yip Street / Yuen Long On Lok Road / Ma Wang Road	Signal	37.4%	25.4%
J6	Po Yip Street / Long Yip Street / Yuen Long On Lok Road	Signal	37.6%	48.2%
J7	Shui Pin Wai Interchange	Signal	>50%	>50%

Note:

A signal-controlled junction with a Reserved Capacity (RC) of 0% implies that it is operating at capacity while a negative RC suggests that it is over capacity. For priority junctions and roundabouts, the performance indicator is

the Design Flow to Capacity (DFC) ratio. A DFC ratio of 0.85 indicates a reasonable capacity provision which queuing would be prevented in the majority of cases (85%).

The results indicate that all assessed signal-controlled junctions are currently operating at satisfactory level except for J4 where the RC drops to 9.6% during AM peak.

Table 2.5.3 Assessment of existing priority junctions

Junction		Type	2012 RC / DFC	
			AM	PM
P1	Long Ping Road / Ingress of Long Ping Estate	Priority	0.45	0.48
P2	Long Ping Road / Egress of Long Ping Estate	Priority	0.53	0.45

The results indicate that all assessed signal-controlled junctions are currently operating at satisfactory level.

2.5.3 Existing Rail Network

West Rail

The West Rail Line forms part of the strategic rail network in Hong Kong. It links NWNT with main urban area, e.g. Kowloon, and contains 10 stations between Hung Hum and Tuen Mun. In the vicinity of the development site, there are Long Ping Station and Yuen Long Station. The development site is some 450m away from Long Ping Station.

Light Rail Transit

The Yuen Long Section of the LRT is located in Zone 5 which comprises 5 stations including Shui Pin Wai, Fung Nin Road, Hong Lok Road, Tai Tong Road and Yuen Long Terminus. These stations are located mainly at Castle Peak Road – Yuen Long Section to the south of the Study Area and are some 700m away.

LRT serves as one of the feeder services to West Rail Yuen Long Station. For the rider of West Rail, the LRT service within Zone 5 is free of charge for local residents to use West Rail.

2.5.4 Existing Public Transport Services

Two bus termini can be found within the Study Area. They are located at Wang Lee Street and Long Ping Estate respectively. At present Long Ping bus terminus provides service for 8 franchised bus routes, and 2 of which terminate at the terminus. A summary of public transport services in the two bus termini as well as those serving the Study Area are shown in **Table 2.5.3**. **Figure 2.5.2** illustrates the bus routes and bus terminus in the vicinity of the Study Area.

Table 2.5.3 Public transport services in the study area

Route No	Origin / Destination
Franchised Bus (FB)	
68A	Long Ping Estate Bus Terminus Tsing Yi Railway Station Bus Terminus
76K	Long Ping Estate Bus Terminus Wah Ming Bus Terminus
263M	Fu Tai Estate Bus Terminus Tsing Yi Railway Station Bus Terminus

Route No	Origin / Destination	
264M	Tin Yan Estate Bus Terminus	Tsing Yi Railway Station Bus Terminus
268B	Long Ping Railway Station	Hung Hom Ferry Concourse Bus Terminus
268C	Long Ping Railway Station	Kwun Tong Ferry Bus Terminus
269D	Tin Fu Bus Terminus	Lek Yuen Bus Terminus
276	Tin Tsz Bus Terminus	Sheung Shui Bus Terminus
276P	Tin Tsz Bus Terminus	Sheung Shui Bus Terminus
B1	Tin Shui Wai Railway Station	Lok Ma Chau Spur Line
E34	Tin Shui Wai Town Centre Bus Terminus	Airport (Ground Transportation Centre) Terminus
K66	Long Ping Estate Bus Terminus	Tai Tong Bus Terminus
K68	YLIE Bus Terminus	Yuen Long Park
K73	Tin Heng Estate Public Transport Interchange	Yuen Long Plaza
K74	Tin Shui Bus Terminus	Yuen Long (East) Public Transport Interchange
N269	Tin Tsz Bus Terminus	Mei Foo Bus Terminus
N30	Yuen Long (East) Bus Terminus	Tung Chung Railway
Green Minibus (GMB)		
74	Yuen Long (Fook Hong Street) Minibus Terminus	Shing Uk Tsuen
74A	Yuen Long (Fook Hong Street) Minibus Terminus	Tung Tau Wai
77	Tin Shui Wai Town Centre Public Transport Interchange	Lok Ma Chau (San Tin) Public Transport Interchange
77A	Grandeur Terrace Terminus	Pok Oi Hospital Terminus
79S	Tin Chung Court Bus Terminus	Lok Ma Chau Control Point

2.5.5 Existing Pedestrian & Cycle Network

A comprehensive pedestrian network can be found in the Study Area providing access for pedestrian within and externally to public transport terminus and Long Ping Station (**Figure 2.5.3**). The existing elevated walkway system provides access from Fuk Hi Street to Long Ping Estate and further connects to Long Ping West Rail Station. The elevated walkway system further extends towards Castle Peak Road – Yuen Long providing access to Yuen Long Town.

The existing cycling network established in the Study Area connects YLIE, Tung Tau Industrial Estate, Long Ping Estate, Tin Shui Wai, Ping Shan and along Wang Tat Road, Long Yip Street, and Castle Peak Road – Yuen Long. These facilities are operating at a satisfactory level (**Figure 2.5.3**).

2.5.6 Future Infrastructure

Improvement to Pok Oi Interchange (Contract No. HY/2011/13)

The major component of this committed improvement works involves the construction of a single lane flyover adjacent to the northbound carriageway of Pok Oi Flyover and

associated slips roads connection with the ground level sections of Yuen Long Highway.

The proposed improvement work is planned to commence in the third quarter of 2012 and is anticipated to be completed in mid 2015. Upon completion of the work, traffic from Sheung Shui (via San Tin Highway) and Kowloon (via Tai Lam Tunnel) heading for Yuen Long South and traffic from Yuen Long South heading for Sheung Shui (via San Tin Highway) and Kowloon (via Tai Lam Tunnel) can bypass Pok Oi Interchange using the new southbound and northbound slip road respectively. It is anticipated that the proposed improvement measures can alleviate the traffic congestion at Pok Oi Interchange.

2.5.7 Possible Traffic Improvement Measures in Yuen Long

Pedestrian Environment Improvement in Yuen Long (Agreement No. 4/2011 HY)

The objective of the project is to minimise vehicle-pedestrian conflicts, improve connectivity arrangement and pedestrian safety of Yuen Long Town. At this stage of the project, the following key improvement measures have been proposed for further public consultation:

- New footbridge connection between West Rail Long Ping Station as well as Yuen Long South; and
- Junction improvement works along Castle Peak Road – Yuen Long.

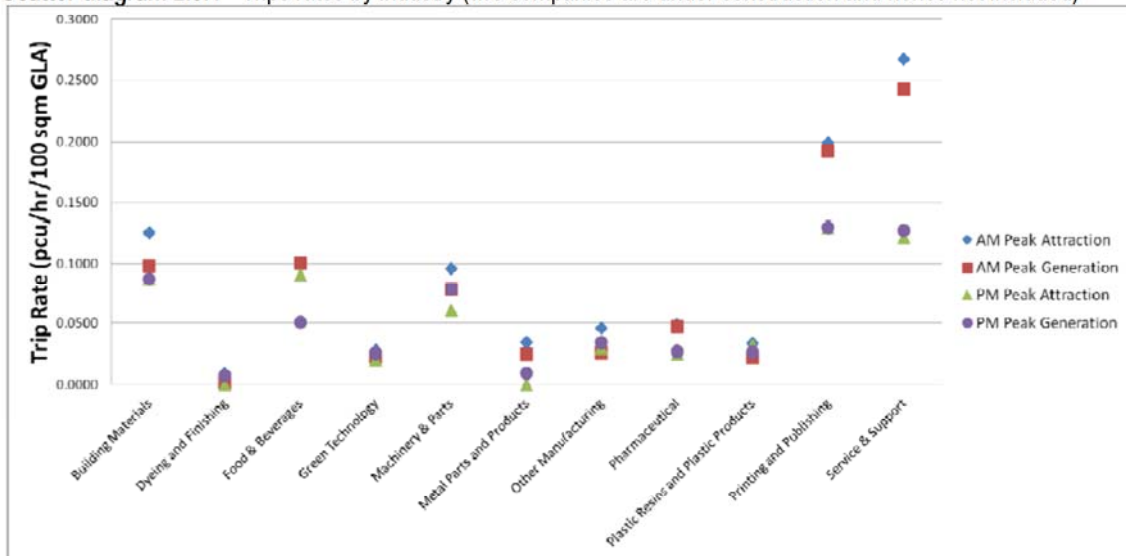
Traffic Improvement Measures in Relation to Future Developments in Yuen Long

It is noted that a number of residential developments have been proposed in the vicinity of West Rail Long Ping Station including Long Ping Station North, Long Ping Station South, Ex-Yuen Long Estate. The traffic improvement / arrangement arising from these proposed developments will be taken into consideration as appropriate.

2.5.8 Travel Characteristics of the Existing YLIE

In order to review the current travel characteristics in the YLIE, an information enquiry form has been sent to all existing tenants within the YLIE to collate the baseline business operation information including the no. of workers, gross floor area (GFA), industry type, vehicle generation / attraction, etc. **Scatter Diagram 2.5.1** summarises the traffic attraction and generation for different industry types in existing YLIE during the AM and PM peak.

Scatter diagram 2.5.1 Trips rates by industry (two companies are under construction and hence not included)



Based on the preliminary information, the AM peak attraction rate ranges between 0.0097 and 0.2675 while the generation ranges between 0.0019 and 0.2426. The PM peak attraction and generation rates are comparatively lower than the AM peak. Particular attention will be paid on the type of industry of the proposed Extension of YLIE.

It should be noted that the privacy of the individual, public and private sector organisations is protected under the Personal Data (Privacy) Ordinance (Cap. 486). The Project Proponent is under obligation to protect the privacy of the YLIE companies and have committed that the private business operation information for individual company will be treated confidentially and will not be disclosed and published to the public. The business operation information presented in this Baseline Review Report are only provided to the government departments and will not be presented in the subsequent report.

2.6 Geotechnics

Baseline geological and geotechnical conditions have been developed from a desk based review of the published geological maps and memoirs; a preliminary review of aerial photographs covering the Study Area between 1924 and 2011; various Geotechnical Information Unit (GIU) slopes records; and a preliminary site walkover survey undertaken on 7th September 2012. Records for existing ground investigation data have also been sought from the GIU of the Civil Engineering and Development Department (CEDD), Hong Kong Geological Survey (HKGS) and from the Buildings Department (BD) archive. An initial review has been undertaken, and these will be reviewed in further detail as part of the Geotechnical Assessment under Technical Report No. 3: Preferred Options and Technical Assessments.

The baseline geological and geotechnical conditions are described below in relation to the following components of the Study, as illustrated by **Figure 2.6.1**:

- The Study Area - an area of approximately a 3.6km² surrounding the Project site (i.e. proposed development);
- The Project site for the YLIEE and PHD.

2.6.1 Topography and Geomorphology

The topography of the Study Area is illustrated by the contours shown in **Figures 2.6.2a to 2.6.2f**.

The Study Area comprises side slopes and floodplain of a broad river valley. Elevations range from +2.7 mPD on the floodplain to +120.7 mPD on the crest of the ridge in the western portion of the Study Area.

As shown in **Figures 2.6.2a to 2.6.2f**, two smaller areas comprising natural slopes located in the north and eastern central parts of the Study Area are characterised by relatively low hills rising to between +53mPD and +62mPD. A larger area of natural, locally modified slopes covers much of the western portion of the Study Area. This area includes a prominent N-S trending ridge with slopes varying in height between +50mPD and +121mPD. A number of minor natural drainage lines, predominantly trending NE-SW, with some trending NW-SE, are present within the slopes.

The Project site for YLIEE and PHD are located predominantly within the floodplain and encroaching on the lower slopes.

2.6.2 Published Geology

2.6.2.1 Superficial Geology

The HKGS 1:5,000 superficial geological map (see **Figures 2.6.3 and 2.6.5**) and memoir (GEO, 1992); 1:20,000 geological map (GCO, 1986) (see **Figure 2.6.1**) suggest that the majority of the eastern portion of the Study Area is underlain by marine mud overlying alluvium. Alluvium (described as Terraced Alluvium on the 1:20,000 map) is also shown covering much of the central portion of the Study Area with Pleistocene debris flow deposits shown around the hill in the central eastern portion of the Study Area. The maps show Pleistocene and Holocene debris flow deposits covering the lower slopes of the hillside within the western portion of the Study Area.

The maps suggest the Project site for YLIEE and PHD are underlain by alluvium and debris flow deposits.

2.6.2.2 Solid Geology

The HKGS 1:5,000 solid geological map (see **Figures 2.6.4 and 2.6.5**) and memoir (GEO, 1992); 1:20,000 geological map (GCO, 1986) (see **Figure 2.6.1**); 1:100,000 geological map (Sewell et al., 2000) and geological memoir (GCO, 1986), suggest the solid geology of the Study Area comprises mostly foliated metasiltstone and metasandstone of the Lok Ma Chau Formation overlying the marble of the Yuen Long Formation. The Site falls within Scheduled Area No. 2, recognised as an area of complex geology where karst features such as an uneven upper surface and dissolution cavities are known to occur within the marble. Cavities in the marble have been noted in exploratory holes within the Study Area with the closest drillhole proving marble with cavities located within 60 m to the east of the YLIEE.

The 1:20,000 map (**Figure 2.6.1**) indicates there is a localised area of mylonitized fine grained granite in the northern portion of the Study Area. It also includes graphite schist in the description of the Lok Ma Chau Formation suggesting localised variations in the degree of metamorphism.

The 1:5,000 solid geological map (**Figures 2.6.4 and 2.6.5**) provides additional detail on geology of the Study Area, based on mapping, gravity surveys, and boreholes undertaken by the British Geological Survey (BGS). This shows the solid geology of the Study Area is complex and highly variable. Large fault bounded outcrops of Mesozoic age metamorphosed granodiorite are shown in the east and the north of the Study Area. Small fault bounded outcrops of marble from the Yuen Long Formation was also identified within the central and eastern portions of the Study Area.

The maps and corresponding geological cross sections suggest the solid geology of the YLIEE and PHD sites comprises metasilstone and metasandstone of the Lok Ma Chau Formation, overlying the Yuen Long Formation. However, there are no borehole locations shown on the 1:5,000 map within the proposed YLIEE and PHD sites to confirm any localised variations similar to those identified immediately to the north of the YLIEE site.

2.6.2.3 Structural Geology

Although there are no faults shown on the 1:20,000 map, the geological memoir suggests that the Study Area is located within the influence zone of the northeast-trending Lo Wu-Tuen Mun fault and fold belt which contains a series of faults, folds and shear zones, including at least four major northeast-trending faults, namely the Lau Fau Shan Fault, Yuen Tau Shan Fault, Ma Tso Lung Fault and the San Tin Fault. The San Tin Fault is a major structural thrust fault that influences the whole area giving rise to a strongly developed foliation and structure within the bedrock.

The 1:5,000 solid geological map (**Figures 2.6.4 and 2.6.5**) shows three NW-SE trending normal faults crossing the Study Area. These cross-cut and offset a NNE-SSW trending thrust fault and a NNE-SSW trending normal fault. The NNE-SSW trending thrust fault crosses both the YLIEE and potential PHD sites. And one of the NW-SE trending normal faults crosses the north of the YLIEE site. Heavily fractured zones identified in BGS boreholes immediately adjacent to the east of the YLIEE may be related to faults identified on the published 1:5,000 map.

2.6.3 Existing Ground Investigation Data

A total of 571 exploratory holes were identified within the Study Area from a search of the GIU and BD archival data. The locations of data held by the GIU are shown in **Figure 2.6.1**. A further 6 boreholes were identified from the BGS archives, with locations shown on the 1:5,000 geological map and data discussed in the corresponding memoir. The majority of the existing data within the Study Area is associated with the existing YLIE and the Long Ping housing estate. There is no existing ground investigation data for the natural terrain slopes to the north, central eastern and western portions of the Study Area.

No existing ground investigation data has been identified within the YLIEE site and coverage within the PHD site is limited to two drillholes located in the southern portion, as shown in **Figure 2.6.1**.

2.6.4 Existing Man-Made Features

According to CEDD's Slope Information System (SIS), there are 102 registered man-made features within the Study Area. 16 of these features are located within, or partially within, the proposed YLIEE or PHD sites, comprising predominantly minor

cut and fill slopes, with one more significant feature - an approximately 5 m high cut slope along Long Ping Road which forms the southern boundary of the proposed PHD site.

2.6.5 Aerial Photographs

Aerial photographs reviewed in this report cover the period from 1924 to 2010. In 1924, the entire Study Area comprised farmland and river terraces with no man-made structures observed. Some minor development of low-rise structures took place within the agricultural land in the 1960's and 1970's. Major development within the Study Area occurred in the 1980s. By 1984, construction of the fill covered much of the area immediately to the north and east of the proposed YLIEE and part of the proposed YLIEE site. A number of low-rise structures are also observed within the same area at this time. These works were associated with construction of the YLIE. By 1994, much of the proposed YLIEE site is covered with open storage and light industrial land use similar to that observed today. In addition, the man-made features located in the southern portion of the PHD had been constructed. By 2010, agricultural land within the northern portion of the proposed YLIEE site had been covered with fill and the container storage area extended northward to cover this area.

There were no significant changes to the natural terrain slopes to the west of the proposed YLIEE and PHD between 1924 and 2011. Rock outcrop and occasional boulders were observed typically confined to spur lines. No recent landslide scars or evidence of instability was observed. Several topographical depressions have been identified which may indicate evidence of relict landslides. Numerous graves and footpaths are observed within the lower hillslopes.

2.6.6 Site Walkover Survey

A site walkover survey covering the proposed YLIEE and PHD sites was conducted on 7th September 2012. The following key observations were made regarding current land use and ground conditions.

Land use in the YLIEE site and northern part of the PHD site was observed to include light industrial, open storage and vehicle parking with most of the land in active use. An area of agricultural land was observed within the northern portion of the YLIEE. Current land use within the remainder of the proposed PHD site was observed to comprise a mixture of agricultural land, car parking, graves, and village housing, including a number of illegal squatter huts, and a school. The residential areas comprised a network of narrow passageways and lanes between the buildings, restricting vehicle access. A slope comprising approximately 3m of fill material was observed at the western extent of the YLIEE site.

The natural terrain hillside was relatively accessible through the YLIEE and PHD sites and a high density of graves was observed. Exposure of Grade III meta-siltstone/meta-sandstone outcrop was observed within the natural terrain slopes to the west of the YLIEE and PHD sites suggesting that rockhead is shallow in this part of the Study Area. No obvious sources of rock fall were observed. There were also no obvious signs of recent landslide activity within the natural terrain hillside. Occasional boulders were observed, typically angular and less than 2 m³ in volume. None appeared to be unstable.

2.6.7 Natural Terrain Hazards

The extent of natural terrain catchment areas with potential to affect the proposed YLIEE and PHD has been determined based on the topographic setting of the hillside (see **Figure 2.6.6**). The catchment areas include 31 sub-catchments (namely Catchments A to AE).

The extent of the natural terrain hillside that requires Natural Terrain Hazard Study (NTHS) has been determined using the screening guidelines provided in Section 1.5 of GEO Report No. 138.

As no site layout has been defined at this phase of the study, the assumption was made that the proposed facilities will fall into Facility Group 1(a), based on GEO Report 138, Table 1, and will be constructed up to the site boundary. Based on this it is found that Catchments D to J, M, R to S and V to AD satisfy the above Inclusion Criteria and thus require a NTHS.

Although findings from the aerial photograph interpretation (API) (**Section 2.6.5**) and the site walkover survey (**Section 2.6.6**) identify limited evidence of past instability, a preliminary review of recorded landslide incidents, the Enhanced Natural Terrain Landslide Inventory (ENTLI), the Large Landslide Study (LLS) and the Boulder Field Inventory (BFI) identify record possible evidence of previous instability, including a number of large landslides within the LLS. A detailed review of this data will be undertaken as part of the NTHS under Technical Report No. 3. The potential for rock fall and boulder fall affecting the sites will also be reviewed in further detail.

2.6.8 Anticipated Ground Conditions

Following an initial review of all existing relevant information, as described above, the sub-surface ground conditions are expected to be complex. The anticipated ground conditions for the Study Area are described in **Section 2.6.8.1** below to indicate the broad geological condition in the vicinity of the Project site. The anticipated ground conditions more specifically for the proposed YLIEE and PHD sites are described in **Section 2.6.8.2**.

2.6.8.1 Study Area

The central, eastern and southern portions of the Study Area are expected to be underlain by fill associated up to 7m in thickness. This is expected to be overlain by marine clays up to 60m in thickness and alluvium up to 25m in thickness, comprising clays and silts with interbedded sands and gravels.

The solid geology of the Study Area is expected to comprise foliated metasiltstone and metasandstone of the Lok Ma Chau Formation with localised blocks of marble of the Yuen Long Formation; and metamorphosed Granodiorite, the distribution of which appears to be controlled by the predominantly NE-SW and NW-SE trending faults.

The thickness of Grade IV/V rock varies locally but the trend follows the local rockhead profile, increasing in thickness to the east. A thicknesses of approximately 60m was recorded below the YLIE, at a location approximately 350m east of the eastern boundary of the YLIEE. Thicknesses of approximately 30m and 20m were recorded at the northern portion of the Study Area, at the YLSTW, and in the southern portion of the Study Area respectively.

Grade III rockhead levels are highly variable across the Study Area but are typically in excess of 30 metres below ground level (mbgl). Rockhead generally deepens towards the east, below the valley, with a maximum depth of approximately 150 mbgl recorded in the north-eastern part of YLIE, with corresponding thicknesses of Grade IV/V of 130 m.

2.6.8.2 YLIEE and PHD Sites

Although no fill is recorded within the proposed YLIEE and PHD sites on any of the published geological maps or in the memoirs, based on evidence from the site walkover, API and ground investigation data from the adjacent YLIE site, a layer of fill of variable thickness is anticipated below the YLIEE and PHD sites. Local variations in thickness will depend on the recent site history and current land use. Based on data from exploratory holes adjacent to the eastern boundary of the YLIEE, fill could be up to 4 m in thickness.

Up to 10m of alluvium and debris flow deposits are expected to be present underlying the fill, where present, across the majority of the proposed YLIEE and PHD sites. Along the toe of the natural terrain slopes along the western extent of the YLIEE, up to 15m of debris flow deposits may be present.

Based on the available data, the solid geology underlying the proposed YLIEE and PHD is expected to comprise foliated metasiltstone and metasandstone of the Lok Ma Chau Formation. Whilst there is insufficient existing ground investigation data to confirm the complexity of ground conditions below the proposed YLIEE and PHD sites, studies undertaken on the adjacent existing YLIE site confirm significant variations in the solid geology over a relatively small area, influenced by faulting. Blocks of metamorphosed granodiorite were identified adjacent to the thrust fault which passes through both sites. Marble has been identified very close to the eastern site boundary of the proposed YLIEE. Similarly variable conditions may extend below the adjacent proposed YLIEE and PHD sites, however, additional ground investigation will be required to confirm this.

There is insufficient data to determine the variation in Grade III rockhead level below the proposed YLIEE and PHD sites but exploratory holes along the eastern boundary of the YLIEE and PHD sites suggest it may be up to 40 mbgl. If marble is present, this may exhibit karst features such as a highly variable rockhead surface and cavities.

2.7 Drainage

2.7.1 Existing Drainage System

The Study Area locates at the catchment boundaries of Yuen Long Basin and Tin Shui Wai Basin. However, the Project site only falls within the catchment boundary of Yuen Long Basin. The general layout of Yuen Long Basin and Tin Shui Wai Basin are shown in **Figure 2.7.1**.

The Yuen Long Basin covers an area of approximately 92.9 km² and contains 2 primary rivers, Kam Tin River and Shan Pui River. This basin is susceptible to flooding and characterised by steep upland portion with abrupt transition to a relatively flat lowland portion. The Project site is surrounded by the following main stormwater drainage systems and they are shown in **Figure 2.7.2**.

Tai Tseng Wai Channel

Tai Tseng Wai Channel is an existing 6,000 mm wide channel at the north-east side of the Project Site to intercept the surface runoff from hillside to the Shan Pui River.

Stormwater Drainage along Fuk Hi Street

There are existing storm drains with diameters ranging from 450 mm to 900 mm running along Fuk Hi Street. The storm drains eventually convey the collected surface runoff to Shan Pui River via existing box culverts underneath Wang Lok Street. There are also existing storm drains with diameters ranging from 300 mm to 450 mm along Fuk Hi Street and discharge surface runoff to Shan Pui River via existing box culverts underneath Wang Lok Street.

Stormwater Drainage along Long Ping Road

There are 2 sections of existing storm drains running along Long Ping Road at different directions. The first section of existing storm drains with diameters ranging from 300mm to 1,800mm at the south-east side of the Project site convey the surface runoff to Shan Pui River via existing box culverts underneath Wang Lok Street. Another section of existing storm drains with diameters of 675 mm at the southern side of the Project site convey the surface runoff to Shan Pui River via existing box culverts underneath Ma Wang Road.

Watercourses from Kai Shan

Kai Shan is situated to the west of the Project site and there are a number of watercourses on this hill to convey the surface runoff from hillside to the above existing drainage system adjacent to the Project site. Sections of several watercourses flow through the project site.

2.7.2 Existing Drainage Condition

Yuen Long basin is susceptible to flooding due to the relatively flat lowland portion within the basin. Due to the sedimentation at downstream of Kam Tin River and Shan Pui River, the changes in land uses and adoption of 500mm and 300mm freeboard for channels and pipelines, the Review of Drainage Master Plans in Yuen Long and North Districts – Feasibility Study (DMP Review) concluded that the flood protection level of the primary rivers and several main rural drainages (including Shan Pui River) are reduced from previous above 1 in 50 years to about 1 in 5 years to 1 in 20 years. There are problematic flooding locations within and in the vicinity of the Project site and they are shown in **Figure 2.7.3**. Currently, DSD has an Agreement No. CE 37/2012(DS) Improvement of Yuen Long Town Nullah (Town Centre Section) – Design and Construction to modify the existing flood wall along Shan Pui River. The tentative construction period of the works is from early 2014 to 2018. After the modification works, the flood protection level along Shan Pui River should increase back to 1 in 50 years.

One of the problematic flooding locations mentioned in DMP Review, Ting Fook Villas (problematic flooding location no. YL11), falls within the proposed development. Flooding was recorded at an open storage yard near Ting Fook Villas due to the overflow from the existing channel. The bottlenecks at local sharp bends and the insufficient drainage capacity at the downstream stream course are the main reasons of the overflow from the existing channel. For some low spot areas at Tai Kau and Ting Fook Villas, flood depth more than 600 mm is anticipated for the return period of 50

years. The DMP Review recommended constructing a new covered channel for connecting to the existing stream along the footpath adjacent to the open storage yard and the existing drainage channel at the northern side of the village road. However, there is no implementation programme for the proposed scheme in the DMP Review.

Another problematic flooding location is at Tai Tseng Wai (location no. YL12). Tai Tseng Wai is situated in a low-lying area and the surface water runoff of the area is currently drained into a stream running adjacent to Fuk Shun Street. The stream conveys the collected surface water runoff into the Tai Tseng Wai Channel. Based on the information collected, there are also two blocked cross road pipes beneath Fuk Shun Street connecting into the aforesaid stream. In addition, the residents along Fuk Shun Street have partially filled and replaced the stream with various concrete pipes which has significantly reduced the capacity of the stream. Therefore, Tai Tseng Wai area only has flood protection levels of less than 1 in 2 years. The DMP Review recommended replacing the existing stream with a box culvert to increase the capacity of the system, installing a flap valve at the outlet to Tai Tseng Wai Channel and replacing the existing 600mm diameter cross road drain with a larger sized pipe to mitigate the flooding risk to Tai Tseng Wai area. However, there is no implementation programme for the proposed scheme in the DMP Review.

All mitigation measures within and in the vicinity of the Project site recommended in the DMP Review are summarized in **Table 2.7.1**. It should also be noted that the Wang Chau development was not included in the DMP review.

Table 2.7.1 Planned drainage improvement works within and in the vicinity of the Project site

Item No./ Project Ref.	Name of the River /Water Course	Project Description	Actual or Programmed Completion Date
CE 37/2012(DS)	Shan Pui River	Improvement of Yuen Long Town Nullah (Town Centre Section) – Design and Construction	2018
-	-	Construction of Covered Channel at Tin Fook Villas	-
-	-	Improvement works at Tai Tseng Wai	-

2.8 Sewerage

The Project site is located within Yuen Long Sewerage Catchment. The existing sewage flow within Yuen Long Sewerage Catchment is treated at the existing YLSTW. The general layout of Yuen Long Sewerage Catchment and locations of YLSTW are shown in **Figure 2.8.1**.

According to “Provision of Sewerage to Unsewered Areas/Villages in Northwest New Territories – Feasibility Study”, the total flow contributing to YLSTW (Average Dry Weather Flow, ADWF in m³/day) is as below:

Table 2.8.1 Sewage flow projection for YLSTW

Catchment	Development Scenario under Current EPD Study		
	2011	2016	2030
YLSTW	14,575	35,488	44,791

The existing treatment capacity of YLSTW is 70,000 m³/day (ADWF). The proposed Effluent Polishing Scheme (EPS) at YLSTW is under planning with tentative

commissioning date in September 2017. The scope of EPS at YLSTW will upgrade the effluent standards with design capacity decrease to 46,000 m³/day (ADWF).

Based on the information from HKSTP on the Water Supply and Sewage Treatment Allocation for YLIE, it is revealed that HKSTP had already paid for a reserve of 36,000 m³/day (ADWF) at YLSTW (refer to **Appendix 2.8.1**) and currently only 4,000 m³/day (ADWF) is used in YLIE but there is an internal allocation of 12,000 m³/day to all grantees in YLIE. Therefore, the YLSTW shall retain the reserved capacity to cater for flow up to 36,000 m³/day (ADWF) including additional flow from future extension subject to further investigation and the upgraded capacity of YLSTW.

2.9 Water Supply and Utilities

2.9.1 Existing Water Supply System

The information about existing and planned water supply system including service reservoir and Water Treatment Works (WTW) has been obtained from Water Supply Department (WSD) to identify the interface and for the design of future water supply system to the Project site.

The Project site is located within the supply zone of Ngau Tam Mei Water Treatment Works (NTMWTW) and Au Tau Water Treatment Works (ATWTW). NTMWTW has an output capacity of 230 Million Litres per Day (MLD) and ATWTW as an output capacity of 330 MLD. Currently, both NTMWTW and ATWTW serve Wang Chau, Tin Shui Wai, Ngau Tam Mei, San Tin and Mai Po areas and they are alternatively used. Either one WTW can singly meet the existing water demands within the whole supply zone. However, according to the Technical Report No. 6E of North East New Territories New Development Areas Planning and Engineering Study – Investigation, it was found that the existing NTMWTW nearly reached its capacity and it alone should have no spare capacity to cater for the addition water demand from the Project site.

The Project site is located at the boundaries of supply zones between Wang Chau Fresh Water Service Reservoir (WCFWSR), Tan Kwai Tsuen North Fresh Water Service Reservoir (TKTNFWSR) and Ngau Tam Mei Fresh Water Primary Service Reservoir (NTMFWPSR). WCFWSR has a capacity of 58,790 m³ with a Top Water Level (TWL) as +67.00 mPD and Invert Levels (ILs) ranging from +60.81 mPD to +60.845 mPD. TKTNFWSR has a capacity of 80,000 m³ with a TWL as +65.00 mPD and ILs as +56.00 mPD. NTMFWPSR has a capacity of 40,750 m³ with a TWL as +104.10 mPD and ILs as +94.15 mPD.

The key waterworks and fresh water service reservoir supply zones are shown in **Figure 2.9.1**.

There is an existing DN900 MS fresh water distribution main running along Fuk Hi Street which is next to the Project site. The existing DN900 MS fresh water distribution main is fed from both WCFWSR and NTMFWPSR with a cut-off valve in-between (shown in **Figure 2.9.2**). The existing DN900 MS fresh water distribution main running along Fuk Hi Street should have a capacity of 1.9m³/s (assuming the peak flow velocity in the water main is 3m/s).

There is an existing DN250 DI fresh water distribution main running along Long Ping Road which is next to the Project site. The existing DN250 DI fresh water distribution main is fed from TKTNFWSR and NTMFWPSR with a cut-off valve in-between (shown in **Figure 2.9.2**). The existing DN250 DI fresh water distribution main running

along Long Ping Road should have a capacity of $0.074\text{m}^3/\text{s}$ (assuming the peak flow velocity in the water main is 1.5m/s).

There is, on the other side, no existing salt water supply system within and in the vicinity of the Project site for flushing. However, WSD showed their intention to have salt water supply to North West New Territories and Yuen Long under their Planning Report No. 10/2008. Nevertheless, the proposed development in Wang Chau had not been covered in WSD's study and the planned salt water supply system is already in construction stage.

2.9.2 Existing Gas Supply

On gas supply issue, the Hong Kong and China Gas Company (HKCG) has been consulted. Currently there is no existing gas main within the Project site. There is an existing 315mm diameter medium pressure underground gas pipe along Fuk Hi Street and an existing 300/355mm diameter medium pressure underground gas pipe along Long Ping Road. Those existing gas mains serve the existing YLIE, Chu Wong Ling and Long Ping Estate. **Figure 2.9.3** shows the gas supply network in the vicinity of the Project site.

2.9.3 Existing Power Supply

Information on the existing power supply network within and in the vicinity of the Project site has been obtained from China Light and Power (CLP). There are existing 132 kV and 11 kV cable circuits along Fuk Hi Street and Long Ping Road. There are also existing Low Voltage (L.V.) cables within the development site. Highways Department (HyD) has also been consulted about the existing street lightings. All public roads within and in the vicinity of the Project site are well served by street lightings. **Figure 2.9.4** shows the main power supply circuits in the vicinity of the proposed developments.

2.9.4 Existing Communications

Telecommunication companies have been consulted to collate information on the existing and planned cable networks within and in the vicinity of the Project site. There are telecommunication services owned by PCCW, Hutchison Global Communications (HGC), Wharf T&T and Cable TV. These cables are mainly laid along Long Ping Road. HGC, Wharf T&T and PCCW also have cables laid along Fuk Hi Street. The existing cables within and in the vicinity of the Project site owned by New World, and Hong Kong Broadband (HKBN) (if any) would be included once the information is received. The networks of these services are shown on **Figure 2.9.5**.

2.10 Ecology and Fisheries

2.10.1 Ecology

2.10.1.1 Relevant Legislation, Standards & Guidelines

Reference to the following local legislations, guidelines and standards, and international conventions and guidance which governing the conservation of flora, fauna and habitat, and survey methodologies will be made:

- Forests and Countryside Ordinance (Cap. 96) and its subsidiary legislation, the Forestry Regulations;
- Wild Animals Protection Ordinance (Cap. 170);
- Environmental Impact Assessment Ordinance (Cap. 499) and the associated TM Annexes 8 and 16;
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) and its subsidiary legislation;
- Town Planning Ordinance (Cap. 131);
- TPB Guidelines for Application for Developments within Deep Bay Area under Section 16 of the Town Planning Ordinance (TPB PG-No. 12B);
- EIAO Guidance Note No. 6/2010 - Some Observations on Ecological Assessment from the Environmental Impact Assessment Ordinance Perspective;
- EIAO Guidance Note No. 7/2010 – Ecological Baseline Survey for Ecological Assessment;
- EIAO Guidance Note No. 10/2010 – Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys; Hong Kong Planning Standards and Guidelines (HKPSG) Chapter 10, "Conservation";
- PELB Technical Circular 1/97 Works Branch Technical Circular 4/97, "Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures";
- International Union for Conservation of Nature (IUCN) Red List of Threatened Species – IUCN corporate with IUCN Species Survival Commission to assess the conservation status of the flora and fauna species in a global scale in order to evaluating the risk of extinction of the species (see <http://www.iucnredlist.org>);
- United Nations Convention on Biological Diversity. This convention requires parties to regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use. It also requires parties to promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings. The People's Republic of China (PRC) ratified the Convention on Biological Diversity on 5th January 1993. This convention came into force in Hong Kong during 2011.

2.10.1.2 Literature search

Baseline conditions of the Study Area were established by conducting a desktop literature review and supplemented by a preliminary site check on areas which may be of ecological interest or concern. The purpose of the literature review is to identify the existing information on the habitats and species present within the Study Area. Available literature and information from the following sources has been reviewed:

- Newsletters from Agriculture, Fisheries and Conservation Department (AFCD) – Hong Kong Biodiversity;
- AFCD website;
- Environmental Protection Department (EPD) website;

- Any other available literature and information identified to be useful to the Study during the Study.

There is relatively limited literature available on the Study Area as most of the land within the Project Site and Study Area is a developed area. Relevant scientific publications and EIA reports include the following:

- AFCD. 2007. Camera Trap Survey of Hong Kong Terrestrial Mammals in 2002-06. *Hong Kong Biodiversity – AFCD Newsletter* 15: 1-11.
- AFCD. 2010. Breeding Record of Black-winged Stilt (*Himantopus himantopus*) in Hong Kong Wetland Park. *Hong Kong Biodiversity – AFCD Newsletter* 18: 9-12.
- AFCD. 2011. A Review of the Local Restrictedness of Hong Kong Butterflies. *Hong Kong Biodiversity - AFCD Newsletter* 21: 1-12.
- Anon, 2007. Summer 2007 Report: Egretty Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.
- Anon, 2008. Summer 2008 Report: Egretty Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.
- Anon, 2009. Summer 2009 Report: Egretty Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.
- Anon, 2010. Summer 2010 Report: Egretty Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.
- Anon, 2011. Monthly Waterbird Counts Data April 2010 – March 2011: Waterbird Monitoring at the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Watching Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.
- Anon, 2012a. Summer 2011 Report: Egretty Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.
- Anon, 2012b. Summer 2011 Report on Waterbird Monitoring at the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Watching Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.
- Anon, 2012c. Winter 2011-12 Report on Waterbird Monitoring at the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Watching Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.

- Ballantyne, L., Fu, X.H., Shih, C.H., Cheng, C.Y. and Yiu, V. 2011. *Pteroptyx maipo* Ballantyne, a new species of bent-winged firefly (Coleoptera: Lampyridae) from Hong Kong, and its relevance to firefly biology and conservation. *Zootaxa* 2931: 8-34.
- CH2M HILL Hong Kong Limited, 2008. Environmental Impact Assessment of Proposed Development at Fung Lok Wai, Yuen Long Lot 1457 R.P. in D.D. 123.
- Chan, H.S.R., Chau, W.K., Cheng, W.K., Chow, S.M., Ho, S.C.J., Kan, S.C.J., Lau, W.H.S. and Ng, K.L.E. 2012. *Encyclopedia of Hong Kong Butterflies - Search for Butterflies*. Hong Kong Lepidopterists' Society Limited.
- Fellowes, J. R., Lau, M. W. N., Dudgeon, D., Reels, G. T., Ades, G. W. J., Carey, G. J., Chan, B. P. L., Kendrick, R. C., Lee, K. S., Leven, M. R., Wilson, K. D. P. and Yu, Y. T. 2002. Wild animals to watch: terrestrial and freshwater fauna of conservation concern in Hong Kong. *Memoirs of the Hong Kong Natural History Society* 25:123-159.
- Lee, V. L. F., Lam, S. K. S., Ng, F. K. Y., Chan, T. K. T. and Young, M. L. C. 2004. Field Guide to the Freshwater Fish of Hong Kong. Agriculture, Fisheries and Conservation Department, Friends of the Country Parks and Cosmos Books Ltd., Hong Kong.
- Tam, T.W., Leung, K.K., Kwan, B.S.P., Wu, K.K.Y., Tang, S.S.H., So, I.W.Y., Cheng, J.C.Y., Yuen, E.F.M., Tsang, Y.M., Hui, W.L. 2011. The Dragonflies of Hong Kong. Friends of the Country Parks.
- Yiu, V. 2011. A new species of firefly from Hong Kong – *Pteroptyx maipo* Ballantyne, 2011 米埔屈翅螢. *Hong Kong Entomological Society Newsletter* 3: 2-6.

2.10.1.3 Baseline Conditions within the Project Site

The Project site is located adjacent to the existing YLIE and Long Ping Estate, and is currently exposed to continuous human disturbance. The footprint of the Project Site is not situated within any site of conservation importance. There is little literature about the ecological conditions of the Project site available; however, the ecological profile will be established through the desktop review and ecological surveys to be conducted for this Project.

The proposed YLIEE at the northern portion of the Project site is dominated by developed area. Some agricultural land and ruderal vegetation is found in the northern portion of the proposed YLIEE. This ruderal vegetation is believed to be resulted from the invasion of abandoned agricultural land by weedy vegetation. Wooded areas were also found at the fringe of the proposed YLIEE.

The rest of the Project site is proposed for PHD. Developed areas occupy the northern portion within the PHD site boundary and are scattered through the southern portion of the PHD site. Wooded areas are present in the southern portion of the site and patches of agricultural land and ruderal vegetation are found in the central portion of the site.

An initial site visit was also conducted in September 2012 to check the conditions in the Project site. The Project site was mainly occupied by open storage. An area of agricultural land at the northern part of the Project site is mainly occupied by dryland agricultural crops.

2.10.1.4 Baseline Conditions within the Study Area

There are several sites of conservation interest or areas of ecological importance found in the Study Area. They include WCA, WBA, CA and grassland/shrubland at Kai Shan.

Wetland Conservation Area

The southern boundary of the WCA is approximately 500m from the Project Site (**Figure 2.10.1**). The landward portion of the Deep Bay area consists mainly of fishponds and is important to wetland dependent fauna species especially birds. To protect this large fishpond area, a WCA has been designated to protect and conserve the ecosystem in the area. Development within the WCA is generally not allowed unless it is related to the conservation of the area or is critical to the public purpose.

Wetland Buffer Area

The southern edge of WBA is located immediately outside the northern boundary of the Project Site (**Figure 2.10.1**). The WBA was designated to protect the ecological integrity of the fishponds and wetlands within the WCA and protect the WCA from negative impacts arising from development.

Conservation Area

The area to the immediate west of the Project site is zoned as CA in the Approved Ping Shan OZP No. S/YL-PS/14 (**Figure 2.1.2**). This zone is intended to protect and retain the existing natural landscape, ecological or topographical features of the area for conservation, educational and research purposes. There is a general presumption against development in this zone. In general, only developments that are needed to support the conservation of the existing natural landscape or scenic quality of the area or are essential infrastructure project with overriding public interest may be permitted.

Kai Shan

Kai Shan is situated to the west of the Project site and there are a number of watercourses on this hill. Given the limited development on Kai Shan, the uphill sections of the watercourses are believed to have limited human disturbance. These sections are also protected from development as they fall within a CA zone. A section of a watercourse flows through an area of agricultural land in the northern part of the Project site. This lower section is believed to be disturbed and used as irrigation ditch for the surrounding agricultural land.

Over 100 species of butterfly had been recorded on Kai Shan (Chan *et al.*, 2012) including 15 species which are of conservation interest (see **Table 2.10.1**). Kai Shan is the only peak in the area and thus attracts butterfly species which show 'hill-topping' behaviour.

Habitats and Species of Conservation Interest Found within the Study Area

Developed areas dominate the eastern portion of the Study Area with patches of wooded area and ruderal vegetation of which the former is mostly roadside plantation while the latter comprises abandoned agricultural land overgrown by invasive species. The western portion of the Study Area was mostly occupied by grassland/shrubland (at Kai Shan) and wooded area (the area surrounding Kai Shan) and the northwestern part was occupied by ponds and ruderal vegetation. A wooded area was found in the northern part of the Project site (at Ng Uk Tsuen), and ponds were also identified to the west of the YLSTW.

CH2M Hill (2008) identified some wet habitats, such as wet agricultural land and freshwater marsh, at the northwestern corner of the Study Area. This will be verified in the wet season during the ecological surveys to be conducted under this Study.

A preliminary habitat map is presented in **Figure 2.10.1**.

A single specimen of the rare plant species *Sphenoclea zeylanica* was recorded in wet agricultural land in the northwestern part of the Study Area by CH2M Hill (2008); however, the exact location where the specimen was found is unknown. Over 100 species of butterflies were recorded at Kai Shan (Chan *et al.*, 2012) in the western part of the Study Area, including 15 species of Local Concern as considered in Fellowes *et al.* (2002) (see **Table 2.10.1**). Kai Shan is also the location of the first record of the butterfly Common Yellow Swallowtail *Papilio machaon* and most frequent recorded location for this species in Hong Kong (Chan *et al.*, 2012). This species is considered to be very rare by AFCD (2011).

Table 2.10.1 Butterfly species of conservation interest recorded on Kai Shan (Chan *et al.* 2012; Fellowes *et al.* 2002).

Common Name	Species Name	Hong Kong Status (AFCD, 2011)	Conservation Status (Fellowes <i>et al.</i> , 2002)
Common Awl	<i>Hasora badra</i>	Very Rare	Local Concern
Tamil Grass Dart	<i>Taractroceras ceramas</i>	Rare	Local Concern
Spotted Angle	<i>Caprona alida</i>	Very Rare	Local Concern
Plain Hedge Blue	<i>Celastrina lavendularis</i>	Very Rare	Local Concern
Peacock Royal	<i>Tajuria cippus</i>	Rare	Local Concern
Spotted Royal	<i>Tajuria maculata</i>	Very Rare	Local Concern
Yellow Rajah	<i>Charaxes marmax</i>	Uncommon	Local Concern
Orange Staff Sergeant	<i>Athyma cama</i>	Very Rare	Local Concern
Common Yeoman	<i>Cirrochroa tyche</i>	Very Rare	Local Concern
Danaid Egg-fly	<i>Hypolimnys misippus</i>	Uncommon	Local Concern
Vagrant	<i>Vagrans egista</i>	Very Rare	Local Concern
Painted Lady	<i>Vanessa cardui</i>	Rare	Local Concern
Small Three-ring	<i>Ypthima norma</i>	Very Rare	Local Concern
Red-spot Sawtooth	<i>Prioneris philonome</i>	Very Rare	Local Concern
Spotted Sawtooth	<i>Prioneris thestylis</i>	Rare	Local Concern

Three individuals of Small Snakehead *Channa asiatica* were found on the upper section of a stream which flows into the Project site, during the site visit conducted in September 2012 (see **Figure 2.10.1**). This fish species favours lentic water in streams and paddy fields (Lee *et al.*, 2004) and is listed as of Local Concern in Fellowes *et al.* (2002). It is considered to be an uncommon species in the wild but is also available in markets (Lee *et al.*, 2004). The individuals found in the stream are not considered to be from the wild population as the location is situated in proximity to a residential area.

2.10.1.5 Baseline Conditions in the vicinity of the Study Area

There are several sites of conservation interest or areas of ecological importance found in the vicinity of the Study Area. They include Mai Po Inner Deep Bay Ramsar Site, Mai Po Marshes SSSI and Inner Deep Bay SSSI, confluence of Kam Tin River and Shan Pui River, and Nam Sang Wai.

Mai Po Inner Deep Bay Ramsar Site

Mai Po Inner Deep Bay Ramsar Site was designated in 1995 under the “Convention on Wetlands of International Importance especially as Waterfowl Habitat” (the Ramsar Convention). The Ramsar Site includes wetland habitats, such as, ponds, *gei wais*, freshwater and/or brackish marsh, reedbed and mudflat, which provide foraging grounds to waterbirds and is especially important to wintering waterbirds. The Ramsar Site is about 900m from the Project site.

Mai Po Marshes SSSI and Inner Deep Bay SSSI

Mai Po Marshes SSSI was designated in 1976 as its ecological importance of the ponds and *gei wais* to the waterbirds. This SSSI falls within the Mai Po Inner Deep Bay Ramsar Site. Inner Deep Bay SSSI was designated in 1986 because of the provision of habitats (such as mudflat) to the waterbirds as the roosting and foraging grounds. The southern part of this SSSI also falls within the Ramsar Site. The Project site is located at about 1000m from the Ramsar site, 1600m from Mai Po Marshes SSSI, and 1100m from Inner Deep Bay SSSI.

Hong Kong Wetland Park Special Area

The Hong Kong Wetland Park Special Area has been designated since 2005. Any activities within the Park have been under the control of the Country Parks and Special Areas Regulations (CAP 208A) since this designation. This designation provides a legal framework to protect and manage the Park while conserving the ecosystem and providing education to the public as a tourism ‘hotspot’. Due to its proximity to the Deep Bay area, the Park also attracts a variety of wetland fauna. This Special Area is located approximately 1,000m from the Project site.

Confluence of Kam Tin River and Shan Pui River

Kam Tin River and Shan Pui River are under the influence of tidal action and the confluence of these two rivers provides intertidal mudflat habitat for the foraging birds during periods of low tide. This area, located in close proximity to the fishpond area of Deep Bay, attracts a diversity of wetland dependent bird species. The riparian vegetation along the rivers, dominated by mangrove and associate species, also provides habitat for roosting and foraging birds and other wildlife. The confluence of these two rivers is located more than 1000m from the Project site and they are separated by the existing YLIE.

Nam Sang Wai

Nam Sang Wai consists mainly of fishponds and other wetland habitats (such as reedbeds). Due to its proximity to the Deep Bay fishpond area and the confluence of the Kam Tin River and Shan Pui River, it is also an ecologically important area for wetland dependent species. Plantation on the fishpond bunds also provides roosting site for the Great Cormorant. Nam Sang Wai is over 1000m from the Project site and is separated by the existing YLIE.

Species Recorded in the vicinity of the Study Area

A number of mammal species of conservation interest have been recorded in the Deep Bay area. They include East Asian Porcupine *Hystrix brachyura* (AFCD, 2007), which is of Potential Global Concern (Fellowes *et al.*, 2002), Red Muntjac *Muntiacus muntjak* (AFCD, 2007), which is of Potential Regional Concern (Fellowes *et al.*, 2002), Masked Palm Civet *Paguma larvata* (AFCD, 2007), which is of Potential Regional Concern

(Fellowes *et al.*, 2002), Greater Bandicoot Rat *Bandicota indica* (AFCD, 2007), which is of Local Concern (Fellowes *et al.*, 2002), Yellow-bellied Weasel *Mustela kathiah* (AFCD, 2007), which is of Local Concern (Fellowes *et al.*, 2002), Crab-eating Mongoose *Herpestes urva* (AFCD, 2007), which is of Local Concern (Fellowes *et al.*, 2002), Chinese Pangolin *Manis pentadactyla* (AFCD, 2007), which is of Regional Concern (Fellowes *et al.*, 2002) and Eurasian Otter *Lutra lutra* (AFCD, 2007), which is of Regional Concern (Fellowes *et al.*, 2002).

Twenty-four out of 142 bird species recorded by CH2M Hill (2008) were considered to be of conservation interest by Fellowes *et al.* (2002). The Hong Kong Bird Watching Society conducts monthly waterbird counts. 81 species recorded in 2011 (Anon, 2011; Anon, 2012b; Anon, 2012c) are of conservation interest (Fellowes *et al.*, 2002). These species are summarized in **Table 2.10.2**.

Table 2.10.2 Bird species of conservation interest recorded in the Area to the north of the study area and in the Deep Bay Area.

Common Name	Species Name	Conservation Status (Fellowes <i>et al.</i> , 2002) #	Source
Falcat Duck	<i>Anas falcata</i>	RC	Anon (2011); Anon (2012c)
Eurasian Wigeon	<i>Anas penelope</i>	RC	CH2M Hill (2008) ; Anon (2011); Anon (2012b); Anon (2012c)
Northern Shoveler	<i>Anas clypeata</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Northern Pintail	<i>Anas acuta</i>	RC	Anon (2011); Anon (2012c)
Eurasian Teal	<i>Anas crecca</i>	RC	CH2M Hill (2008); Anon (2011); Anon (2012c)
Tufted Duck	<i>Aythya fuligula</i>	LC	Anon (2011); Anon (2012c)
Little Grebe	<i>Tachybaptus ruficollis</i>	LC	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Great Crested Grebe	<i>Podiceps cristatus</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Eurasian Spoonbill	<i>Platalea leucorodia</i>	LC	Anon (2011); Anon (2012b); Anon (2012c)
Black-faced Spoonbill	<i>Platalea minor</i>	PGC	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Eurasian Bittern	<i>Botaurus stellaris</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Yellow Bittern	<i>Ixobrychus sinensis</i>	(LC)	Anon (2011); Anon (2012b); Anon (2012c)
Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	LC	Anon (2011); Anon (2012b); Anon (2012c)
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	(LC)	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Striated Heron	<i>Butorides striata</i>	(LC)	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Chinese Pond Heron	<i>Ardeola bacchus</i>	PRC (RC)	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Eastern Cattle Egret	<i>Bubulcus coromandus</i>	(LC)	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Grey Heron	<i>Ardea cinerea</i>	PRC	Anon (2011); Anon (2012b); Anon (2012c)
Purple Heron	<i>Ardea purpurea</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Great Egret	<i>Ardea alba</i>	PRC (RC)	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)

Common Name	Species Name	Conservation Status (Fellowes <i>et al.</i> , 2002) #	Source
Intermediate Egret	<i>Egretta intermedia</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Little Egret	<i>Egretta garzetta</i>	PRC(RC)	Anon (2011); Anon (2012b); Anon (2012c)
Great Cormorant	<i>Phalacrocorax carbo</i>	PRC	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Western Osprey	<i>Pandion haliaetus</i>	RC	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Black Kite	<i>Milvus migrans</i>	(RC)	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Crested Serpent Eagle	<i>Spilornis cheela</i>	(LC)	CH2M Hill (2008)
Eastern Marsh Harrier	<i>Circus spilonotus</i>	LC	Anon (2011); Anon (2012c)
Greater Spotted Eagle	<i>Aquila clanga</i>	GC	CH2M Hill (2008); Anon (2011); Anon (2012c)
Eastern Imperial Eagle	<i>Aquila heliaca</i>	GC	CH2M Hill (2008); Anon (2011); Anon (2012c)
Peregrine Falcon	<i>Falco peregrinus</i>	(LC)	Anon (2011); Anon (2012b); Anon (2012c)
Eurasian Coot	<i>Fulica atra</i>	RC	Anon (2011); Anon (2012c)
Black-winged Stilt	<i>Himantopus himantopus</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Pied Avocet	<i>Recurvirostra avosetta</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Grey-headed Lapwing	<i>Vanellus cinereus</i>	LC	Anon (2011); Anon (2012c)
Pacific Golden Plover	<i>Pluvialis fulva</i>	LC	Anon (2011); Anon (2012b); Anon (2012c)
Grey Plover	<i>Pluvialis squatarola</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Little Ringed Plover	<i>Charadrius dubius</i>	(LC)	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Kentish Plover	<i>Charadrius alexandrinus</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Lesser Sand Plover	<i>Charadrius mongolus</i>	LC	Anon (2011); Anon (2012b)
Greater Sand Plover	<i>Charadrius leschenaultii</i>	RC	Anon (2012b); Anon (2012c)
Greater Painted-Snipe	<i>Rostratula benghalensis</i>	LC	Anon (2012b); Anon (2012c)
Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	LC	Anon (2011); Anon (2012b); Anon (2012c)
Pintail Snipe/ Swinhoe's Snipe*	<i>Gallinago stenura/ Gallinago megala</i>	LC *	Anon (2012b); Anon (2012c)
Asian Dowitcher	<i>Limnodromus semipalmatus</i>	RC	Anon (2012b)
Black-tailed Godwit	<i>Limosa limosa</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Bar-tailed Godwit	<i>Limosa lapponica</i>	LC	Anon (2012b); Anon (2012c)
Whimbrel	<i>Numenius phaeopus</i>	LC	Anon (2011); Anon (2012b); Anon (2012c)
Eurasian Curlew	<i>Numenius arquata</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Eastern Curlew	<i>Numenius madagascariensis</i>	LC	Anon (2012b); Anon (2012c)

Common Name	Species Name	Conservation Status (Fellowes <i>et al.</i> , 2002) #	Source
Spotted Redshank	<i>Tringa erythropus</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Common Redshank	<i>Tringa totanus</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Marsh Sandpiper	<i>Tringa stagnatilis</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Common Greenshank	<i>Tringa nebularia</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Nordmann's Greenshank	<i>Tringa guttifer</i>	GC	Anon (2011); Anon (2012b)
Wood Sandpiper	<i>Tringa glareola</i>	LC	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Grey-tailed Tattler	<i>Tringa brevipes</i>	LC	Anon (2012b)
Terek Sandpiper	<i>Xenus cinereus</i>	RC	Anon (2012b); Anon (2012c)
Ruddy Turnstone	<i>Arenaria interpres</i>	LC	Anon (2012b)
Great Knot	<i>Calidris tenuirostris</i>	LC	Anon (2012b)
Red Knot	<i>Calidris canutus</i>	LC	Anon (2012b)
Sanderling	<i>Calidris alba</i>	LC	Anon (2012b)
Red-necked Stint	<i>Calidris ruficollis</i>	LC	Anon (2012b); Anon (2012c)
Temminck's Stint	<i>Calidris temminckii</i>	LC	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Long-toed Stint	<i>Calidris subminuta</i>	LC	Anon (2012b)
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	LC	Anon (2012b)
Curlew Sandpiper	<i>Calidris ferruginea</i>	RC	Anon (2011); Anon (2012b)
Dunlin	<i>Calidris alpina</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
Broad-billed Sandpiper	<i>Limicola falcinellus</i>	LC	Anon (2012b)
Ruff	<i>Philomachus pugnax</i>	LC	Anon (2011); Anon (2012b)
Oriental Pratincole	<i>Glareola maldivarum</i>	LC	Anon (2012b)
Black-headed Gull	<i>Chroicocephalus ridibundus</i>	PRC	Anon (2011); Anon (2012b); Anon (2012c)
Saunders's Gull	<i>Chroicocephalus saundersi</i>	GC	Anon (2011); Anon (2012b); Anon (2012c)
Black-tailed Gull	<i>Larus crassirostris</i>	LC	Anon (2011); Anon (2012c)
Mew Gull	<i>Larus canus</i>	LC	Anon (2011)
Caspian Gull	<i>Larus cachinnans</i>	LC	Anon (2011)
Heuglin's Gull	<i>Larus fuscus</i>	LC	Anon (2011); Anon (2012b); Anon (2012c)
Caspian Tern	<i>Sterna caspia</i>	RC	Anon (2011); Anon (2012b); Anon (2012c)
White-throated Kingfisher	<i>Halcyon smyrnensis</i>	(LC)	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Black-capped Kingfisher	<i>Halcyon pileata</i>	(LC)	Anon (2011); Anon (2012b); Anon (2012c)
Pied Kingfisher	<i>Ceryle rudis</i>	(LC)	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)
Collared Crow	<i>Corvus torquatus</i>	LC	CH2M Hill (2008); Anon (2011); Anon (2012b); Anon (2012c)

Common Name	Species Name	Conservation Status (Fellowes <i>et al.</i> , 2002) #	Source
Red-billed Starling	<i>Spodiopsar sericeus</i>	GC	CH2M Hill (2008) Anon (2011); Anon (2012b); Anon (2012c)

Note:

- # Key of the conservation status: LC = Local Concern; RC = Regional Concern; PRC = Potential Regional Concern; Regional Concern = Regional Concern; PGC = Potential Global Concern; GC = Global Concern. Letters in brackets represent the restrictedness in breeding and/or roosting sites rather than in general occurrence.
- * Pintail and Swinhoe's Snipe are considered to be inseparable in the field. Swinhoe's Snipe is of Local Concern (Fellowes *et al.*, 2002).

There was an egretty at Ha Mei San Tsuen to the west of the Study Area, but this has been abandoned since 2008 (Anon, 2007; Anon, 2008; Anon, 2009; Anon, 2010; Anon, 2012a). The egretty was utilised by Little Egret, Chinese Pond Herons and Cattle Egrets and contained up to 32 nests (3.9% of total number of nests in Hong Kong) in 2007 (Anon, 2007).

Twelve reptile species were recorded by CH2M Hill (2008). Five out of the twelve species were considered to be of conservation concern, including one of Local Concern i.e. Mangrove Water Snake *Enhydris bennettii* (Fellowes *et al.*, 2002); three of Potential Regional Concern i.e. Indo-chinese Rat Snake *Ptyas korros*, Common Rat Snake *Ptyas mucosus* and Many-banded Krait *Bungarus multicinctus* (Fellowes *et al.*, 2002); and one of Regional Concern, i.e. Banded Krait *Bungarus fasciatus* (Fellowes *et al.* 2002).

Eight amphibian species were recorded by CH2M Hill (2008), of which one, two-striped Grass Frog *Rana taipehensis* is considered to be of Local Concern by Fellowes *et al.* (2002).

Five fish species were recorded by CH2M Hill (2008) in the area to the north of the Study Area and all of them were common species.

Fifty-eight butterfly species were recorded by CH2M Hill (2008) to the north of the Study Area. Two of which, Danaid Egg-fly *Hypolimnas misippus* and Small Grass Yellow *Eurema brigitta*, are considered to be of Local Concern by Fellowes *et al.* (2002). The former is listed as uncommon and the latter is listed as rare in AFCD (2011).

Twenty-six dragonfly species were recorded by CH2M Hill (2008) to the north of the Study Area. Two of which, Blue Chaser *Potamarcha congener* and Scarlet Basker *Urothemis signata*, are considered to be of Local Concern by Fellowes *et al.* (2002); however, these two species are considered to be common in Tam *et al.* (2011).

Firefly Bent-winged Firefly *Pteroptyx maipo* is a newly discovered firefly species and has been recorded in mangrove habitat in the Deep Bay area such as Hong Kong Wetland Park and near the confluence of Kam Tin River and Shan Pui River (Ballantyne *et al.*, 2011; Yiu, 2011).

2.10.2 Fisheries

2.10.2.1 Relevant Legislation, Standards & Guidelines

Reference to the following local legislation, guidelines or standards which governing the assessment of fisheries impacts will be made:

- Environmental Impact Assessment Ordinance (Cap. 499) and the associated TM Annexes 9 and 17.

2.10.2.2 Literature search

The status of the fishponds identified within the Study Area will be checked through desktop review and field survey. Literature review has been conducted to assess the baseline status of pond fish culture activity within the Study Area with respect to the fisheries activity of Hong Kong as a whole. Available literature and information from the following sources has been reviewed:

- AFCD annual reports;
- AFCD website;
- EPD website;
- Any other available literature and information identified as relevant to the Study.

The relevant reference report and EIA report include the following:

- AFCD. 2012. Department Annual Report 2010-2011. Available at <http://www.afcd.gov.hk/misc/download/annualreport2011/index.html>. Accessed in September 2012
- CH2M HILL Hong Kong Limited, 2008. Environmental Impact Assessment of Proposed Development at Fung Lok Wai, Yuen Long Lot 1457 R.P. in D.D. 123.

2.10.2.3 Baseline Conditions

Based on a preliminary check of the aerial photos and base maps available, there are no ponds found within the Project site, but there are ponds to the west of the Project site and in the northern and northwestern part of the Study Area. These latter ponds are located within WCA or WBA (see **Figure 2.10.2**).

Most of the fishponds in Hong Kong are located in the northwest New Territories. The Study Area is located to the south of the main area of continuous and contiguous fishponds in the Deep Bay area. The ponds identified at the northern and northwestern edge of the Study Area are at the southern fringe of these continuous and contiguous fishponds. According to AFCD (2012), most fishponds in the northwest New Territories are used for polyculture (rearing of such species as carps, tilapia and/or grey mullet), while the ponds near the coast may also be used for cultivation of more profitable brackish water species (e.g. scat, sea bream, pompano and giant grouper).

Based on the habitat map presented by CH2M Hill (2008), the ponds at the northern and northwestern edge of the Study Area were classified as “unmanaged ponds” in which there was no evidence of fish culture taking place.

Ponds to the west of the YLSTW (approximately 4.70 ha) were visited in September 2012 and were found to be inactive, i.e. no active management was noted, but there were no significant physical constraints to resumption of commercial fisheries. However, it should be noted that the farming practice is flexible and can be changed from time to time. The other ponds will be visited and surveyed in next stage of this Study. However, due to their limited size relative to the total area of fish culture pond in the northwest New Territories (over 1000 ha in 2010 as stated in AFCD (2012)), the significance of their fisheries production, if any, is likely to be relatively low.

All fishponds identified will be surveyed within a reasonable timeframe to provide a comprehensive update of their pond status. All fishponds within the Study Area will be visited once during March – August 2013 and the pond status will also be recorded during any other visits to the Study Area. Their status will be categorised as active, inactive or abandoned.

Active fishponds are ponds that show commercial aquaculture activities are taking place. Type of aquaculture such as fish cultivated for sale as food, fish fry cultivation, ornamental fish cultivation, bloodworm ponds, will be determined where possible. This information will be confirmed by discussion with the fish farmers where possible.

Inactive fishponds are ponds that show no evidence of commercial aquaculture activities but no major physical constraints to their resumption. These ponds will be checked to determine if fish stocks are present, including fish present in non-commercial quantities or species. Inactive fishponds are often used for informal fisheries activities (such as casual sport fishing); any evidence of this activity will be recorded.

Abandoned fishponds are ponds which have physical evidence that aquaculture has not taken place for many years and/or there are physical constraints to its resumption. Conditions and the physical constraints will be recorded, including the following:

- Presence or absence of water;
- General water quality (pollution source and nature will be identified where possible);
- Presence and extent of emergent vegetation;
- Dumping and/or other inappropriate activities;
- Presence of infrastructure constraints (such as evidence that the water supply to the ponds or the configuration of ponds is affected by nearby development).

2.11 Cultural Heritage

2.11.1 Introduction

The baseline review for cultural heritage is presented in two sections: archaeology and built heritage. In order to assess the need for archaeological field survey, a comprehensive desk-based review and field visits were undertaken. The baseline review recognises potential and known sites of archaeological interest and highlights archaeological no-go areas.

The built heritage baseline study includes desk-based research and site checks to identify the existing resources in the Study Area. The purpose of the baseline study for

built heritage is to highlight no-go areas at an early stage based upon the presence of heritage sites in the Study Area.

The assessment is based on the criteria and guidelines stated in Annexes 10 and 19 of the Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO) for assessing the cultural heritage impacts and covers the PHD site, YLIEE and other area as marked on **Figure 2.11.1**.

2.11.2 Relevant Legislation, Standards & Guidelines

Legislation, Standards, Guidelines and Criteria relevant to the consideration of Cultural Heritage impacts under this study include the following:

- Antiquities and Monuments Ordinance;
- Hong Kong Planning Standards and Guidelines;
- Environmental Impact Assessment Ordinance;
- TM-EIAO;
- Guidelines for Cultural Heritage Impact Assessment; and
- Development Bureau Technical Circular (Works) No. 6/2009: Heritage Impact Assessment (HIA) Mechanism for Capital Works Projects.

Antiquities and Monuments Ordinance

The Antiquities and Monuments Ordinance (the Ordinance) provides the statutory framework to provide for the preservation of objects of historical, archaeological and paleontological 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 paleontological significance.

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.

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.

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.

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.

Hong Kong Planning Standards and Guidelines

Chapter 10 of the HKPSG details the planning principles for the conservation of natural landscape and habitats, historic 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.

The guidelines also address the issue of the preparation of plans for the conservation of historic 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 Antiquities and Monuments Office (AMO) is necessary for any redevelopment or rezoning proposals affecting the Monuments and their surrounding environments.

It is also noted that planning intention for non-statutory town plans at the sub-regional level should include the protection of monuments, historic buildings, archaeological sites and other antiquities through the identification of such features on sub-regional layout plans. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong, and Government departments involved in conservation.

Environmental Impact Assessment Ordinance

The 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.

Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO)

The general criteria and guidelines for evaluating and assessing impacts to Sites of Cultural Heritage are listed in Annexes 10 and 19 of the TM-EIAO. 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 (CHIA), including baseline study, impact assessment and mitigation measures.

Guidelines for Cultural Heritage Impact Assessment

This document, as issued by the AMO, outlines the specific technical requirement for conducting terrestrial archaeological and built heritage impact assessments (BHIA) and is based upon the requirements of the TM-EIAO. 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.

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.

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. 6/2009: Heritage Impact Assessment Mechanism for Capital Works Projects

The technical circular contains the procedures and requirements for assessing heritage impact arising from the implementation of new capital works projects. 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 technical circular) 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).

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 a HIA based upon the submitted information.

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.

2.11.3 Archaeology Desk-based Review

The desk-based review which includes several field visits to the area, evaluates the archaeological potential of the Study Area by assessing geological, topographical, known archaeological information and existing disturbances to the soil deposits.

2.11.3.1 Geological and Topographic Background

The Study Area consists of three defined areas: Proposed area for public housing site; YLIEE site and the Other Area (**Figure 2.11.1**). The focus of the review will be on the former two but will also present a broader review of the other area as proposed outline

of the former two areas may change depending on impacts identified during this feasibility study.

PHD site

The PHD site is bounded to the east by roads and skirts around the southern hills of Kai Shan on its western edge. The site lies between elevation of 18mPD at the foot hills and 4.4mPD near the road. In general the foothills drop gradually but fairly rapidly to low elevations; exceptions lie along the northwest boundary and at the southwestern end of the site.

The area at the northwest lies between the hills and a perennial stream to the north. It consists of a debris flow platform at the base of the hills with elevations between 7 to 10mPD. The platform also has a small area to the south (outside the study area) which rises to 15mPD.

The area at the southwest lies at elevation of 18mPD dipping down to 8mPD. The area remains relatively steep and residential buildings are built on artificial terraces. Graves are set into the hill slope. Comparison with the 1966 map (**Inset 1 - Appendix 2.11.1**) shows that the stream which dissects the northern part has been partially diverted towards the north.

The geology consists of mainly debris flow deposits bounded by the phyllite, metasiltstone with meta sandstone and graphite schist of the Kai Shan (**Insets 2 & 2a - Appendix 2.11.1**). It is interesting to note that these deposits are located in very close proximity to dark grey marine muds and the lower lying areas may have been affected by tidal action (**Inset 2a - Appendix 2.11.1**).

YLIEE Site

The YLIEE site is located to the north of the public housing site. It covers large area currently in use for open storage and (abandoned and ongoing) agricultural use. It is bordered by the road and an artificial fill area on its eastern border. The YLIEE site may have been adjacent to a former coastline about 4,000 and again 2000 years BP during minor sea level regressions (Fyfe, et al 2000). The Pleistocene deposits, terraced alluvium and debris flow, formed prior to the stabilising of the sea levels and have not been buried by Holocene Hang Hau deposits.

The site lies between elevation of 16mPD near the hills which have been partially cut and 3.5mPD at the road, but the main central portion lies currently around 5mPD. The topographical map of 1966 (**Inset 1 - Appendix 2.11.1**) shows the area's elevation at 12 feet (approx. 3.5m) which suggests that the area has been raised by around 1.5m most likely as the area is low lying and wet. If ancient salt fields were located within the low lying area, reclamation and development would have obliterated the evidence.

A thin strip of raised foothills lie along the current foothills according to the 1966 map (**Inset 1 - Appendix 2.11.1**) with elevations between 25 (7.5m) and 50 feet (15m). The gentle slope and the flat land in the western edge of the site could be regarded as area with moderate archaeological potential. The topographical and geological background of the lower western foothills may be compared to the Sheung Cheung Wai and the Mong Tseng Sites of Archaeological Interest.

The geology of the YLIEE site covers similar deposits as for the public housing site: phyllite, metasiltstone with meta sandstone and graphite schist lower foot hills with the main impacts proposed on Pleistocene terraced alluvium and Holocene debris flow deposits (**Insets 3 & 3a - Appendix 2.11.1**).

Other area

The other area will be divided into Kai Shan and Chu Wong Ling, Long Ping Estate, Yuen Long Industrial Area and Ng Uk Tsuen as marked on **Figure 2.11.1**.

The overall geology mirrors the above sites but also includes a small outcrop of fine grained granite near Ng Uk Tsuen and reclaimed dark grey marine mud and alluvial areas along the west (**Inset 4 - Appendix 2.11.1**). The topography of the wider area shows large reclaimed mudflats punctuated by hills and lower hill slopes. A reconstruction of the coastline in the Yuen Long to Lo Wu area of 6000 years ago suggests the northern historic village cluster, Kai Shan and Chu Wong Ling represent the only onshore areas amidst the mudflats (Fyfe, et al 2000). For each section the geology and topography is as follows:

Kai Shan has a maximum elevation of 121mPD. It is the main feature in the surrounding and is covered in graves. A number of streams, medium and small size, run off the hills and feed ultimately and originally into a large sea inlet to the east. The earliest villages surrounding the hills shown on the 1914 map (**Inset 5 - Appendix 2.11.1**) are Tai Tseng in the north and Ha Mi in the south.

Chu Wong Ling includes a phyllite, metasiltstone with meta sandstone and graphite schist hillock which rises to a height of 52.9mPD. To the south of the hillock lies a number of small villages, including the historic villages of Fuk Hing Tsuen, Chung Sam Wai, Lam Uk Tsuen, Tung Tau Wai San Tsuen and Tung Tau Wai, and the more recent villages of Sai Tau Wai, and Yeung Uk Tsuen (**Inset 4a - Appendix 2.11.1**). The historic villages appear under the combined name of Wang Chau on the 1914 map (**Inset 5 - Appendix 2.11.1**). The area is currently built up and contains a mix of old and new residential buildings. The village lies on Pleistocene terraced alluvium and debris flow at relatively low elevation of around 3.6-5mPD.

Long Ping Estate is located on filled lands which were partly the former sea inlet and partly (wet) agricultural fields (**Inset 4 - Appendix 2.11.1**). The south western part of the section includes the villages of Fung Chi and Shui Tin Tsuen; the latter which appears on the 1957 map (**Inset 6 - Appendix 2.11.1**). This south western part occupies phyllite, metasiltstone with meta sandstone and graphite schist and Pleistocene debris flow deposits (**Inset 4 - Appendix 2.11.1**). Both villages lie at elevations around 7mPD.

Yuen Long Industrial Area is located entirely on filled area and covers what previously was a sea inlet and marine mud deposits (**Inset 4 - Appendix 2.11.1**).

Ng Uk Tsuen section has a phyllite, metasiltstone with meta sandstone and graphite schist hillock in the north and includes the villages of Ng Uk Tsuen, Tai Tseng Wai and Shing Uk Tsuen (**Inset 4 - Appendix 2.11.1**). The villages were settled between 400 and 500 years ago and date at least to the Ming Dynasty. On the southern slope of the hillock and behind the old village of Ng Uk Tsuen is a concentration of graves. The villages lie at elevations around 9mPD for Ng Uk Tsuen, between 7-9mPD for Shing Uk Tsuen and 4-5mPD for Tai Tseng Wai.

2.11.3.2 Archaeological Background

PHD site

No archaeological information exists specifically for the PHD site.

YLIEE site

No archaeological information exists specifically for the YLIEE site.

Other area

An archaeological investigation was conducted at northern edge of Kai Shan (Arup 2004). Twenty auger hole tests and two test pit excavations were undertaken and indicate that sterile soils overlay well decomposed bedrock. No archaeological materials or deposits were recorded.

No other archaeological investigations were conducted within the other area; however, certain archaeologically relevant information can be deduced from the geology, topography and similarity to areas nearby with known sites of archaeological interest, such as Sheung Cheung Wai and Mong Tseng Tsuen (see **Figure 2.11.2**).

(i) Sheung Cheung Wai Site of Archaeological Interest (AM02-1671)

The Sheung Cheung Wai Site of Archaeological Interest is located to the southwest of the Study Area. The village itself is a traditional walled village of Ping Shan Heung with a history of 700 to 800 years. Excavated archaeological materials include Ming Dynasty Wun Yiu sherds. While the finds have been sparse the potential for a former Ming Dynasty village at or near the village is likely. Some wall foundations were located in two test pit excavations to the north east of the historic Sheung Cheung Wai village during 2001 investigation (Au, 2001).

(ii) Mong Tseng Site of Archaeological Interest (AM00-1599)

Historically the village may date back to the Late Ming Dynasty (Siu 1990) and thus fits in with the extensive use of the northern wetlands during the Ming and Qing Dynasties as can be gleaned from archaeological evidence and historical records. During the Territory-wide archaeological survey of 1997, however, a single coarse sherd dating to the prehistory was found. The exact location of the site is unknown but the find may indicate prehistoric use of area. Besides, Song/Yuan Dynasty finds have also been recovered.

Both known historical sites of archaeological interest are located near a hillock rising up amongst the wetlands and bay area. The sites cover the area where alluvial areas and hillock meet.

2.11.3.3 Historical Background

The historical background of the area should be referred to **Section 2.11.4.1** below.

2.11.3.4 Existing Impacts

The existing impacts within the Study Area consist of open storage, light industry area, agricultural fields and temporary buildings. As part of the construction of these impacts, areas were artificially raised, hill slopes cut, spaces covered in concrete and streams channelled. **Figure 2.11.2a** marks the areas with adverse existing impacts.

PHD site

The proposed site for public housing is currently partially used for open storage, light industry activities (its northern end) and has a number of temporary and residential buildings, an international school and graves along the base of the hill on cut terraces

(**Inset 7 - Appendix 2.11.1**). A stream is located along the north of the Project site. The stream features prominently on older maps and aerial photographs and was likely channelled when the YLIE was constructed in the mid 1980's. **Inset 7 - Appendix 2.11.1** shows how nowadays the run-off streams have been cut off by development and diverted. The 1924 aerial photograph shows the stream connecting to a large pond in front of Fuk Hing Tsuen (**Inset 8 - Appendix 2.11.1**).

Along the western edge the proposed housing site skirts the lower foot hills of Kai Shan. The area is currently in use as open storage and not accessible. Aerial photograph (**Inset 10 - Appendix 2.11.1**) shows however, that most of the areas are covered in concrete. In the northern part along the edge, during the field visit a few roof tiles typically dated to the Ming/early Qing dynasty were noted along the path. A number of hill slope cuts in close proximity were examined but no further material or cultural deposits were noted. The area which could be of interest is entirely in private hands and the local sentiments are relatively hostile to projects which may bring change. An isolated old granite well, located slightly to the east of the surface finds may date to a similar time.

Concrete paths, roads and steps provide access to the mainly residential area along the now lower slopes in the south of the proposed PHD site. The original village/residential buildings at the base of the hill were demolished for the construction of Long Ping Road but can still be seen on the 1974 aerial photograph (**Inset 9 - Appendix 2.11.1**). The demolished village is not believed to have been historic as it does not feature on the 1914 or 1957 topographical maps (**Insets 5 & 6 - Appendix 2.11.1**).

Some open areas nearby large graves exist. At one grave the denuded surface presented a clear view of the surface. Besides, a shallow ditch dug recently provided a fresh section cut. No archaeological materials or cultural deposits were noted. The purpose of the surface clearance was not apparent and there were no local residents to interview. The MTR West Rail runs immediately to the south of the study boundary.

The majority of the proposed PHD site is in private lands, but some small pockets, mainly near graves, may be government land.

YLIEE site

Originally the site consisted of agricultural fields. The 1924 aerial photograph shows a number of streams running in a west-east direction (**Inset 8 - Appendix 2.11.1**). The agriculture would have been wet judging by the low-lying nature of the area with elevation for most of the area around 3-4mPD. Currently the area is used for open storage and light industry premises with a small active agricultural area in the north (**Inset 10 - Appendix 2.11.1**). The agricultural area shows vegetation which likes wet environment and water was visible in small streams between fields.

The lower hills slopes along the western boundary in the northern portion of the proposed site have been partially terraced for agricultural purposes and are in close proximity of numerous graves (**Inset 11 - Appendix 2.11.1**). The central area along the west boundary which originally consisted of a small valley backed by agricultural terraces has been converted to an open storage area with roads and levelled surfaced open space. This is where most of the artificial cuts occur on the topographical map (**Inset 11 - Appendix 2.11.1**). A few large structures also occupy the area. To the south, the proposed area skirts the hill and lies at elevations between 15 and 10mPD.

The remaining western boundary at the south of the proposed area skirts the hill and lies at elevations between 15 and 10m. Artificial hill cutting and fill areas are shown on the map on the north side of foot of the hill (**Inset 11 - Appendix 2.11.1**).

In general the impacts for the YLIEE site appear minimal and consist of raising and concrete covering for open storage and industrial use and shallow agricultural disturbance. The main impact includes cutting of the hill slopes to the west and channelling of streams along the east boundary and in the south of the site.

The south-eastern tip of the sites contains vehicle storage areas and light industries, but the impacts may have been minimal. The utility impacts are minimal as they are mainly above ground and few. The lands are mainly privately owned and are in active use.

Other area

Kai Shan is private property and is owned by the Tang Clan. The 1924 aerial photograph shows the central part of the hills barren which suggests erosion is/was an ongoing process (**Inset 8 - Appendix 2.11.1**). The lower hill slopes are shown to have been in agricultural use at least until 1974 (**Inset 9 - Appendix 2.11.1**). The hills are covered in graves. Local informants state that the hill is burned regularly to keep the vegetation low and currently the hills are covered in shrubs. A few (new) residential Spanish villas have recently sprung up along the north of the hill. **Figure 2.11.2a** shows the extent of the hill which is covered in graves or has this soil coverage due to erosion.

The Chu Wong Ling section includes a shrub covered hillock, Chu Wong Ling which has no apparent use and is bordered to the south by Fuk Hing Tsuen, Tung Tau Wai San Tsuen, Lam Uk Tsuen, Chung Sam Wai and Tung Tau Wai along newer residential developments such as Fuk Lai Garden. The villages are thought to be a few hundred years old (local informant). The topographical location of historic villages here shows similarities with the topographical location of the known sites of archaeological interest mentioned above. The 1924 aerial photograph (**Inset 12 - Appendix 2.11.1**) shows extensive ponds surrounded the villages.

Yuen Long Industrial Area and Long Ping Estate are located on reclaimed land (see **Figure 2.11.2a**). The area south of Long Ping Estate, however, includes two small villages - Fung Chi Tsuen and Shui Tin Tsuen. Few historic buildings remain and little is known regarding the history of settlements. The nearby Tin Hau Temple, however, dates back to at least 400 years.

Ng Uk Tsuen, Tai Tseng Wai and Shing Uk Tsuen are ancient established villages. New residential village developments have sprung up around the villages in the last decades and replace agricultural lands. The villages date back 400-500 years and the location of the villages backed by a hillock corresponds with the known sites of archaeological interest at Mong Tseng and Sheung Cheung Wai. The villages have the associated village utility impacts, including water, sewage, electricity, etc.

2.11.3.5 Previous Archaeological Impact Assessment (AIA) investigations

Previous archaeological impact assessments conducted for areas in the vicinity of the Study Area have been reviewed and the details are presented as follows:

Agreement No. CE30/2006(DS) Yuen Long and Kam Tin Sewerage and Sewage Disposal – Design Construction (Arup, 2007)

A field investigation was conducted as part of this project which included a field scan, twenty auger tests and two test pit excavations. The field scan included the recording of some open cut graves and showed that the hill is covered in scrubs and graves. The auger tests proved unsuccessful on the hill as the soil deposits contain numerous rocks which make augering difficult. The first test pit excavation indicated sterile soils to a depth of 1.5m, while a modern grave was uncovered in the second pit at a depth of 0.6m.

The field testing results indicated that within the sewer alignment along the lower hill slopes of Wang Chau, at least on its northern end, there was no archaeological potential.

Interface mitigation measures recommended under the project are a lack of archaeological deposits and cultural soils for the sewerage alignment on Wang Chau and for the sewer alignment from Yuen Long east pumping station to Wang Chau a programme of archaeological monitoring was recommended for the sewer alignment between the historic villages of Tai Tseng Ng Uk Tsuen, Tai Tseng Wai and Shing Uk Tsuen.

Proposed Development at Fung Lok Wai, Yuen Long Lot 1457 R.P. in D.D. 123 (Mutual Luck Investment Limited, 2008)

The Study Area does not impact on the landmass as it is entirely located in former ponds. There were no impacts identified on archaeological resources.

2.11.4 Built Heritage desk-based review

2.11.4.1 Historical Background

Yuen Long District

Yuen Long consists of a large alluvial plain surrounded by hills on three sides. It has long been associated with agricultural activities and there is also reference to pearl cultivation having taken place at Wang Chau during the Yuan Dynasty (Fung 1996). In 1662 an imperial edict was issued by the Qing Emperor that required coastal areas in Southern China, including modern day Hong Kong to be evacuated. The purpose of the order was to prevent support for the recently deposed Ming Dynasty, whose supporters were based in Taiwan. The removal of the population by the Qing forces was carried out very effectively and was enforced by military troops. No new homes were provided and the entire population of displaced people was forced to find a new place to live as best they could. Buildings in the evacuation zone were for the most part demolished and all of what is now Hong Kong was left empty and abandoned. After the repeal of the Coastal Evacuation Edict in 1669, some of the surviving former inhabitants returned, but the population of the district was still much lower than it had been before and this resulted in the Qing government encouraging the movement of the Hakka people to settle in what is now known as Hong Kong (Hayes 1974).

Yuen Long had long been settled by members of the Tang Clan and many of the surviving former residents returned to their villages. The main settlement area in Yuen Long was at Ping Shan to the southwest of the current project Study Area. As well, a new site for the market in Yuen Long was chosen in what is now known as Yuen Long Kau Hui, situated to the south of the current project Study Area. The market was used

both as a local and regional trade site and this would have provided easy access for the villagers to sell their produce. Salt production was one of the major economic activities of the Tang Clan and had commenced as early as Southern Song Dynasty and lasted until the middle of the Qing Dynasty (Johnson et al.1986; pp305.). A salt factory at Wang Chau is mentioned in a 1884 book called *Liang Guang yan fa zhi* (兩廣鹽法志). An accompanying map provides a very general location of the ‘factory’ along with two other factories in Hong Kong: Tai O (Lantau) and Tuen Mun. The tradition of farming in the district continued until very recently with land crops such as rice, potatoes and sugar cane being popular and also fish farming and oyster cultivation. Brackish water paddy crops were cultivated in the Deep Bay marsh area (Ng 1983).

Wang Chau

There are six villages in Wang Chau. Fuk Hing Tsuen is a multi-clan village inhabited by members of the Wong, Li and Kwan clans being the most numerous. It is believed that the Wong clan settled here around 600 years ago. The traditional activities of the villagers were growing crops of rice and vegetables. Tung Tau Wai is a Tsang and Tsoi family village that has been settled for several hundred years. Chung Sam Wai is a Wong family village, and Lam Uk Tsuen is a Lam clan village. Yeung Uk Tsuen and Sai Tau Wai is a multi-clan village with the Leung Clan being the majority surname in the village which also was settled by members of the Chan Clan. The village founding dates back to the Ming Dynasty in the mid-15th Century. The main occupation of the villagers in the past was agricultural, including rice farming. An aerial photograph from 1924 shows the rural setting of the villages in the past (**Inset 1 - Appendix 2.11.2**). These villages are situated to the east of the proposed housing site and to the southeast of the proposed YLIEE site. The locations of the villages with respect to the two proposed project sites can be seen in **Figures 2.11.3 and 2.11.3b**.

Historical references to the villages can be found in documents associated with the annexation of the New Territories by the British in 1898. In that year, the Colonial Government commissioned a study on the area that would become the New Territories. The work was undertaken by the Colonial Secretary at the time, Mr. Stewart Lockhart and the result is a document commonly referred to as the Lockhart Report. It states that Wang Chau in Un Long (i.e. Yuen Long) had a population of 900 and that the villages were occupied by Punti clans. Wang Chau is also referred to in a government document (Enclosure No. 1 in the Colonial Secretary’s Minute of the 24th of April 1899) describing the resistance to the annexation of the new territories by the local clans. This document notes that the villages of Wang Chau were involved in the resistance activities in Yuen Long District, which were believed to have been started in nearby Ping Shan. The document specifically states that “*on the 9th (18th April), those present were from Ping Shan, Ha Tsuen, Castle Peak, Wang Chau....*” This refers to the villages which had sent men to resist the Colonial forces. It also mentions that members of the Tang Clan, including those from Ping Shan were involved in the leadership of the resistance.

The earliest reference to Wang Chau however, occurs since the middle Qing dynasty in reference to coastal defense. The “新安縣誌” (San On District Gazette) in the Qing dynasty recorded that there was a navy guidepost (汛房) in Wang Chau manned by 10 soldiers (Gui *ed.* Qing Tungzhi, 20). An accompanying map provides a very general location for the ‘Wang Chau’ navy guidepost.

Tai Tseng

There are three villages in this grouping which is situated to the north of the proposed YLIEE site. They are Tai Tseng Wai, Shing Uk Tsuen and Ng Uk Tsuen, see **Figures 2.11.3** and **2.11.3a** for locations. Their locations can also be seen on maps from 1914 and 1957 in **Insets 2 & 3 - Appendix 2.11.2** respectively. The village of Tai Tseng Wai was settled approximately 500 years ago. There are five surnames associated with the village - Cheng, Leung, Shing, Lam and Tang. All of the families came from Tai Peng, Tung Kwun in Guangdong. The Leung and Cheng families arrived first. The Shing, Lam and Tang arrived about 300 years ago. The people here supported themselves through fishing and farming in the area and the rural nature of the area in the past can be seen on the aerial photograph taken in 1924 (**Inset 4 - Appendix 2.11.2**). The village of Shing Uk Tsuen was settled approximately 400 years ago. It is a single family surname village, i.e. Shing. The families came from Guangdong province. The area behind the village was used to grow crops such as sweet potatoes and peanuts. Many of the men from the villages, traditionally worked abroad. The village of Ng Uk Tsuen is a single surname village, Ng. The 1st generation ancestor was called Ng Hung Lan, who came from Nam Tau. The current generation is the 29th. The Ng family of Ng Uk Tsuen is related to the Shing family of Shing Uk Tsuen by marriage. The villagers supported themselves through farming rice, in rented fields and through fishing and catching crabs in Deep Bay. The three villages all share the gods hall in Tai Tseng Wai and the Tin Hau Temple near Ng Uk Tsuen.

Fung Chi Tsuen and Shui Tin Tsuen

The final two historic villages are Fung Chi Tsuen and Shui Tin Tsuen located to the south of the proposed housing site (**Figures 2.11.3** and **Figure 2.11.3c**). Members of the Chan Clan from Ha Mei Tsuen settled in Fung Chi Tsuen in the early 20th Century. As such it is not shown on the 1914 map, but is marked on the map from 1957 (**Inset 3 - Appendix 2.11.2**). The Chan's also have family connections with the village of Shui Pin Tsuen. The second village is Shui Tin Tsuen. Both this village and Fung Chi Tsuen are part of the Shui Pin Yuek (Alliance) which also included the villages of Shui Pin Tsuen, Shui Pin Wai and Ha Mei San Tsuen.

The Tang Clan and the Kai Shan Burial Grounds

The Tang Clan has a long history in Hong Kong, with the first ancestors arriving in the 11th Century. The story of the arrival and settlement by the Tang Clan names the first ancestor, Tang Fu-hip as having travelled through the region on his way to an official posting as magistrate in Yeung Chun County (Hayes 1977). The clan first settled in Kam Tin, but there is also reference to a burial site chosen by Tang Fu-hip for his great grandparents on a hill near Wang Chau, near to the burial site he chose for himself (Hayes 1977).

2.11.4.2 Declared Monuments

DM-1: I Shing Kung

There is one Declared Monument in the project Study Area, the I Shing Kung which was built by the inhabitants of the six villages of Wang Chau. The temple dates back to around 1718 (the 57th year of the Kangxi reign of the Qing Dynasty). It is used to worship the deities of Hung Shing and Che Kung. The temple has a recessed entrance which leads into the main hall. There is a second hall behind separated from the entrance by a courtyard. There are side chambers and bays on both sides of the halls. It

is constructed of green brick walls with tile roofs supported by timber step beams and purlins. It became a Declared Monument in 1996. A detailed description and photographs of the temple can be found in the Catalogue in **Appendix 2.11.3** and the location is highlighted on the map in **Figures 2.11.4** and **Figure 2.11.4b**.

2.11.4.3 Graded Historic Buildings

GB-1: Tin Hau Temple at Fung Chi Tsuen

This is a **Grade 1** Historic Building. The original temple was built in 1684 (the 23rd year of the Kangxi reign which is inscribed on a bell in the temple). The temple was built by the fishing communities in the Deep Bay area, but also used by the local villagers, including those from Ping Shan and Wang Chau. It is a Qing vernacular building with three halls and side chambers. It is a green brick structure with a pitched tile roof supported by a timber bracket system. A major renovation was undertaken in 1908. A detailed description and photographs of the temple can be found in the Catalogue in **Appendix 2.11.3** and the location is highlighted on the map in **Figures 2.11.4** and **2.11.4d**.

GB-2: Yu Yuen at Tung Tau Wai

This is a **Grade 2** Historic Building. It was built in 1927 by Tsoi Po-tin. Yu Yuen was built as a summer retreat for Tsoi and his family, who lived on Hong Kong Island and remained as a private residence until the 1990's. It was built in the Classical Revival architectural with elements of the Palladian style. It is a red brick structure with a façade containing a segmental pediment over the entrance porch and a cupola behind the pediment. It also contains white painted columns, balustrades and window surrounds. The layout consists of a large entrance with a central reception hall with a staircase leading to the upper floor. A detailed description and photographs of the building can be found in the Catalogue in **Appendix 2.11.3** and the location is highlighted on the map in **Figures 2.11.4** and **2.11.4b**.

GB-3: Entrance Gate Tai Tseng Ng Uk Tsuen

This is a **Grade 2** Historic Building. It was built in 1862 as a defensive structure to protect the village. The interior houses a village earth god shrine in a niche on the ground floor and also another deity Fui Shing, which is situated on the cockloft. The gate is a two storey Qing vernacular structure with one hall. It is a green brick structure with a pitched tile roof supported by timber purlins. A detailed description and photographs of the Entrance Gate can be found in the Catalogue in **Appendix 2.11.3** and the location is highlighted on the map in **Figures 2.11.4** and **2.11.4a**.

GB-4: Nos. 4 & 7A and Lot WCL132 in DD123 at Sai Tau Wai

These consist of four connected village houses, No. 4 and Lot WCL132 being single units and No. 7A consisting of two units. The buildings were constructed by the Leung family probably before 1903 and are **Grade 3** Historic Buildings. The units are all Qing vernacular in style and the layouts are one hall and one courtyard in style. The buildings are constructed of green bricks with granite foundation courses on the sides and backs of the buildings. No. 4 is still in use as a residence and the other two buildings contain ancestor soul tablets. A detailed description and photographs of the Building can be found in the Catalogue in **Appendix 2.11.3** and the location is highlighted on the map in **Figures 2.11.4** and **2.11.4b**.

GB-5: No. 83 Fung Chi Tsuen (Lung Wah Yuen)

The building was built as a private Buddhist Nunnery in the 1930's founded by Wong Jyun-ciu. It is a **Grade 3** Historic Building. It was set up by private individuals for the nuns and their adopted daughters, but was also used as a shelter for orphans and homeless women. The building is a two storey green brick Chinese Eclectic style building with both Chinese and Western architectural features. A detailed description and photographs of the building can be found in the Catalogue in **Appendix 2.11.3** and the location is highlighted on the map in **Figures 2.11.4** and **2.11.4d**.

GB-6A: No. 39 Shing Uk Tsuen

This is the northern end unit in a row of five traditional village houses was built by Shing Lin-kwong for his five sons around 1879 and the Shing family occupied the houses until the 1960's. It is a **Grade 3** Historic Building. All of the original units in the row have been retained and all are Grade 3 Historic Buildings. It is a Qing vernacular style structure with one hall and one courtyard. It is constructed of green brick walls with a pitched tile roof supported by timber purlins. The interior consists of a pantry, living area, bedroom and cockloft with a rice polishing mill in the living room. There is also a grain drying area outside of the house. A detailed description and photographs of the building can be found in the Catalogue in **Appendix 2.11.3** and the location is highlighted on the map in **Figures 2.11.4** and **2.11.4a**.

GB-6B: No. 40 Shing Uk Tsuen

This is northern most of the middle units in the terrace row. It is a Qing vernacular style structure with one hall and one courtyard. It is a **Grade 3** Historic Building. It is constructed of green brick walls with a pitched tile roof supported by timber purlins. The interior consists of a pantry, living area, bedroom and cockloft with a rice polishing mill in the living room. There is also a grain drying area outside of the house. A detailed description and photographs of the building can be found in the Catalogue in **Appendix 2.11.3** and the location is highlighted on the map in **Figures 2.11.4** and **2.11.4a**.

GB-6C: No. 41 Shing Uk Tsuen

This unit is in the middle of the five row terrace built by Shing Lin-kwong. It is a **Grade 3** Historic Building. It is a Qing vernacular style structure with one hall and one courtyard. It is constructed of green brick walls with a pitched tile roof supported by timber purlins. The interior consists of a pantry, living area, bedroom and cockloft with a rice polishing mill in the living room. There is also a grain drying area outside of the house. A detailed description and photographs of the building can be found in the Catalogue in **Appendix 2.11.3** and the location is highlighted on the map in **Figures 2.11.4** and **2.11.4a**.

GB-6D: No. 42 Shing Uk Tsuen

This is the southernmost middle unit in the five row terrace built by Shing Lin-kwong. It is a **Grade 3** Historic Building. It is a Qing vernacular style structure with one hall and one courtyard. It is constructed of green brick walls with a pitched tile roof supported by timber purlins. The interior consists of a pantry, living area, bedroom and cockloft with a rice polishing mill in the living room. There is also a grain drying area outside of the house. A detailed description and photographs of the building can be found in the Catalogue in **Appendix 2.11.3** and the location is highlighted on the map in **Figures 2.11.4** and **2.11.4a**.

GB-6E: No. 43 Shing Uk Tsuen

This is the southern end unit in the row of five village house constructed by Shing Lin-kwong. It is a **Grade 3** Historic Building. It is a Qing vernacular style structure with one hall and one courtyard. It is constructed of green brick walls with a pitched tile roof supported by timber purlins. The interior consists of a pantry, living area, bedroom and cockloft with a rice polishing mill in the living room. There is also a grain drying area outside of the house. A detailed description and photographs of the building can be found in the Catalogue in **Appendix 2.11.3** and the location is highlighted on the map in **Figures 2.11.4** and **2.11.4a**.

GB-7: No. 40 Fuk Hing Tsuen

This is a **Grade 3** Historic Building. The building probably dates back to 1884 and it is thought to have been built by Wong Chong-yip. The house was also a venue for family gatherings, ceremonies and celebrations such as the lighting the lantern ceremony and its celebration feasts. It has been left vacant since 1992. A detailed description and photographs of the building can be found in the Catalogue in **Appendix 2.11.3** and the location is highlighted on the map in **Figures 2.11.4** and **2.11.4b**.

GB-8: No. 41 Fuk Hing Tsuen

This is a **Grade 3** Historic Building. It was built around 1900 by Li Fuk-tai as a residence. Since the death of Li Fuk-tai in the late 1950s, the house has been abandoned. A detailed description and photographs of the building can be found in the Catalogue in **Appendix 2.11.3** and the location is highlighted on the map in **Figures 2.11.4** and **2.11.4b**.

GB-9: No. 38 Fuk Hing Tsuen (Demolished Building)

This building was a **Grade 3** Historic Building before demolition. It was built by Wong Wah-fuk in 1884 as a family residence. It was left vacant since 1992.

2.11.4.4 Previous Investigations in the Study Area**Proposed Development at Fung Lok Wai, Yuen Long Lot 1457 R.P. in D.D. 123: Environmental Impact Assessment (CH2M Hill) 2007**

A CHIA was conducted as part of the EIA for the project. The villages of Tai Tseng, Ng Uk Tsuen, Shing Uk Tsuen and Tai Tseng Wai were included in the project Study Area. A BHIA was conducted as part of the project. The results of the survey were that 30 built heritage resources were identified in Shing Uk Tsuen, including domestic and residential buildings, a Tsz Tong, a shrine and the Grade 3 residential structures at No. 39 to No. 43. There were 43 recorded resources in Tai Tseng Wai, the majority again being domestic and residential structures. Additional to these the village entrance gate and Tsz Tong were also identified. 39 resources were recorded in Ng Uk Tsuen, including the Grade 2 entrance gate to the village, a Tin Hau temple, shrine, well and many domestic and residential buildings.

Agreement No. CE 13/2006 (DS) Yuen Long and Kam Tin Sewerage Stage 2 and Stage 3 Design and Construction – Environmental Study (Black & Veatch) 2008

A CHIA was conducted as part of the environmental study for the project. The six Wang Chau villages were included in the project Study Area. The BHIA for the project included a built heritage field survey which identified built heritage resources in all of the villages. The village of Tung Tau Wai had 23 resources recorded as well as a

nearby shrine and well. This village also included many domestic and residential buildings as well as the Grade 2 Yuen Yuen Mansion and the I Shing Kung, a Declared Monument. The villages of Sai Tau Wai and Chung Sam Wai each contained 5 resources, including domestic and residential structures, a village gate and shrine. The Grade 2 Historic buildings at Nos. 4 & 7A and Lot WCL132 in DD123 were included at Sai Tau Wai. Lam Uk Tsuen had six recorded resources, all domestic buildings. The village of Yeung Uk Tsuen had 23 resources recorded, again mostly domestic and residential structures, a shrine and a Tsz Tong. Finally, Fuk Hing Tsuen had twelve resources recorded including domestic buildings, a Tsz Tong and an internal village gate.

2.11.4.5 Built Heritage Resources in the Proposed PHD site

Twelve graves and one shrine have been identified in the proposed PHD site in the desk-based study and a site visit was undertaken to further study these items. Ten historic clan graves were identified. The locations of the graves are marked on **Figures 2.11.4** and **2.11.4c**. Detailed recording of the historic clan graves can be found in **Appendix 2.11.4**.

A Pak Kung Shrine (S1) and a well and shrine (W1) were also identified in the proposed site and detailed recording can be found in **Appendix 2.11.3** and their location can be seen on **Figures 2.11.4** and **2.11.4c**.

2.11.4.6 Built Heritage Resources in the Proposed YLIEE

No built heritage resources have been identified in the proposed expansion area for the industrial estate. There are graves to the west of the proposed site but the boundary of the proposed housing site and YLIEE have been designed to avoid the burial areas to the west.

2.11.4.7 Built Heritage Resources in the Other Area

The Declared Monument and Graded Historic Buildings described above are all located in this area. There are also eleven historic villages and site visits have been undertaken to gather information on nil grade built heritage resources with the following results:

Shing Uk Tsuen

The village of Shing Uk Tsuen was found to contain five Graded Historic Buildings (GB-6A, GB-6B, GB-6C, GB-6D and GB-6E (Nos. 39 through 43 Shing Uk Tsuen). As well twenty nil grade built heritage resources were identified; a A Tsz Tong (HB-1), a shrine (HB-3) two sheds (HB-2 and HB-6), one Ancestral Hall (HB-16) and fifteen village houses (HB-4, HB-5, HB-7 through HB-15 and HB-17 through HB-20). A map showing the locations of the resources in this village can be found in **Figures 2.11.4** and **2.11.4a**. Photographs of each nil grade resource can be found in **Appendix 2.11.5**.

Tai Tseng Wai

The village of Tai Tseng Wai contained 30 nil grade built heritage resources. These consisted of a shrine (HB-21), village entrance gate (HB-22), Tsz Tong (HB-31) and 27 village houses ranging from good to ruinous conditions. A map showing the locations of the resources in this village can be found in **Figures 2.11.4** and **2.11.4a**. Photographs of each nil grade resource can be found in **Appendix 2.11.5**.

Ng Uk Tsuen

This village contains the Grade Two Historic Building, the Entrance Gate of Tai Tseng Ng Uk Tsuen (GB-3). It also contains a Tin Hau Temple (HB-73), three shrines (HB-52, HB-53 and HB-72), a former village school (HB-51), a well (HB-69), a Tsz Tong (HB-68) and village houses ranging from good to ruinous condition (HB-54 through HB-68 and HB-70 and HB-71). Maps showing the locations of the resources in this village and the Tin Hau Temple can be found in **Figures 2.11.4** and **2.11.4a**. Photographs of each nil grade resource can be found in **Appendix 2.11.5**.

Fung Chi Tsuen

This village contains two Graded Historic Buildings, a Grade 1 Tin Hau Temple (GB-1), the Grade 3 Lung Wah Yuen (GB-5) and a shrine (HB-74). A map showing the locations of the resources in this village can be found in **Figures 2.11.4** and **2.11.4d**. A photograph of the shrine can be found in **Appendix 2.11.5**.

Shui Tin Tsuen

This village contains five nil grade built heritage resources, a commemorative arch (HB-75), a shrine (HB-76) and three village houses (HB-77, HB-78 and HB-79). A map showing the locations of the resources in this village can be found in **Figures 2.11.4** and **2.11.4d**. Photographs of the resources can be found in **Appendix 2.11.5**.

Fuk Hing Tsuen

The village contains two Grade 3 Historic Buildings at No. 40 Fuk Hing Tsuen (GB-7) and No. 41 Fuk Hing Tsuen (GB-8). No. 38 Fuk Hing Tsuen has been demolished and replaced by a modern structure. The village also contains the following nil grade structures; a Tsz Tong (HB-80), a gate (HB-82) a shrine (HB-90) and five village houses (HB-81, HB-83 through HB-86). A map showing the locations of the resources in this village can be found in **Figures 2.11.4** and **2.11.4b**. Photographs of each nil grade resource can be found in **Appendix 2.11.5**.

Tung Tau Wai Village

The Grade 2 Historic Building Yu Yuen (GB-2) is situated near the village as is the Declared Monument the I Shing Kung (DM-1). There are also two shrines (HB-87 and HB-89) and a well (HB-88) near the village. All of these resources can be seen on **Figures 2.11.4** and **2.11.4b**. The village also contains a Tsz Tong (HB-99), a shrine (HB-98) and seventeen village houses ranging from good condition to ruinous (HB-97 and HB-100 to HB-115). A map showing the locations of the resources in the village can be found in **Figures 2.11.4** and **2.11.4b**. Photographs of each nil grade resource can be found in **Appendix 2.11.5**.

Chung Sam Wai

The village contains six nil grade built heritage resources. The resources consist of the village entrance gate (HB-95) and ruinous structure attached to either side of the gate (HB-94 and HB-96); a shrine (HB-93), a village house (HB-92) and a Tsz Tong (HB-91). A map showing the locations of the resources in this village can be found in **Figures 2.11.4** and **2.11.4b**. Photographs of each nil grade resource can be found in **Appendix 2.11.5**.

Sai Tau Wai

The village contains the Grade 3 Historic Building at Nos. 4 & 7A and Lot WCL132 in DD123 at Sai Tau Wai (GB-4). It also contains shrines (HB-116 and HB-117), which has been confirmed nil grade as of 21 September 2012. A map showing the locations of the resources in this village can be found in **Figures 2.11.4** and **2.11.4b**. Photographs of each nil grade resource can be found in **Appendix 2.11.5**.

Lam Uk Tsuen

This village contains a shrine (HB-122) and four village houses (HB-118 to HB-121). A map showing the locations of the resources in this village can be found in **Figures 2.11.4** and **2.11.4b**. Photographs of each nil grade resource can be found in **Appendix 2.11.5**.

Yeung Uk Tsuen

The village contains sixteen built heritage resources. The resources consist of a shrine (HB-123), a Tsz Tong (HB-126) and sixteen village houses ranging from good to ruinous condition (HB-124 and HB-125 and HB-127 to HB-140). A map showing the locations of the resources in this village can be found in **Figures 2.11.4** and **2.11.4b**. Photographs of each nil grade resource can be found in **Appendix 2.11.5**.

2.11.4.8 Burial Grounds in the Proposed PHD site and Other Area

The Other Area contains burial grounds including the traditional burial ground of the Tang Clan. A small piece of land in the middle portion of the proposed PHD site also falls within the boundary of burial grounds on Kai Shan. These burial areas are highlighted in **Figure 2.11.5**. The design of the projects will ensure that no direct impacts to historical clan graves at Kai Shan occur and the graves will be preserved in-situ. Indirect impacts may occur from ground borne vibration if construction works are in close proximity.

2.12 Other Environmental Aspects

2.12.1 Air Quality

2.12.1.1 Relevant Legislation and Standards

Air Quality Objectives

The air quality impact assessment criteria shall make reference to the Hong Kong Planning Standards and Guidelines (HKPSG), the Air Pollution Control Ordinance (APCO) (Cap.311), and Annex 4 of the TM-EIAO.

The APCO (Cap.311) provides the power for controlling air pollutants from a variety of stationary and mobile sources and encompasses a number of Air Quality Objectives (AQOs). In addition to the APCO, the following overall policy objectives are laid down in Chapter 9 of the HKPSG as follows:

- Limit the contamination of the air in Hong Kong, through land use planning and through the enforcement of the APCO to safeguard the health and well-being of the community; and

- Ensure that the AQOs for seven common air pollutants are met as soon as possible.

Currently, the AQOs stipulate limits on concentrations for seven pollutants including sulphur dioxide (SO₂), Total Suspended Particulates (TSP), Respirable Suspended Particulates (RSP), Nitrogen Dioxide (NO₂), Carbon Monoxide (CO), photochemical oxidants, and Lead (Pb). The existing AQOs are listed in the table below.

Table 2.12.1 Hong Kong Air Quality Objectives (AQOs)

Pollutant	Limits on Concentration, µg/m ³ [1] (Number of Exceedance per year allowed in brackets)				
	1-hr	8-hr	24-hr	3-Month [2]	Annual [2]
Sulphur Dioxide	800 (3)		350 (1)		80 (0)
Total Suspended Particulates	500 [5]		260 (1)		80 (0)
Respirable Suspended Particulates [3]			180 (1)		55 (0)
Carbon Monoxide	30,000 (3)	10,000 (1)			
Nitrogen Dioxide	300 (3)		150 (1)		80 (0)
Photochemical Oxidants (as ozone) [4]	240 (3)				
Lead				1.5 (0)	

Notes:

[1] Measured at 298K and 101.325kPa.

[2] Arithmetic mean.

[3] Respirable suspended particulates means suspended particulates in air with a nominal aerodynamic diameter of 10 micrometres or smaller.

[4] Photochemical oxidants are determined by measurement of ozone only.

[5] Not an AQO but is a criterion for evaluating air quality impacts as stated in Annex 4 of TM-EIAO.

Air Pollution Control (Construction Dust) Regulation

The Air Pollution Control (Construction Dust) Regulation specifies processes that require special dust control. The Contractors are required to inform the EPD and adopt proper dust suppression measures while carrying out “Notifiable Works” (which requires prior notification by the regulation) and “Regulatory Works” to meet the requirements as defined under the regulation.

Odour Criterion

In accordance with Annex 4 of TM-EIAO, the limit of 5 odour units based on an averaging time of 5 seconds for odour prediction assessment should not be exceeded at any receivers.

Proposed New Air Quality Objectives

In 2007, EPD commissioned a comprehensive study to review the prevailing AQOs. The study considered various factors e.g. protection of public health and socio-economic etc., and devised a new set of AQOs and developed a long-term air quality management strategy for Hong Kong. According to the Executive Council meeting on 17 January 2012, it is understood that the proposed new AQOs shall tentatively become

effective from Year 2014. In accordance with the Project brief, the new AQOs shall be adopted in this Study. The new AQO is more stringent and will include fine suspended particulates (FSP) as new criteria pollutant. **Table 2.12.2** below summarises the proposed new AQOs.

Table 2.12.2 Hong Kong New Air Quality Objectives (new AQO)

Pollutant	Limits on Concentration, $\mu\text{g}/\text{m}^3$ [1] (Number of Exceedance in brackets)				
	10-min	1-hr	8-hr	24-hr [2]	Annual [2]
Sulphur Dioxide	500 (3)			125 (3)	
Total Suspended Particulates		500 [5]			
Respirable Suspended Particulates (PM10) [3]				100 (9)	50 (0)
Fine Suspended Particulates (PM2.5) [4]				75 (9)	35 (0)
Carbon Monoxide		30,000 (0)	10,000 (0)		
Nitrogen Dioxide		200 (18)			40 (0)
Ozone			160 (9)		
Lead					0.5 (0)

Notes:

[1] Measured at 298K and 101.325kPa.

[2] Arithmetic mean.

[3] Respirable suspended particulates means suspended particulates in air with a nominal aerodynamic diameter of 10 micrometres or smaller.

[4] Fine suspended particulates means suspended particulates in air with a nominal aerodynamic diameter of 2.5 micrometres or smaller.

[5] Not an AQO but is a criterion for evaluating air quality impacts as stated in Annex 4 of TM-EIAO.

2.12.1.2 Prevailing Ambient Air Quality Condition

Historical air quality monitoring data from the Air Quality Monitoring Station (AQMS) operated by EPD have been examined. The nearest EPD AQMS is located at Yuen Long. The air quality monitoring data monitored at Yuen Long AQMS for recent 5 years i.e. 2007 to 2011 are tabulated in **Table 2.12.3** below.

Table 2.12.3 Air quality monitoring data against prevailing and new AQO (Yuen Long Station, 2007-2011)

Pollutant	Year	Highest 1-Hour Average ($\mu\text{g}/\text{m}^3$) [1]	Highest Daily Average ($\mu\text{g}/\text{m}^3$) [1]	Annual Average ($\mu\text{g}/\text{m}^3$) [1]
SO ₂	2007	326	112	24
	2008	263	103	21
	2009	187	81	14
	2010	154	54	11
	2011	92	36	13
	5-year mean [3]	204 (26%)	77 (22%)	17 (21%)
	Prevailing AQO	800	350	80
	New AQO	N/A [2]	125	N/A [2]
NO ₂	2007	279	137	55

Pollutant	Year	Highest 1-Hour Average ($\mu\text{g}/\text{m}^3$) ^[1]	Highest Daily Average ($\mu\text{g}/\text{m}^3$) ^[1]	Annual Average ($\mu\text{g}/\text{m}^3$) ^[1]
	2008	239	133	56
	2009	215	124	52
	2010	228	160	54
	2011	257	157	54
	5-year mean ^[3]	244 (81%)	142 (95%)	54 (68%)
	Prevailing AQO	300	150	80
	New AQO	200	N/A ^[2]	40
CO	2007	3540	2975	969
	2008	3220	3034	726
	2009	2540	2181	711
	2010	2730	2318	833
	2011	3210	2610	677
	5-year mean ^[3]	3048 (10%)	2624 (26%)	783
	Prevailing AQO	30,000	10,000	N/A ^[2]
	New AQO	30,000	10,000	N/A ^[2]
TSP	2007	Not an AQO but Annex 4 of TM-EIAO specifies a criterion of 500 $\mu\text{g}/\text{m}^3$ for evaluating air quality impacts.	304	97
	2008		217	87
	2009		173	77
	2010		249	78
	2011		196	86
	5-year mean ^[3]		228 (88%)	85 (106%)
	Prevailing AQO		260	80
	New AQO		N/A ^[2]	N/A ^[2]
RSP	2007	341	207	64
	2008	261	164	60
	2009	225	186	51
	2010	602 ^[4]	361^[4]	49
	2011	222	173	54
	5-year mean ^[3]	262	183 (101%)	56 (101%)
	Prevailing AQO	N/A ^[2]	180	55
	New AQO	N/A ^[2]	100	50
FSP	2007	199	142	43
	2008	188	113	41
	2009	178	144	33
	2010	194	108	32
	2011	139	109	36
	5-year mean ^[3]	180	123	37
	Prevailing AQO	N/A ^[2]	N/A ^[2]	N/A ^[2]
	New AQO	N/A ^[2]	75	35
O ₃	2007	327	119	36
	2008	298	128	35
	2009	301	131	41

Pollutant	Year	Highest 1-Hour Average ($\mu\text{g}/\text{m}^3$) [1]	Highest Daily Average ($\mu\text{g}/\text{m}^3$) [1]	Annual Average ($\mu\text{g}/\text{m}^3$) [1]
	2010	<u>280</u>	100	34
	2011	<u>310</u>	131	39
	5-year mean [3]	<u>303 (126%)</u>	122	37
	Prevailing AQO	240	N/A [2]	N/A [2]
	New AQO	N/A [2]	160	N/A [2]

Note:

- [1] Monitoring results exceeded existing AQOs are shown as underlined characters.
 [2] N/A - Not applicable since there is no AQO for this parameter.
 [3] % of existing AQOs is provided in the bracket. The 5-year mean is the arithmetic mean of the yearly average.
 [4] The value was recorded during a dust plume that originated from northern part of China in March 2010 which was an abnormal event and hence has not been taken into account to calculate the 5 years average.

It can be seen from the above table that there was no obvious trend for the highest 1-hour NO_2 concentration, and the range is from $215\mu\text{g}/\text{m}^3$ in 2009 to $279\mu\text{g}/\text{m}^3$ in 2007, against its prevailing AQO of $300\mu\text{g}/\text{m}^3$ and new AQO of $200\mu\text{g}/\text{m}^3$. High daily NO_2 concentrations were recorded in recent 2010 and 2011, with both in excess of the respective prevailing AQO. The maximum highest daily average of NO_2 was $160\mu\text{g}/\text{m}^3$ in 2010 and the minimum was $124\mu\text{g}/\text{m}^3$ in 2009. The annual NO_2 concentrations were in the range of $52\mu\text{g}/\text{m}^3$ in 2009 to $56\mu\text{g}/\text{m}^3$ in 2008 without any exceedance of the prevailing AQO of $80\mu\text{g}/\text{m}^3$, but all exceeded the new AQO of $40\mu\text{g}/\text{m}^3$. It can also be seen that the annual NO_2 concentrations remained rather steady at $54\mu\text{g}/\text{m}^3$ in recent 2010 and 2011.

There was also no obvious trend for the daily RSP concentration. The exceptionally high maximum daily concentration of $361\mu\text{g}/\text{m}^3$ in 2010 was an abnormal event due to the dust plume that originated from northern part of China in March 2010. The maximum daily concentrations recorded in 2007 and 2009 were also high and exceeded the prevailing AQO. The annual RSP concentration showed a general decreasing trend, from $64\mu\text{g}/\text{m}^3$ in 2007 to $54\mu\text{g}/\text{m}^3$ in 2011. The minimum annual RSP of $49\mu\text{g}/\text{m}^3$ was recorded in 2010.

The daily FSP concentrations were consistently high in the past 5 years in the range of $108\mu\text{g}/\text{m}^3$ to $144\mu\text{g}/\text{m}^3$. They all exceeded the new AQO of $75\mu\text{g}/\text{m}^3$. Similar to RSP, annual FSP concentration also showed a general decreasing trend, from $43\mu\text{g}/\text{m}^3$ in 2007 to $36\mu\text{g}/\text{m}^3$ in 2011. The minimum annual FSP of $32\mu\text{g}/\text{m}^3$ was also recorded in 2010.

It can be seen from the table that although the annual TSP concentrations dropped significantly from $87\mu\text{g}/\text{m}^3$ in 2008 to $77\text{--}78\mu\text{g}/\text{m}^3$ in 2009 and 2010, it sharply rose to a high level of $86\mu\text{g}/\text{m}^3$ in 2011. The 5 year average of annual TSP concentration has already exceeded the prevailing AQO.

The maximum hourly concentration of O_3 from 2007–2011 were high in the range of $280\text{--}327\mu\text{g}/\text{m}^3$, with all in excess of the respective prevailing AQO of $240\mu\text{g}/\text{m}^3$. The highest daily average O_3 concentrations are in the range of $100\text{--}131\mu\text{g}/\text{m}^3$, and were within the new AQO of $160\mu\text{g}/\text{m}^3$.

For SO_2 , the hourly, daily and annual concentrations showed an obvious decreasing trend. The 5 years averaged pollutant levels were also relatively low, in the order of less than 30% of the prevailing AQOs. Compared to the new AQO, the daily SO_2 concentrations recorded in the past 5 year were still well complied.

Similarly, the CO concentrations were also found well within both the prevailing and new AQO. The 5 year average of the highest 1-hour and daily concentrations was only in the order of 10% and 26% of the corresponding AQOs respectively.

2.12.1.3 Future Ambient Air Quality Condition

The future ambient air quality is influenced by various sources including territory wide vehicular emission, power plants and marine emission in Hong Kong, the Hong Kong International Airport, as well as regional emission from Pearl River Delta (PRD), etc.

In 2002, the HKSAR jointly agreed regional air emission reduction targets to be achieved by 2010 with the Guangdong Provincial Government. Latest Hong Kong figures (**Table 2.12.4**), covering up to 2010, show that emissions of SO₂, NO_x, RSP and Volatile Organic Compounds (VOCs) have been reduced beyond the agreed targets. Emission reductions in 2010 for the four pollutants range from 30% to 59% when compared with emissions in 1997.

Table 2.12.4 Progress in achieving the 2010 emissions reduction targets (Extracted from EPD's website: http://www.epd.gov.hk/epd/english/environmentinhk/air/data/emission_inve.html)

Pollutant	Emission Level 1997 (tonnes)	Emission Level 2010 (tonnes)	Change in Emission Level 1997-2010	Emission Reduction Target for 2010
SO ₂	82,000	35,500	-57%	-40%
NO _x	154,000	109,000	-30%	-20%
RSP	15,500	6,340	-59%	-55%
VOC	81,700	33,700	-59%	-55%

In 2007, EPD had also commissioned a comprehensive study to review Hong Kong's AQOs and develop a long-term air quality management strategy. The study has identified a host of comprehensive emission reduction measures for improving Hong Kong's air quality, such as capping the emissions from power plants, advancing the earlier replacement of more polluting vehicles, promoting the use of more environment-friendly vehicles, further tightening the control of emissions from vessels and other sources, introducing suitable traffic management measures to reduce roadside emissions (such as low emission zones, etc), expanding rail/tram network, promoting energy efficiency. Together with the joint effort of the Guangdong Provincial Government, the regional emission is expected to be further reduced and the background air quality impacts would be much improved in the near future.

The future ambient air quality will be predicted by the Pollutants in the Atmosphere and the Transport over Hong Kong (PATH, a regional air quality prediction model developed by EPD) in this study. The assessment area involves 4 grids in the PATH, including 17_38, 17_39, 18_38 & 18_39 (**Figure 2.12.1**). The PATH emission inventory has recently been updated and model run by EPD for Year 2015, 2020 and 2030, with consideration of all committed and planned control measures in Pearl River Delta Economic Zone (PRDEZ) and HKSAR. The PATH results will be directly used for the air quality assessment in this study.

2.12.1.4 Air Sensitive Receivers

In accordance with Annex 12 of the TM-EIAO, Air Sensitive Receivers (ASRs) include domestic premises, hotel, hostel, hospital, clinic, nursery, temporary housing accommodation, school, educational institution, office, factory, shop, shopping centre,

place of public worship, library, court of law, sports stadium or performing arts centre. Any other premises or places with which, in terms of duration or number of people affected, has a similar sensitivity to the air pollutants as the afore-listed premises and places would also be considered as a sensitive receiver.

The assessment area for air quality impact should generally be defined by a distance of 500m from the boundary of the Project site. Representative ASRs within a distance of 500m from the Project site boundary have been identified. These ASRs include both the existing and planned developments. Existing ASRs are identified by means of reviewing topographic maps, aerial photos, land status plans, supplemented by site inspections. They include schools, scattered villages generally of 1 to 3-storeys, mid-high rise residential developments to south of Long Ping Station, in Long Ping Estate, Shui Pin Wai Estate and Villa by the Park, as well as industrial premises in existing YLIE. Planned/committed ASRs include the proposed PHD site and other planned sensitive developments within 500m from the Project site boundary which are identified by making reference to relevant OZP, Layout Plans, etc.

The representative ASRs are summarized in **Table 2.12.5** and their locations are shown in **Figure 2.12.2**. The air assessment points (AAPs) are also selected. The AAPs for the industrial buildings are the locations of fresh air intake (FAI). The photographs of each AAP are provided in **Appendix 2.12.1**. It should be noted that the list of ASRs and AAPs are still subject to review in next assessment stage when the proposed development option and proposed roadwork alignment are available.

Table 2.12.5 Existing and planned ASRs

ASR	Location	AAP	Uses ^[1]	No. of Storey
A1	Tai Tseng Wai	A001 – A004	R	1-3
A2	Shing Uk Tsuen	A021 – A023	R	1-3
A3	Ng Uk Tsuen	A041	R	1-3
A4	Jade Court	A061	R	1-3
A5	Vienna Villa	A081	R	1-3
A6	Carole Garden	A101	R	1-3
A7	Leon Court	A121	R	1-3
A8	Fuk Hing Garden & Fuk Hing Tsuen	A141 – A142	R	1-3
A9	Fuk Fai Garden & Meon Court	A161 – A162	R	1-3
A10	Sai Tau Wai & Lam Uk Tsuen	A181	R	1-3
A11	Yeung Uk Tsuen	A201 – A202	R	1-3
A12	Yuk Yat Garden	A221 – A222	R	1-3
A13	Tung Tau Wai	A241 – A242	R	1-3
A14	Tung Tau Industrial Area	A261 – A263	R / I	20 ^[2]
A15	Yeung Uk San Tsuen	A281 – A283	R	1-3
A16	Long Ping Estate	A301 – A305	R / E	6-34
A17	Shui Tin Tsuen	A321 – A322	R	1-3
A18	Wing Ning Tsuen & Residential Premises along Yung Yuen Road	A341 – A346	R / I	1-3
A19	Fung Chi Tsuen	A361 – A365	R	1-3
A20	Residential Premises to the south of Long Ping Station	A381 – A386	R	7-20 ^[2]
A21	Shui Pin Wai Estate	A401 – A403	R / W	3-26

ASR	Location	AAP	Uses ^[1]	No. of Storey
A22	Chun Hing San Tsuen	A421 – A424	R	1-3
A23	Villa by the Park	A441	R	1-3
A24	Pak Fa Tsuen	A461	R	1-3
A25	Shui Pin Wai Tsuen	A481	R	1-3
A26	YLIE	A501 – A515	I	1-5
A27	Project site (Planned ASRs)	N/A	N/A	N/A

Notes:

- [1] R– Residential Premises; E – Educational Institutions; H – clinic/ home for the aged; W – worship; I – Industrial Premises
 [2] No. of Storey may varies due to unknown building height for future developments

2.12.1.5 Air Pollution Sources

Construction Stage

The construction of the Project would inevitably generate dust emission that would have potential impact on neighbouring sensitive receivers. Major sources of fugitive dust include site foundation, general construction activities, material handling, transportation and removal, stockpiling, and wind erosion, etc.

Operational Stage

The key existing air pollution sources within the assessment area that may bear upon the air quality include the roads and nearby chimneys. Other emission sources outside the assessment area which would also have certain influence on the background air quality level include territory wide vehicular emission, power plants, marine emission, as well as regional emission from Pearl River Delta (PRD).

Vehicle emission from the nearby traffic and the project induced traffic is one of the major air pollution sources during the operational stage of the Project that would cause potential impacts on both the proposed PHD development and other nearby ASRs. The major roads include Long Ping Road and Fuk Hi Street.

Chimney emission is another major air pollution source during the operational stage of the Project. A site survey has been conducted to identify all existing chimneys inside the YLIE and other areas within the 500m of the Project site boundary. The locations of all identified chimneys are shown in **Figures 2.12.3** and **2.12.3a-e**. The photographs and the status of the chimneys are given in **Appendix 2.12.2**. The chimney information, including fuel consumption rate, stack height, gas exhaust velocity, exhaust temperature and the internal diameter of the stack etc has been collected from the respective operators where available. An information enquiry form has been sent to all existing tenants within the YLIE to collate the baseline business operation information including the chimney and fuel consumption data. Based on information provided by tenants, it is found that some of the chimneys are no longer used or some are being used for emergency only. There are 4 Specified Processes (SP) currently being operated inside YLIE. These include [REDACTED]

[REDACTED] In addition to the AQO criteria pollutants, toxic pollutants e.g. HCl, NH₃, Styrene and H₂S etc are also emitted which may have potential impacts on

the proposed PHD site. The chimney and emission data are extracted directly from their respective latest SP licenses. A detailed chimney emission inventory for all chimneys currently being used is compiled and given in **Appendix 2.12.3**.

It should be noted that the privacy of the individual, public and private sector organisations is protected under the Personal Data (Privacy) Ordinance (Cap. 486). The Project Proponent is under obligation to protect the privacy of the YLIE companies and have committed that the private business operation information for individual company will be treated confidentially and will not be disclosed and published to the public. The chimney information presented in this Baseline Review Report are only provided to the government departments and will not be presented in the subsequent EIA report.

2.12.1.6 Potential Odorous Sources

Based on the desktop studies and site survey, potential odorous sources within the Study Area have been identified. They are summarised in **Table 2.12.6** below and their locations are shown in **Figure 2.12.4**.

Table 2.12.6 Potential odorous sources

Potential odorous sources	Description	Nearest distance to the Project site boundary
Shan Pui River Channel next to the inflatable dam	Sources include rubbish and wastewater at the inflatable dam	~550m to YLIEE ~480m to PHD
[REDACTED]	According to SP license (based on previous version of [REDACTED]), the plant involves "Organic Chemical Works" with potential odour emission.	~590m to YLIEE ~1020m to PHD
YLSTW	Secondary treatment works with current ADWF capacity of 70,000 m ³ /day. Potential odour sources are arising from the treatment processes such as the primary sedimentation tanks, sludge treatment units and the sludge and screening handling facilities. The "Effluent Polishing Scheme" is being undertaken by DSD and the project is designed to provide an enhanced effluent quality for a design ADWF of 46,000 m ³ /day.	~830m to YLIEE ~1260m to PHD

All these sources are located at about 480m – 1260m away from the Project site. Reconnaissance surveys were conducted on three days on 14 August 2012, 15 August 2012 and 29 August 2012 to evaluate the significance of odour nuisance from the potential emission sources within the Study Area. In order to capture the reasonable worst case odour emissions from the sources, the surveys were conducted during low tide, hot periods (about 28-30°C) and low wind speed (<1m/s) of the day. At each location where the assessment was made, a general 5 minutes of the observation period was undertaken in order to perceive and evaluate the potential odour smell.

The site surveys have found that the Project site boundary and a majority of the Study Area had no odorous smell as highlighted in **Figure 2.12.4**. A few odorous smell however was perceived at or near the inflatable dam of Shan Pui River Channel and the findings are described below:

Near Shan Pui River Channel

Shan Pui River runs northeast to southeast of the YLIE and Long Ping Estate. A total of nine observation points were taken along Shan Pui River. Mild odour along this section of Wang Lok Street was perceived which might be due to sewage, rubbish and dirt found inside the channel (see observation points A and B in **Figure 2.12.4**; and photos in **Appendix 2.12.4**). The distance from observation point A to the YLIEE and PHD site is approximately 570m and 370m, respectively; and that from observation point B to the YLIEE and PHD site is approximately 620m and 590m, respectively.

Odorous smell became mild to more noticeable along Wang Lok Street between the intersection point of Fuk Hi Street and the footpath next to Tung Tau Wai San Tsuen where the inflatable dam is located. Odorous smell was found significant at the inflatable dam of Shan Pui River Channel where the accumulation of rubbish and dirt was identified (see observation point C in **Figure 2.12.4**; and photos in **Appendix 2.12.4**). The distance from observation point C to the YLIEE and PHD site however is approximately 550m and 480m, respectively.

Near Nullah along YLIE and next to Chu Wong Ling

Odorous smells was generally not found at the nullah along YLIE and next to Chu Wong Ling. There was only one mild odour smell location at the south of Chu Wong Ling and north of Tung Tau Wai San Tsuen (see observation point D in **Figure 2.12.4**; and photos in **Appendix 2.12.4**). It was found that there were a few dead fishes in the nullah and the observation was made during hot and low-tide period. The distance from observation point D to the YLIEE and PHD site is approximately 430m and 450m, respectively.

Near [REDACTED] and YLSTW

There were no trace of odour smell around the [REDACTED] and YLSTW (i.e. observation points E & F in **Figure 2.12.4**). The distance from observation point E to the YLIEE and PHD site is approximately 640m and 1200m, respectively. The distance from observation point F to the YLIEE and PHD site is approximately 830m and 1260m, respectively.

2.12.1.7 Potential Concurrent Projects

The tentative commissioning year of the Project is around 2022. The construction programme is yet to be established. All potential concurrent projects within 500m of the Project site boundary, which may have cumulative environmental impacts during its construction and operational stages have been identified and reviewed in this baseline study. They are listed in **Table 2.12.7** below and shown in **Figure 2.12.5**. The respective project proponents have been approached to obtain the latest available information in order to determine whether there are potential cumulative impacts which need to be addressed. Whereas information is not available, these concurrent projects have been made reference to the best available information such as Project Profile.

Although the proposed Housing Sites in Yuen Long South are outside the 500m of the Project boundary, the cumulative operational air quality impacts due to its induced traffic would also be considered.

Table 2.12.7 Potential concurrent projects

Key Concurrent Projects	Tentative Construction Programme
Construction of Cycle Tracks and the associated Supporting Facilities at Nam Sang Wai, Yuen Long	Mid 2011 to Mid 2015

Village Sewerage at Wang Chau, Yuen Long	Jul 2009 to Dec 2012
Housing Sites in Yuen Long South ^[1]	Late 2012 to Mid 2015 (EIA)

Note:

[1] Outside 500m of the Project site boundary, but induced traffic will be considered.

The following briefly describes the potential concurrent projects and its implications on cumulative air quality impact on the Project:

Construction of Cycle Tracks and the associated Supporting Facilities at Nam Sang Wai, Yuen Long

The project is to construct cycle track at Nam Sang Wai, Yuen Long with provision of supporting and recreation facilities. The proposed cycle tracks are 8.5 km long with minimum width 3.5m. The construction work is tentatively to be completed by mid 2015 and hence would not overlap with the development sites at Wang Chau. There will also be no air pollution sources arising from cycle track during its operational stage. Thus, cumulative air quality impacts during both construction and operational stages are not anticipated.

Village Sewerage at Wang Chau, Yuen Long

The aim of the project is to improve the water quality in Deep Bay and the sanitary environment for 9 unsewered villages at Wang Chau. The scope comprises the construction of the following:

- about 9 km of sewers for nine unsewered areas in Wang Chau of Yuen Long
- a new sewage pumping station near Tung Tau Industrial Area
- ancillary works

The construction work is tentatively to be completed by December 2012 and hence would not overlap with the development sites at Wang Chau. The proposed sewage pumping station is located near Tung Tau Industrial Area at more than 500m from the Project site and potential impacts are not anticipated. There will be no other air pollution sources from the project during its operational stage. Thus, cumulative air quality impacts during both construction and operational stages are not anticipated.

Housing Sites in Yuen Long South

The Project comprises housing sites for public and private housing developments in Yuen Long south and the associated infrastructure works. The total area of the potential development area is 200ha. The planning and engineering study, including the EIA study, is anticipated to commence in late 2012 for completion within a study period of approximately 30 months. The construction work would likely overlap with the development sites at Wang Chau. However, since the housing sites in Yuen Long south are located at some 1500m away, cumulative construction dust impacts are not anticipated. In view of the large development site which may generate significant induced traffic impacts on nearby road networks, the cumulative operational air quality impacts will be taken into account.

2.12.2 Noise

2.12.2.1 Relevant Legislation, Standards & Guidelines

The noise assessment criteria and guidelines would follow Annex 5 and 13 of the TM-EIAO. Annex 5 of the TM-EIAO lists out criteria for evaluating noise impacts and Annex 13 provides guidelines for noise assessment by describing commonly adopted approaches and methodologies for assessment of noise impacts arising from designated projects.

Construction Noise

The Noise Control Ordinance (NCO) (Cap.400) provides the statutory framework for noise control in Hong Kong. Assessment procedures and standards are set out in the respective TM promulgated under NCO. The following TMs are applicable to control of construction noise.

- TM on Noise from Percussive Piling (TM-PP);
- TM on Noise from Construction Work other than Percussive Piling (TM-GW); and
- TM on Noise from Construction Work in Designated Areas (TM-DA).

To ensure a better environment, the TM-EIAO promulgated under the EIAO has imposed more stringent criteria. For construction, there is no statutory limit on daytime construction noise under the NCO and related TMs. Nevertheless, the TM-EIAO stipulates criteria of 65-75dB(A) for daytime construction activities, as shown in **Table 2.12.8**.

Table 2.12.8 Noise standards for construction activities

Uses	Noise Standards ^[1] , L _{eq} (30mins) dB(A)
	0700 to 1900 hours on any day not being a Sunday or general holiday
All domestic premises including temporary housing accommodation	75
Hotels and hostels	75
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	70 65 (During examinations)

Note:

[1] The above standards apply to uses that rely on opened windows for ventilation.

Construction Noise during Restricted Hours

The NCO also provides statutory control on general construction works during restricted hours (i.e. 1900 to 0700 hours (of the next day) from Monday to Saturday and at any time on Sundays or public holidays). The use of Powered Mechanical Equipment (PME) for construction works during restricted hours would require a Construction Noise Permit (CNP). The TM-GW details the procedures adopted by EPD for assessing such application. The granting of a CNP is subject to conditions stated in the CNP and it may be revoked at any time for failure to comply with the permit conditions.

In addition to the general controls on the use of PME during restricted hours, the use of Specified Powered Mechanical Equipment (SPME) and the undertaking of Prescribed Construction Work (PCW) during the restricted hours in a designated area are controlled by the TM-DA. Construction plant or equipment classified as SPME under the TM-DA includes hand-held breakers, bulldozers, concrete mixer lorries, dump

trucks and poker vibrators. The PCW includes the erection or dismantling of formwork or scaffolding, hammering, handling of rubble, wooden boards, steel bars, or scaffolding material, and the disposal of rubble through plastic chutes.

The procedures that should generally be adopted by the Authority for assessing the use of SPME during restricted hours and for determining whether a CNP would be issued are provided in the TM-DA.

Maximum noise levels from construction activities during restricted hours at affected Noise Sensitive Receivers (NSRs) are controlled under the TMs and shall not exceed the specified Acceptable Noise Levels (ANLs). These ANLs are stipulated in accordance with the Area Sensitivity Ratings established for the NSRs. **Table 2.12.9** summarises the ANLs for construction works in Designated Areas, which are more stringent than those given in the TM-GW.

Table 2.12.9 Acceptable noise levels for construction during restricted hours

Time Period	ANLs for Area Sensitive Ratings, dB(A)		
	A	B	C
All weekdays during the evening (1900 to 2300 hours), and general holidays (including Sundays) during the day and evening (0700 to 2300 hours)	60 (45)	65 (50)	70 (55)
All days during the night-time (2300 to 0700 hours)	45 (30)	50 (35)	55 (40)

Note:

Figures in brackets are ANLs for SPME construction work in designated areas

Percussive Piling

Under the TM-PP, CNPs are also required for percussive piling involving the use of diesel, pneumatic and / or steam hammer. The permitted hours and other conditions for percussive piling are specified in this TM. **Table 2.12.10** lists out the acceptable percussive piling noise levels for various types of NSR.

Table 2.12.10 Acceptable noise levels for percussive piling

NSR Window Type or Means of Ventilation	ANL, dB(A)
NSR (or part of NSR) with no window or other opening	100
NSR with central air conditioning system.	90
NSR with windows or other openings but without central air conditioning system	85

Depending on the numbers and types of piling machines and the separation from NSRs, percussive piling may be restricted to 12, 5 or 3 hours per day. A further reduction of 10dB(A) shall be applied to the above ANLs for NSRs that are particularly sensitive to noise, such as hospitals, medical clinics, educational institutions and courts of law.

Operational Noise

The TM-EIAO has stipulated the noise standards for various noise sources as shown in the following **Table 2.12.11**. It should, however, be noted that the following noise criteria are only applicable to uses that rely on opened windows for ventilation.

Table 2.12.11 Noise standards for operational phase

Common Uses	Noise Standards [1]			
	Helicopter Noise L _{max} dB(A)	Road Traffic Noise L ₁₀ (1hour) dB(A)	Rail Noise [2]	Fixed Noise Sources

Common Uses	Noise Standards [1]			
	Helicopter Noise L _{max} dB(A)	Road Traffic Noise L ₁₀ (1hour) dB(A)	Rail Noise [2]	Fixed Noise Sources
All domestic premises including temporary housing accommodation	85	70	(a) The appropriate ANLs shown in Table 2 of the Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites and (b) L _{max} (2300-0700 hours) = 85dB(A)	(a) 5dB(A) below the appropriate ANLs shown in Table 2 of the Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites, or (b) the prevailing background noise levels (For quiet areas with level 5 dB(A) below the ANL)
Hotels and hostels	85	70		
Offices	90	70		
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	85	65		
Places of public worship and courts of law	85	65		
Hospitals, clinics, convalescences and homes for the aged, diagnostic rooms, wards	85	55		

Notes:

- [1] The above standards apply to uses that rely on opened windows for ventilation.
- [2] Rail noise is under the control of the NCO and shall comply with the ANLs laid down in the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites. The criteria for noise transmitted primarily through the structural elements of the building or buildings should be 10dB(A) less than the relevant acceptable noise level.

a) Fixed Noise Sources

Fixed noise source is controlled under the NCO’s TM on Noise from Places other than Domestic Premises, Public Places or Construction Sites (TM-Places). To plan for a better environment, the TM-EIAO has specified the following requirements, whichever is more stringent.

- 5 dB(A) below the appropriate ANLs in the TM-Places; or
- the prevailing background noise levels.

The ANLs for different Area Sensitive Ratings during different periods are summarised in the following **Table 2.12.12**.

Table 2.12.12 ANLs for fixed noise sources

Time Period	ANL, dB(A)			
	Area Sensitive Rating A	Area Sensitive Rating B	Area Sensitive Rating C	
Day (0700 to 1900 hours)	60	65	70	
Evening (1900 to 2300 hours)	60	65	70	
Night (2300 to 0700 hours)	50	55	60	

The Area Sensitivity Rating at the NSRs is determined in accordance with the TM-Places. The Area Sensitivity Rating depends on the type of area containing the NSR. When determining the type of area containing the NSR, reference has been made to relevant land use plans including the OZPs and information in the Statutory Planning Portal of the TPB. In accordance with TM-Places, NSR is assigned an Area Sensitivity

Rating of "C" if it is within 100m of YLIE zone, or an Area Sensitivity Rating of "B" if it is between 100m and 250m from such a zone. If YLIEE is pursued, this needs to be taken into account in determining the Area Sensitivity Ratings. In addition, Long Tin Road is considered as an Influencing Factor (IF) since the Annual Average Daily Traffic (AADT) is greater than 30,000 vehicles according to "The Annual Traffic Census 2011" by Transport Department (TD). The Area Sensitivity Rating will also take into account the degree to which the NSR is affected by this IF in accordance with TM-Places.

b) Road Traffic Noise

The criteria for assessing road traffic noise is given in the TM-EIAO and tabulated in **Table 2.12.11**. The criterion is 70dB(A) for domestic premises, hotels, hostels and offices. For educational institutes and places of worship, the criterion is 65dB(A). A more stringent criterion of 55dB(A) is stipulated for hospitals, clinics etc. It should be noted that all these criteria only apply to NSRs that rely on opened windows for ventilation.

c) Helicopter Noise

The noise criteria for helicopter noise are given in **Table 2.12.11**. All NSRs should be planned with noise level less than 85dB(A) L_{max} , except for offices for which noise level shall not exceed 90dB(A) L_{max} . Similar to the road traffic noise, all these criteria only apply to NSRs that rely on opened windows for ventilation.

d) Rail Noise

The noise criteria for assessing rail noise are given in **Table 2.12.11**. The ANLs for different Area Sensitive Ratings during different periods are described above. In addition, noise level during the period between 11:00pm and 7:00am of the following day should not exceed 85dB(A) L_{max} . Similar to road traffic noise assessment, all these criteria only apply to NSRs that rely on opened windows for ventilation.

2.12.2.2 Existing Noise Climate

The proposed PHD will be bounded by future YLIEE to the north, Tin Fook Villas, scattered village houses and some rural industrial operation and Fuk Hi Street to the east, Long Ping Estate, Shui Tin Tsuen, Fung Chi Tsuen and Long Ping Road to the south, scattered residential houses to the south-west and Kai Shan to the west as shown in **Figure 2.12.9**.

No existing or planned noise source is identified in the vicinity area to the west of the site. The current landuse within the proposed PHD site is zoned as GB and OS. Several site visits have been carried out in August to January 2013. The existing noise climate in the north of the proposed PHD is dominated by rural industrial operation in the northern and central parts of the Project site; while that in the south of the proposed PHD is dominated by road traffic from Long Ping Road, Fuk Hi Street and rail noise from West Rail Line.

The proposed YLIEE is bounded by Shing Uk Tsuen and Tai Tseng Wai to the north, YLIE to the east, proposed PHD to the south, and Kai Shan to the west. The current landuse is zoned as OS. The existing noise climate is dominated by industrial operations from YLIE, rural industrial operations within the proposed YLIEE site and its vicinity, as well as the road traffic from Fuk Hi Street.

Occasional helicopter flying over Long Ping Estate and the Project site was observed during the site surveys.

2.12.2.3 Existing Noise Sources

The assessment area for noise shall generally include all areas within 300m from the boundary of the Project site. The locations of the identified existing noise sources within 300m from the proposed PHD and YLIEE site are shown in **Figure 2.12.6** and **2.12.7** and summarised in **Table 2.12.13**.

Table 2.12.13 List of major existing noise sources

Noise Sources	Nearest Separation Distance, m ^[1]	Potential Impacts (Y/N)
Road traffic from existing roads	< 10	Y
West Rail Line	< 10	Y
Industrial operations from YLIE	~140	Y
Rural industrial operation in YLIEE and its vicinity	<10	Y (if YLIEE is not pursued)
Helicopter operations	-	Y

Notes:

[1] The nearest separation distance measured from the noise source to NSRs.

The nature and operation of these identified noise sources are described as follows:

Road traffic from existing roads

The major roads in the vicinity of the Project site are Long Tin Road, Long Ping Road and Fuk Hi Street. Amongst them, only Long Tin Road has existing AADT greater than 30,000 in Year 2011. The speed limits for all these roads are 50km/h.

West Rail Line

West Rail Line (WR) starts at Hung Hom Station and ends at Tuen Mun Station. The WR is running close to the southern end of the proposed PHD site on viaduct at about 10m above ground level.

The approved EIA Report for West Rail (i.e. “West Rail - Final Assessment Report West Kowloon to Tuen Mun Centre - Environmental Impact Assessment - Vol. 1, Technical Annexes, & Environmental Monitoring and Audit Manual” ref: EIA-149/BC) has adopted the train noise source term of L_{max} of 82.5 dB(A) at a distance of 25m and at a speed of 135km/h. **Table 2.12.14** summarizes the WR operational parameters extracted from its latest Environmental Permits (EP) and Variation of Environmental Permits (VEP).

Table 2.12.14 Operational parameters based on the latest WR EP/ VEP

Operational parameters	Latest EIA/ VEP Assumptions
Number of train cars	9 cars
Train speed	Maximum 130 km/h
Night-time Headway	Total headway of 40 per hour
Daytime Headway	Total headway of 40 per hour

However, this source term was measured at at-grade ballast track. Hence, with the fact that the WR has been operating for more than a decade, it would be essential to conduct

additional noise measurements to establish the in-situ noise source term of West Rail train units running on viaduct.

The MTRCL has been approached to collate their latest operational information such as actual noise source term of WR, speed profiles, headway (for different time periods), trackform design, and the existing and committed noise mitigation measures in the vicinity of the proposed development. Reply from MTRCL is attached in **Appendix 2.12.5a**. It should be noted that the Project Proponent is under obligation to protect the privacy of the MTRCL, and has committed that all the information should be treated confidentially and will not be disclosed and published to the public. The information presented are only provided to the government departments and will not be presented in the subsequent EIA report.

YLIE and Rural Industrial Operations in its Vicinity

The YLIE is located to the east of the Project site. There are a wide variety of industrial types including pharmaceutical, metal parts and products, green technology, dyeing and finishing, building materials, plastic resins and plastic products, food and beverages, machinery and parts, printing and publishing, other manufacturing, etc. Some of their operations are potential industrial noise sources that may affect the proposed PHD. Besides, a substation at Fuk Shun Street within YLIE is also identified. **Appendix 2.12.5** present the individual major industrial noise source identified at existing YLIE and individual fixed noise sources at Fuk Shun Street and Long Ping Estate. The sound power levels for each industrial noisy activity/source will be established in next assessment stage.

On the northern and central parts of the Project site (i.e. on the proposed YLIEE site), some rural industrial operations with different industrial activities are identified, such as fork lifting, container cranes, mobile cranes, vehicles repairing, tyre replacement, engines testing, loading/unloading etc. All these are potential fixed noise sources that may affect the PHD site if YLIEE is not pursued. As it is still unknown at this stage whether Phase 2A (i.e. with both PHD and YLIEE) or Phase 2B (i.e. with PHD only) will be undertaken, they are included in this baseline review study. **Appendix 2.12.6** present the individual major industrial noise source identified at the northern and central parts of the Project site. The sound power levels for each industrial noisy activity/source will be established in next assessment stage.

Helicopter Flyover

Helicopter flying over Wang Chau including the Project site was observed during the several site visits. As advised by Government Flying Services (GFS), the observed flights should not belong to their activities.

However, there are difficulties in identifying the details of these flights as all PLA's information are confidential. The potential noise impact of these flights has been measured on site (refer to **Section 3.12.2.5**).

2.12.2.4 Planned Noise Sources

Other than the existing noise sources within 300m of the Project site, there are planned noise sources which would give rise to potential impacts on existing and planned NSRs. They are listed in **Table 2.12.15** and their locations are shown in **Figure 2.12.7**.

Table 2.12.15 List of major planned noise sources

Noise Sources	Nearest Separation Distance, m ⁽¹⁾	Potential Impacts [Y]/[N] ⁽¹⁾
---------------	---	--

	Planned NSR	Existing NSR	Planned NSR	Existing NSR
Planned internal road and induced traffic on existing road network	< 10	< 10	Y	Y
YLIEE	< 10	< 10	Y	Y

Notes:

[1] P – Planned NSRs; E – Existing NSRs.

Planned Internal Road and Induced Traffic on Existing Road Network

Internal roads will be planned inside both the proposed PHD and YLIEE sites. In addition, induced traffic flow from the proposed development on nearby road infrastructure including Long Tin Road, Long Ping Road and Fuk Hi Street etc will also be addressed.

YLIEE

Due to the close proximity of the YLIEE to the existing and planned NSRs, industrial noise from YLIEE will need to be controlled to acceptable noise limits. As advised by HKSTP, there are 3 target industries in the proposed YLIEE: biotechnology related production; pharmaceuticals; and machinery and equipment manufacturing. Open air industrial operations with high noise level generation would impose constraints to the existing and planned NSRs. The sound power levels emitted from the new industrial buildings for YLIEE will need to be controlled.

2.12.2.5 Prevailing Noise Level

Prevailing noise levels have been measured in the vicinity of the Project site in September 2012 to January 2013 which cover both day, evening and night time periods. The selected locations cover the accessible areas within and in its immediate vicinity of the proposed PHD site and YLIEE (PNM01 to PNM11), as well as various locations within the nearby Long Ping Estate (PNM12-1 to PNM12-10). **Figure 2.12.8** shows the locations of measurement points. A summary of the results are given in the **Table 2.12.16**.

Table 2.12.16 Prevailing noise measurements

Monitoring Location ^[3]	Prevailing Noise Levels ^[1] , dB(A)		
	Day ^[2]	Evening ^[2]	Night ^[2]
PNM 01	56-59	~50	46-47
PNM 02	64-65	~60	52-54
PNM 03	67-71	64-65	57-58
PNM 04	52-54	50-57	50-51
PNM 05	71-73	62-67	57-61
PNM 06	54-56	47-51	~46
PNM 07	48-51	45-48	~44
PNM 08	54-58	52-54	~52
PNM 09	54-57	~55	~55
PNM 10	~50	-[4]	-[4]
PNM 11	~53	-[4]	-[4]
PNM 12-1	64-65	63-64	53-55
PNM 12-2	62-64	62-63	53-57
PNM 12-3	64-66	63-64	54-55

Monitoring Location ^[3]	Prevailing Noise Levels ^[1] , dB(A)		
	Day ^[2]	Evening ^[2]	Night ^[2]
PNM 12-4	62-63	~62	56-57
PNM 12-5	64-66	~62	60-61
PNM 12-6	63-66	~62	60-62
PNM 12-7	62-63	~60	56-59
PNM 12-8	61-63	~60	54-56
PNM 12-9	60-62	59-61	56-57
PNM 12-10	62-63	~62	54-57

Notes:

[1] Measurements were conducted in the following dates:

<u>Dates</u>	<u>Period</u>
24 September 2012	Day
25 September 2012	Evening + Night
03 October 2012	Day + Evening + Night
09 October 2012	Day
12 October 2012	Day
13 November 2012	Day + Evening + Night
09 January 2013	Day + Evening + Night.

[2] Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 – 0700 hours.

[3] PNM represents prevailing noise measurement locations which are indicated in **Figure 2.12.8**.

[4] Due to safety considerations, prevailing noise measurement at PNM 10 and PNM 11 during evening and night time periods was not conducted.

The measurement locations PNM01, PNM02, PNM03 and PNM05 are selected to capture the existing ambient noise levels along the southern and eastern boundaries of the proposed PHD site. As the noise climate for future NSRs of PHD site facing Fuk Hi Street and Long Ping Road are dominant by road traffic, PNM01, PNM02, PNM03 and PNM05 are considered representative of the future prevailing noise levels at these planned NSRs. Amongst them, PNM01 also represents the future prevailing noise levels for planned NSRs at southern end of PHD site facing the West Rail.

The measurement locations PNM06 and PNM07 cover the existing NSRs to the north of Project site that would be subject to potential impacts from the future planned noise sources in YLIEE. PNM06 and PNM07 are selected to capture the existing ambient noise levels in the immediate vicinity of the existing YLIE and they are representative of the prevailing noise levels at these existing NSRs facing the existing YLIE and its future extension.

Within the YLIEE where it is currently occupied by open storages, garages and various maintenance workshops etc, there are severe constraints in accessing the site for noise measurements including objection by the operators and residents, and the safety concern from feral dogs. Measurements could only be taken at PNM04, PNM10 and PNM11. The selected measurement locations are representative of the existing prevailing noise levels for the rural industrial operation condition currently at the PHD site. For PNM10 and PNM11, access was only allowed by the operators for a short period of time and due to safety concerns, noise measurements during evening and night time periods were therefore not conducted. Although noise measurements were not allowed within YLIEE, the existing land use characteristic is considered very similar to that of the northern portion of the PHD site and hence PNM04, PNM10 and PNM11 could also be used to represent the existing noise levels within YLIEE site. Measurements at PNM08 and PNM09 were also conducted to supplement the existing

noise environment between the existing YLIE and rural industrial operation within YLIEE site.

According to the tentative planning intention, the PHD site would be about 18 ha in size consisting of more than 20 number of high-rise public housing blocks of over 30 storeys, retails, schools, ball courts, car parks, other GIC facilities, bus terminus and internal access roads. By virtue of the proposed development size and characteristics, the PHD site would have similar characteristics compatible to the nearby Long Ping Estate housing development (ref. consist of 15 residential blocks). After the population intake of proposed housing development, the type of area containing the NSR within the central and western part of the PHD site would no longer be regarded as rural area or low density residential area or rural industrial operation. The future ambient noise levels would deviate from the existing conditions, which render the prevailing noise levels at all PNM01 to PNM11 not representative. To address the future conditions, prevailing noise measurements in Long Ping Estate have been conducted which would provide a good reference for the proposed PHD site (for future NSRs not influenced by Fuk Hi Street and Long Ping Road). PNM12-1 to PNM12 were selected to cover various locations inside Long Ping Estate including areas between residential blocks, schools, commercial facilities and open spaces (i.e. PNM12-1 to PNM12-3, PNM12-5, PNM12-7, PNM12-9 to PNM12-10), podium level (PNM12-8) and areas between residential blocks and estate road (PNM12-4 and PNM12-6). These measurement locations reflect the overall landuse characteristics of a general public housing estate and are therefore considered representative of the ambient noise characteristics of the future occupied PHD site.

Notwithstanding the above, further prevailing noise measurements inside the Project site will be attempted to increase the coverage of the area in next stage subject to site accessibility and safety concern.

2.12.2.6 Noise Sensitive Receivers

With reference to Annex 13 of the TM-EIAO, NSRs shall include residential uses (all domestic premises including temporary housing), institutional uses (educational institutions including kindergarten and nurseries), hospitals, medical clinics, homes for the aged, convalescent homes, places of worship, libraries, court of law, performing arts centres, auditoria and amphitheatres, country park and others.

The assessment area for noise impact should generally be defined by a distance of 300m from the boundary of the Project site. Representative NSRs within a distance of 300m from the Project site boundary have been identified with the first layer of NSRs selected for assessment. These NSRs include both the existing and planned sensitive developments during construction and operational phases. Existing NSRs are identified by means of reviewing topographic maps, aerial photos, land status plans, supplemented by site inspections. Planned/committed NSRs include the proposed PHD site and other planned sensitive developments which are identified by making reference to relevant OZP, Layout Plans, etc.

The representative NSRs are summarized in **Table 2.12.17** and their locations are shown in **Figure 2.12.9**. The noise assessment points (NAPs) are also selected in **Figure 2.12.9a - c**. The photographs of each NAP are provided in **Appendix 2.12.7**. It should be noted that the list of NSRs and NAPs are still subject to review in next assessment stage when the proposed development option and proposed roadwork alignment are available.

Table 2.12.17 Existing and planned NSRs (within 300m from Project boundary)

NSR	Location ^[3, 4]	NAP	Uses ^[1]	No. of Storey
N1	Tai Tseng Wai	R001 – R006	R	1-3
N2	Shing Uk Tsuen	R021 – R023	R	1-3
N3	Ng Uk Tsuen	R041	R	1-3
N4	Jade Court	R061	R	1-3
N5	Not used	-	-	-
N6	Not used	-	-	-
N7	Leon Court	R121	R	1-3
N8	Fuk Hing Garden & Fuk Hing Tsuen	R141 – R142	R	1-3
N9	Fuk Fai Garden & Meon Court	R161 – R162	R	1-3
N10	Sai Tau Wai & Lam Uk Tsuen	R181	R	1-3
N11	Not used	-	-	-
N12	Yuk Yat Garden	R221 – R222	R	1-3
N13	Tung Tau Wai	R241 – R242	R	1-3
N14	Not used	-	-	-
N15	Yeung Uk San Tsuen	R281 – R283	R	1-3
N16	Long Ping Estate	R301 – R313	R	18-34
N16-A	Twghs. Lo Kon Ting Memorial College		E	6
N16-B	POH. Tang Pui King Memorial College		E	6
N16-C	Yuen Long Long Ping Estate Tung Koon Primary School		E	7
N16-D	Yuen Long Long Ping Estate Wai Chow School		E	7
N16-E	AD&FD of POHL Leung Sing Tak School		E	7
N16-F	Yan Oi Tong Tin Ka Ping Care and Attention Home		H	1
N17	Shui Tin Tsuen	R321 – R322	R	1-3
N18	Wing Ning Tsuen & Residential Premises along Yung Yuen Road and Long Ping Road	R341 – R346	R	1-3
N19	Fung Chi Tsuen	R361 – R365	R	1-3
N19-A	Tin Hau Temple		W	1
N20	Residential Premises to the south of Long Ping Station	R381 – R384	R	5-23
N21	Shui Pin Wai Estate	R401 – R402	R	5-25
N22	Chun Hing San Tsuen	R421 – R425	R	1-3
N23	Villa by the Park	R441	R	26
N24	Pak Fa Tsuen	R461	R	1-3
N25	Not used	-	-	-
N26	Not used	-	-	-
N27	Proposed PHD (Planned NSR)	[2]	[2]	[2]

Notes:

- [1] R – Residential Premises, E – Educational Institutions, W – Places of Public Worship, H – Hospitals, Home for the aged
- [2] To be determined.
- [3] The assessment will only include NSRs which rely on opened windows for ventilation. The NSRs will be updated when more information is available.
- [4] NSRs within 300m from Project boundary are included.

The representative NAPs applicable to fixed plant and railway noise sources are selected and the proposed noise criteria (for with YLIEE) are summarised in **Table 2.12.18**. The proposed Area Sensitivity Ratings for the NAPs are detailed in **Appendix 2.12.8**, which has included two scenarios, with and without YLIEE, for fixed noise assessment.

The Area Sensitive Ratings are proposed in accordance with TM-Places. NAPs at N1 to N8 are located within 100m of a zone designated as “Industrial” or “Industrial Estate” on OZP and hence Area Sensitive Rating of C is assigned, while for those at N9 to N10, they are located between 100m and 250m from such zone and hence Area Sensitive Rating of B is assigned. For N27 facing the YLIEE and YLIE, the same would be applied and the Area Sensitive Ratings will be determined subject to the future layout plan.

However for N27 facing rail noise (i.e. at the southern end of the site), the Area Sensitive Ratings depend on the type of area containing the NSR in accordance with TM-Places. When determining the type of area containing the NSR, reference has been made to relevant land use plans in the area and land use characteristics change due to the proposed PHD. As mentioned in the section above, the PHD site would be about 18 ha in size consisting of more than 20 number of high-rise public housing blocks of over 30 storeys, retails, schools, ball courts, car parks, other GIC facilities, bus terminus and internal access roads. With the proposed housing development in place, the type of area containing the NSR within the PHD site would no longer be rural area or low density residential area. The proposed PHD by virtue of its size and characteristics also play a major role in determining the type of area within which the NSR would be located. For N27 facing rail noise, the Area Sensitive Rating should be “B” as the type of area is (iv) and is indirectly affected by Long Tin Road according to TM-Places.

Table 2.12.18 Existing and planned NAPs applicable to fixed plant and railway noise sources

NSR	NAP	Time Period	Area Sensitivity Rating	ANL-5, dB(A)[A]	Prevailing Noise Level, dB(A)[B] ^[2]	Criteria, dB(A) [Minimum of [A] and [B]]	Ref PNM ^[2]
Fixed Noise Sources							
N1	R004	Day	C	65	54	54	PNM06
		Evening	C	65	47	47	
		Night	C	55	46	46	
N2	R021	Day	C	65	48	48	PNM07
		Evening	C	65	45	45	
		Night	C	55	44	44	
N8	R141	Day	C	65	71	65	PNM05
		Evening	C	65	62	62	
		Night	C	55	57	55	
N8	R142	Day	C	65	71	65	PNM05
		Evening	C	65	62	62	
		Night	C	55	57	55	
N9	R161	Day	B	60	71	60	PNM05
		Evening	B	60	62	60	
		Night	B	50	57	50	

NSR	NAP	Time Period	Area Sensitivity Rating	ANL-5, dB(A)[A]	Prevailing Noise Level, dB(A)[B] [2]	Criteria, dB(A) [Minimum of [A] and [B]]	Ref PNM [2]
N9	R162	Day	B	60	71	60	PNM05
		Evening	B	60	62	60	
		Night	B	50	57	50	
N10	R181	Day	B	60	71	60	PNM05
		Evening	B	60	62	60	
		Night	B	50	57	50	
N27	[1]	Day	To be determined according to the proposed layout plan				-
		Evening					
		Night					
Railway Noise Sources							
N27	[1]	Day	B	NA	NA	65	NA
		Evening				65	
		Night				55	

Notes:

[1] To be determined.

[2] PNM reference locations for representative prevailing noise levels. The minimum prevailing noise levels are adopted.

2.12.2.7 Concurrent Project

All potential concurrent projects, which may have cumulative environmental impacts during its construction and operational stages have been identified in **Section 2.12.1.7** above. They are summarised again in **Table 2.12.19** below and shown in **Figure 2.12.5**.

Although the proposed Housing Sites in Yuen Long South are outside the 500m of the Project boundary, the cumulative operational road traffic impacts due to its induced traffic would also be considered.

Table 2.12.19 Potential concurrent projects

Key Concurrent Projects	Tentative Construction Programme
Construction of Cycle Tracks and the associated Supporting Facilities at Nam Sang Wai, Yuen Long	Mid 2011 to Mid 2015
Village Sewerage at Wang Chau, Yuen Long	Jul 2009 to Dec 2012
Housing Sites in Yuen Long South [1]	Late 2012 to Mid 2015 (EIA)

Note:

[1] Outside 500m of the Project site boundary, but induced traffic will be considered.

The general description of the potential concurrent projects shall be referred to **Section 2.12.1.7**. The following summarises its implications on cumulative noise impact on the Project:

Construction of Cycle Tracks and the associated Supporting Facilities at Nam Sang Wai, Yuen Long

The construction work of the proposed cycle track is tentatively to be completed by mid 2015 and hence would not overlap with the development sites at Wang Chau. There

will also be no noise sources from cycle track during its operational stage. Thus, cumulative noise impacts during both construction and operational stages are not anticipated.

Village Sewerage at Wang Chau, Yuen Long

The construction work is tentatively to be completed by December 2012 and hence would not overlap with the development sites at Wang Chau. A new sewage pumping station is planned near Tung Tau Industrial Area. However, since it is located at >500m away from the Project site, cumulative fixed noise impacts during operational stages are not anticipated.

Housing Sites in Yuen Long South

The planning and engineering study, including the EIA study, is anticipated to commence in late 2012 for completion within a study period of approximately 30 months. The construction work would likely overlap with the development sites at Wang Chau. However, since the housing sites in Yuen Long south are located at some 1500m away, cumulative construction noise impacts are not anticipated. In view of the large development site which may generate significant induced traffic impacts on nearby road networks, the cumulative operational road traffic impacts will be taken into account.

2.12.3 Water Quality

2.12.3.1 Legislation, Standards and Criteria

The relevant legislations, standards and guidelines applicable to the present study for the assessment of water quality impacts include:

- Water Pollution Control Ordinance (WPCO) CAP 358;
- Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems Inland and Coastal Waters (TM-DSS);
- EIAO (CAP. 499) and TM-EIAO;
- No Net Increase in Pollution Loads Requirement to Deep Bay;
- Hong Kong Planning Standards and Guidelines; and
- ProPECC PN 1/94 “Construction Site Drainage”.

Water Pollution Control Ordinance, CAP 358

The entire Hong Kong waters are divided into ten Water Control Zones (WCZs) and four supplementary WCZs under the WPCO (CAP 358). Each WCZ has a designated set of statutory Water Quality Objectives (WQOs) designed to protect the inland and/or marine environment and its users. Wang Chau is located in the Deep Bay WCZ and the corresponding WQOs are summarised in **Table 2.12.20**.

Table 2.12.20 Water quality objectives for Deep Bay Water Control Zones

Parameters	Objectives	Sub-Zone
Offensive Odour, Tints	Not to be present	Whole zone
Visible foam, oil	Not to be present	Whole zone

Parameters	Objectives	Sub-Zone
scum, litter		
Dissolved Oxygen (DO) within 2 m of the seabed	Not less than 2.0mg/L for 90% of samples	Outer Marine Subzone except Mariculture Subzone
DO within 1 m below surface	Not less than 4.0mg/L for 90% of samples	Inner Marine Subzone except Mariculture Subzone
	Not less than 5.0mg/L for 90% of samples	Mariculture Subzone
Depth-averaged DO	Not less than 4.0mg/L for 90% of samples	Outer Marine Subzone except Mariculture Subzone
	Not less than 4.0mg/L	Yuen Long & Kam Tin (Upper and Lower) Subzones, Beas Subzone, Indus Subzone, Ganges Subzone, Water Gathering Ground Subzones and other inland waters of the Zone
5-Day Biochemical Oxygen Demand (BOD ₅)	Not to exceed 3mg/L	Yuen Long & Kam Tin (Upper) Subzone, Beas Subzone, Indus Subzone, Ganges Subzone and Water Gathering Ground Subzones
	Not to exceed 5mg/L	Yuen Long & Kam Tin (Lower) Subzone and other inland waters
Chemical Oxygen Demand (COD)	Not to exceed 15mg/L	Yuen Long & Kam Tin (Upper) Subzone, Beas Subzone, Indus Subzone, Ganges Subzone and Water Gathering Ground
	Not to exceed 30mg/L	Yuen Long & Kam Tin (Lower) Subzone and other inland waters
pH	To be in the range of 6.5 – 8.5, change due to waste discharges not to exceed 0.2	Marine waters except Yung Long Bathing Beach Subzone
	To be in the range of 6.5 – 8.5	Yuen Long & Kam Tin (Upper and Lower) Subzones, Beas Subzone, Indus Subzone, Ganges Subzone and Water Gathering Ground Subzones
	To be in the range of 6.0 – 9.0	Other inland waters
	To be in the range of 6.0 – 9.0 for 95% samples, change due to waste discharges not to exceed 0.5	Yung Long Bathing Beach Subzone
Salinity	Change due to waste discharges not to exceed 10% of ambient	Whole zone
Temperature	Change due to waste discharges not to exceed 2°C	Whole zone
Suspended solids (SS)	Not to raise the ambient level by 30% caused by waste discharges and shall not affect aquatic communities	Marine waters
	Not to cause the annual median to exceed 20mg/L	Yuen Long & Kam Tin (Upper and Lower) Subzones, Beas Subzone, Ganges Subzone, Indus Subzone, Water Gathering Ground Subzones and other inland waters
Unionized Ammonia (UIA)	Annual mean not to exceed 0.021mg/L as unionized form	Whole zone
Nutrients	Shall not cause excessive algal growth	Marine waters
Total Inorganic Nitrogen (TIN)	Annual mean depth-averaged inorganic nitrogen not to exceed 0.7mg/L	Inner Marine Subzone
	Annual mean depth-averaged inorganic	Outer Marine Subzone

Parameters	Objectives	Sub-Zone
	nitrogen not to exceed 0.5mg/L	
Bacteria	Not to exceed 610per 100ml, calculated as the geometric mean of all samples collected in one calendar year	Secondary Contact Recreation Subzones and Mariculture Subzones
	Should be zero per 100 ml, calculated as the running median of the most recent 5 consecutive samples taken between 7 and 21 days.	Yuen Long & Kam Tin (Upper) Subzone, Beas Subzone, Indus Subzone, Ganges Subzone and Water Gathering Ground Subzones
	Not to exceed 180per 100ml, calculated as the geometric mean of the collected from March to October inclusive in one calendar year. Samples should be taken at least 3 times in a calendar month at intervals of between 3 and 14days.	Yung Long Bathing Beach Subzone
	Not to exceed 1000 per 100ml, calculated as the running median of the most recent 5 consecutive samples taken at intervals of between 7 and 21days	Yuen Long & Kam Tin (Lower) Subzone and other inland waters
Colour	Not to exceed 30 Hazen units	Yuen Long & Kam Tin (Upper) Subzone, Beas Subzone, Indus Subzone, Ganges Subzone and Water Gathering Ground Subzones
	Not to exceed 50 Hazen units	Yuen Long & KamTin (Lower) Subzone and other inland waters
Turbidity	Shall not reduce light transmission substantially from the normal level	Yuen Long Bathing Beach Subzone
Phenol	Quantities shall not sufficient to produce a specific odour or more than 0.05mg/L as C ₆ H ₅ OH	Yuen Long Bathing Beach Subzone
Toxins	Should not cause a risk to any beneficial uses of the aquatic environment	Whole Zone
	Should not attain such levels as to produce toxic carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole Zone

Technical Memorandum for Effluents Discharge into Drainage and Sewerage Systems, Inland & Coastal Waters (TM-DSS)

Apart from the WQOs, Section 21 of the WPCO also specifies the limits to control the physical, chemical and microbial parameters for effluent discharges into drainage and sewerage system at both inland and coastal waters under the Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS). The discharge limits vary with the effluent flow rates. Sewerage from Wang Chau should comply with the standards for effluent discharged into inland water. Group B inland water standard in TM-DSS is adopted and the effluent discharge standards are presented in **Table 2.12.21**.

Table 2.12.21 Standards for effluents discharged into Group B Inland Waters

Parameter	Flowrate (m ³ /day)							
	≤ 200	> 200 and ≤400	> 400 and ≤ 600	> 600 and ≤ 800	> 800 and ≤ 1000	> 1000 and ≤ 1500	> 1500 and ≤ 2000	> 2000 and ≤ 3000

Parameter	Flowrate (m ³ /day)							
	≤ 200	> 200 and ≤400	> 400 and ≤ 600	> 600 and ≤ 800	> 800 and ≤ 1000	> 1000 and ≤ 1500	> 1500 and ≤ 2000	> 2000 and ≤ 3000
pH (pH units)	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
Temperature (°C)	30	30	30	30	30	30	30	30
Colour (lovibond units) (25mm cell length)	1	1	1	1	1	1	1	1
Suspended solids	30	30	30	30	30	30	30	30
BOD	20	20	20	20	20	20	20	20
COD	80	80	80	80	80	80	80	80
Oil & Grease	10	10	10	10	10	10	10	10
Iron	10	8	7	5	4	3	2	1
Boron	5	4	3	2.5	2	1.5	1	0.5
Barium	5	4	3	2.5	2	1.5	1	0.5
Mercury	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Selenium	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
Other toxic metals individually	0.5	0.5	0.2	0.2	0.2	0.1	0.1	0.1
Total Toxic metals	2	1.5	1	0.5	0.5	0.2	0.2	0.2
Cyanide	0.1	0.1	0.1	0.08	0.08	0.05	0.05	0.03
Phenols	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sulphide	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Fluoride	10	10	8	8	8	5	5	3
Sulphate	800	800	600	600	600	400	400	400
Chloride	1000	1000	800	800	800	600	600	400
Total phosphorus	10	10	10	8	8	8	5	5
Ammonia nitrogen	5	5	5	5	5	5	5	5
Nitrate + nitrite nitrogen	30	30	30	20	20	20	10	10
Surfactants (total)	5	5	5	5	5	5	5	5
<i>E. coli</i> (cfu/100ml)	100	100	100	100	100	100	100	100

Notes:

[1] All units in mg/L unless otherwise stated

EIAO (Cap. 499) and TM-EIAO

The general criteria and guidelines for evaluating and assessing water quality impacts are listed in Annexes 6 and 14 of the TM-EIAO.

No Net Increase in Pollution Loads Requirement in Deep Bay

In addition to the provisions of the TM, the 'No Net Increase in Pollution Loads Requirement' aims to provide protection to the inland and marine water quality of the Deep Bay WCZ. The pollutions entering into Deep Bay have exceeded the assimilative

capacity of the water body. To increase pollution loads to the water body is environmentally undesirable. In accordance with TPB Guideline No.12B, the pollution loads of concern should be offset by equivalent reduction of current loads for new discharge into Deep Bay. The policy ensures that developments within the Deep Bay catchment areas do not result in an increase in pollution loads to the inland and marine waters.

Hong Kong Planning Standards and Guidelines

Chapter 9 of the HKPSG outlines environmental requirements that need to be considered in land use planning. The recommended guidelines, standards and guidance cover the selection of suitable locations for the developments and sensitive uses, provision of environmental facilities, and design, layout, phasing and operational controls to minimise adverse environmental impacts. It also lists out environmental factors influencing land use planning and recommend buffer distances for land uses.

ProPECC PN 1/94 “Construction Site Drainage”

The Practice Note for Professional Persons (ProPECC Note PN1/94) on Construction Site Drainage provides guidelines for the handling and disposal of construction discharges. It is applicable to this study for control of site runoff and wastewater generated during the construction phase. The types of discharges from construction sites outlined in the ProPECC Note PN1/94 include:

- a) Surface runoff;
- b) Groundwater;
- c) Boring and drilling water;
- d) Wastewater from concrete batching;
- e) Wheel washing water;
- f) Bentonite slurries;
- g) Water for testing and sterilization of water retaining structures and water pipes;
- h) Wastewater from building construction and site facilities; and
- i) Acid cleaning, etching and pickling wastewater.

2.12.3.2 Baseline Condition

The project falls within the Deep Bay Water Control Zone (WCZ) according to the WPCO. It is located at upstream of Shan Pui River and downstream of Yuen Long Creek. Several small streams/seasonal streams and a service reservoir were identified at Kai Shan upstream of the project and/or within the project area. Downstream of the project is a drainage channel along the edge of Tai Tseng Wai and the ultimate discharge of this drainage channel is downstream of Shan Pui River and Inner Deep Bay.

There is no existing EPD water quality monitoring station located at the abovementioned streams and nullah. The closest water quality monitoring station would be Yuen Long Creek (YL3 and YL4) which represents the water quality of downstream water bodies. **Table 2.12.22** summarises the water quality monitoring data for Yuen Long Creek (YL3 and YL4) below:

Table 2.12.22 Water quality at Yuen Long Creek (YL3 & YL4) for Year 2010

	YL3	YL4
Dissolved Oxygen, mg/L	3.8 (2.7 - 7.3)	3.2 (2.2 - 8.0)
pH	7.5 (7.1 - 7.8)	7.3 (7.0 - 7.6)
Suspended solids, mg/L	22 (7 - 83)	63 (26 - 94)
5-day Biochemical Oxygen Demand, mg/L	34 (18 - 67)	122 (71 - 240)
Chemical Oxygen Demand, mg/L	33 (15 - 75)	71 (38 - 180)
Oil & grease, mg/L	2.2 (<0.5 - 12.0)	5.1 (1.5 - 33.0)
<i>Faecal coliforms</i> , cfu/100mL	1,600,000 (820,000 - 4,800,000)	4,600,000 (1,200,000 - 12,000,000)
<i>E. coli</i> , cfu/100mL	630,000 (300,000 - 1,300,000)	2,100,000 (770,000 - 5,300,000)
Ammonia-nitrogen, mg/L	8.30 (5.10 - 26.00)	7.20 (3.20 - 13.00)
Nitrate-nitrogen, mg/L	<0.01 (<0.01 - 0.69)	<0.01 (<0.01 - 0.62)
Total Kjeldahl Nitrogen, mg/L	10.15 (7.10 - 28.00)	12.50 (6.10 - 18.00)
Ortho-phosphate, mg/L	0.78 (0.62 - 2.00)	0.88 (0.10 - 1.60)
Total phosphorus, mg/L	1.20 (0.96 - 2.70)	1.55 (0.69 - 2.50)
Total sulphide, mg/L	0.06 (0.03 - 0.10)	0.11 (0.05 - 0.25)
Aluminium, µg/L	165 (120 - 500)	225 (130 - 710)
Cadmium, µg/L	<0.1 (<0.1 - 0.4)	0.1 (<0.1 - 0.2)
Chromium, µg/L	<1 (<1 - 3)	<1 (<1 - 2)
Copper, µg/L	8 (5 - 29)	8 (4 - 12)
Lead, µg/L	6 (3 - 110)	3 (1 - 16)
Zinc, µg/L	50 (30 - 240)	65 (40 - 150)
Flow, L/s	296 (210 - 875)	146 (71 - 549)

Note:

[1] Figures in the table are mean values and the ranges are given in bracket.

According to EPD's River Monitoring Report, Yuen Long Creek's overall compliance rate in 2010 was 47% compared with 43% in 2009. The rates for the two upstream stations (YL1 and YL2) stations were 60% and 65% this year compared with 40% and 62% in 2009 respectively. The rates for the stations in the middle of Yuen Long township (YL3 and YL4) were 30% and 27% in 2010 compared with 40% and 35% in 2009 respectively. The river was still subject to discharges from remaining livestock farms, unsewered village houses and industrial establishments.

2.12.3.3 Water Quality Sensitive Receivers

The identified water quality sensitive receivers in the Study Area that may potentially be affected by the Project (**Figure 2.12.10**) include the following:

- Streams / seasonal streams upstream of the Project and/or within the project area
- Drainage channel along the edge of Tai Tseng Wai and Chu Wong Ling
- Yuen Long Creek and Shan Pui River

2.12.3.4 Water Pollution Sources

Potential water pollution source during construction phase would include construction site runoff and sewage from workforce. Construction site runoff would come from all the works sites during site formation. The surface runoff might be polluted by:

- Runoff and erosion from site surfaces, earth working areas and stockpiles;
- Wash water from dust suppression sprays and wheel washing facilities; and
- Fuel, oil, solvents and lubricants from maintenance of construction machinery and equipment.

Sewage effluents will arise from the sanitary facilities provided for the on-site construction workforce. The characteristics of sewage would include high levels of BOD₅, Ammonia and *E. coli* counts. Portable chemical toilets and sewage holding tank are recommended to be provided.

Potential water pollution source during operational phase would include sewage discharge and road runoff. A conformal design standard to satisfy the WQO and the “No net increase in pollution load” policy for Deep Bay shall apply. Substances such as dust and lubricant oil deposited and accumulated on the road surfaces will be washed into the drainage system, fish ponds or streams during rainfall.

2.12.4 Land Contamination

2.12.4.1 Legislation and Standards

Legislation and non-statutory guidance for carrying out land contamination assessment are as follows:

- Annex 19 of the TM-EIAO, Guidelines for Assessment of Impact On Sites of Cultural Heritage and Other Impacts (Section 3: Potential Contaminated Land Issues), EPD, 1997;
- Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management, EPD, 2007.
- Guidance Notes for Contaminated Land Assessment and Remediation, EPD, 2007; and
- Practice Guide for Investigation and Remediation of Contaminated Land, EPD, 2011.

2.12.4.2 The Project Site

The land contamination assessment will focus on the Project Site (see **Figure 2.12.11**) where there are actual proposed developments. The Assessment Area comprises of a 34.4 ha site shared tentatively with the northerly portion, around 16 hectares in size, to be allocated for the YLIEE, while the remaining 18.4 hectares in the south would be developed for public housing use.

2.12.4.3 Historical and Existing Land Use Environment

In order to identify any past land uses which may have the potential for causing land contamination, the development history of the Project site has been reviewed with the aid of selected historical aerial photos between 1963 and 2011. The aerial photographs are shown in **Appendix 2.12.9** and the findings are summarised as below:

1963

The Project site almost entirely consisted of agricultural land and rural residential areas. The agricultural land was concentrated in the north of the Project site whilst the rural residential areas were concentrated in the south.

1973

The Project site still consisted of agricultural land and rural residential area in 1973. However, the area of agricultural land had been significantly reduced.

1982

A large portion of the agricultural land within the Project site had been further significantly reduced since 1973 whilst the rural residential areas in the south of the Project site had expanded. Construction of Fuk Hi Street and the neighbouring YLIE has commenced.

1993

The construction of Fuk Hi Street was completed and the YLIE was partially occupied. Long Ping Road was also in operation. The northern section of the Project site consisted of agricultural land and few fish ponds. Industrial activities could be observed within the Project site where there were several areas consisting of containers and temporary structures.

2000

The Project site showed significant changes since 1993. The southern section of the Project site remained as rural residential whilst a small portion of agricultural land was observed in the northern section of the Project site. The vast majority of the Project site comprised of industrial activities where temporary structures, heavy vehicles and containers could be observed.

2011

No significant changes in the landuse of the Project site were observed since the year 2000. The area still comprised mainly of industrial activities with small areas of agricultural land and rural residential areas also evident.

2.12.4.4 Site Geology

The superficial geology of the Project site is expected to comprise terraced alluvium and debris flow deposits. A thin layer of fill may overly these deposits in some areas of the site, depending on the current land use.

The solid geology of the Project site is expected to be complex due to the presence of major regional structural features, foliated meta-sandstones and siltstones, phyllites and schists, and underlying marble subcrop in this area.

The Project site falls within Scheduled Area No. 2, recognised as an area of complex geology where karst features such as an uneven upper surface and dissolution cavities are known to occur within the marble. The site is also located within the influence zone of the northeast-trending Lo Wu-Tuen Mun fold belt which is cut by northeast-trending faults including Lau Fau Shan Fault, Yuen Tau Shan Fault, Ma Tso Lung Fault as well as San Tin Fault. The San Tin Fault is a major structural thrust fault that influences the whole area giving rise to a strongly developed foliation and structure within the bedrock.

2.12.4.5 Site Survey

Site surveys were conducted in August 2012 to ground truth the findings of desktop study and to identify any other land uses within the Project site which may have potential to cause soil and groundwater contamination. Photo shooting was taken at some of the industrial sites despite detailed site appraisal was refused at all industrial sites. Peripheral inspection (i.e. conducted from the entrance and / or boundary of the sites) was conducted around the sites instead. In addition, supplementary site surveys were also undertaken from the rooftop of buildings in Long Ping Estate and YLIE, and the hillsides surrounding the Project site, giving a bird's eye view of the operation.

It was observed that the Project site in Wang Chau mainly consisted of industrial activities such as vehicle/repair maintenance facilities, container storage areas, waste recycling workshops and open storage areas. Many of the sites observed were unpaved and oil stains were evident. Residential and agricultural land uses were also present within the Project site.

By demarcation of the current occupancies, a total of 98 sites with various industrial activities and extents were identified from observations during site surveys. The locations of the identified sites within the Project site are shown in **Figure 2.12.12**. The photo records of the identified sites are given in **Appendix 2.12.10**. The observations at each site are summarized in **Table 2.12.23**.

Table 2.12.23 Summary of surveyed sites in the Project site

Site ID	Locations	Current Occupants (Company Name)	Approximate Area (m ²)	Observations/ Remarks
WC-01	Northern	██████████	██████	A waste recycling yard of packaged waste electronic, paper, and plastic. The site contained several containers, temporary structures and a few forklifts. The area was partially paved with cracks.
WC-02	Northern	██████████	██████	A waste recycling yard of waste electronic and plastic. The site contained temporary structures and a few forklifts. The area was partially paved.
WC-03	Northern	██████████	██████	A waste recycling yard of pressed scrap metal and open storage area for generators. Several temporary

Site ID	Locations	Current Occupants (Company Name)	Approximate Area (m ²)	Observations/ Remarks
				structures and containers were observed within the site. A shelter was under construction during site visit. The area was partially paved.
WC-04	Northern	[REDACTED]	[REDACTED]	An open storage area with containers present within the site. Heavy vehicles were observed to be parked within the site. Wood scrap and garbage were observed to be collected in the centre of the site. Storage of packaged good were observed under the shelter. The area was unpaved with heavy oil stain.
WC-05	Northern	[REDACTED]	[REDACTED]	An open carpark with several heavy vehicles observed within the site. The site stored a few containers and trailers. The area was unpaved with oil stain.
WC-06	Northern	[REDACTED]	[REDACTED]	An open storage area for motorcycles with one temporary structure and several containers observed within the site. The area was unpaved.
WC-07	Northern	[REDACTED]	[REDACTED]	A storage area consisted of one large temporary structure with several containers, including cold storage containers, located outside of the temporary structure. A few oil drums and forklifts were observed inside the temporary structure. The area was partially paved.
WC-08	Northwestern	[REDACTED]	[REDACTED]	A maintenance workshop under the main temporary structure with many heavy construction machinery parked within the site. Oil drums, compressed gas, and metal welding tools were observed within the site. The area was unpaved with heavy oil stain.
WC-09	Northwestern	[REDACTED]	[REDACTED]	A maintenance workshop for trailers observed under the shelter. The area was unpaved. Oil drums and oil stains were observed throughout the site.
WC-10	Northern	[REDACTED]	[REDACTED]	An open storage area for containers, including cold storage containers. Heavy machinery and forklifts were found operational in the site. The area was unpaved with heavy oil stain.
WC-11	Northern	[REDACTED]	[REDACTED]	An open storage area for trailers and a container office of a logistic company. The area was paved.
WC-12	Northern	[REDACTED]	[REDACTED]	An open carpark for trailers and storage area for containers. A number of temporary structures and a shelter were observed within the site. The area was partially paved. A few used oil drum and some oil stain were observed near the site entrance.
WC-13	Northwestern	[REDACTED]	[REDACTED]	A recycling computer hardware storage area consisted of a number of packed computer hardware waste, shelters and temporary structures. The area was paved.
WC-14	Northwestern	[REDACTED]	[REDACTED]	An open carpark of heavy machinery and trailers. A workshop was observed in the southwestern corner of the site. Stacks of wooden pallets were found in the site with oil stain. The area was unpaved.
WC-15	Northwestern	[REDACTED]	[REDACTED]	A petrol filling station consisted of two petroleum tankers and several containers. A maintenance workshop was observed within the site. The area was partially paved

Site ID	Locations	Current Occupants (Company Name)	Approximate Area (m ²)	Observations/ Remarks
				with heavy oil stain.
WC-16	Northwestern	[REDACTED]	[REDACTED]	An repair/maintenance workshop for heavy machinery. Oil drums and lubricant containers were observed in the site. The area was unpaved with heavy oil stain.
WC-17	Northwestern	[REDACTED]	[REDACTED]	A maintenance & painting workshop under a shelter. Used oil drums, paint cans and compressed gas canisters were observed in the site. The area was partially paved with oil stain.
WC-18	Northwestern	[REDACTED]	[REDACTED]	A repair / maintenance workshop for heavy vehicles. Oil drums, used oil filters, used car parts, scrap metal, burnt paint cans were observed within the site. The area was partially paved with oil stain.
WC-19	Northern	[REDACTED]	[REDACTED]	A suspected waste recycling workshop and warehouse containing trays of waste electronics and metals.
WC-20	Northern	[REDACTED]	[REDACTED]	An open storage area for containers and cold storage containers. A generator set and heavy vehicles were observed within the site. The area was partially paved with oil stain.
WC-21	Northern	[REDACTED]	[REDACTED]	An open storage area for containers. Packaged goods and oil drums were observed under the shelter. An oil tank was also observed at the entrance of site. The area was unpaved with heavy oil stain.
WC-22	Northern	[REDACTED]	[REDACTED]	A warehouse and an open storage area for containers and trailers. Stacks of wooden pallets were observed within the site. The area was partially paved.
WC-23	Northern	[REDACTED]	[REDACTED]	A storage warehouse and an open carpark. Packaged metal cans were observed in the warehouse. The area was unpaved with oil stain.
WC-24	Northern	[REDACTED]	[REDACTED]	A repair / maintenance workshop for light vehicles. Oil drums, used oil cans, used oil filters were observed within the site. The area was partially paved with oil stain.
WC-25	Northern	[REDACTED]	[REDACTED]	An open storage area for metal scraps and construction tools. The area was partially paved.
WC-26	Northern	[REDACTED]	[REDACTED]	An open storage area for construction tools. Oil drums were observed within the site. The area was unpaved.
WC-27	Northern	[REDACTED]	[REDACTED]	An open carpark and repair / maintenance workshop for heavy machinery. Oil drums, lubricant containers, compressed gas canister, metal scraps and construction tools were observed in the site. The area was unpaved with oil stain.
WC-28	Northern	[REDACTED]	[REDACTED]	An open carpark for trailers. Stacks of wooden pallets were observed within the site. The area was unpaved with oil stain.
WC-29	Northern	[REDACTED]	[REDACTED]	A maintenance / painting workshop for trailers. Oil drums, lubricant containers, and compressed gas canisters were observed within the site. The area was paved with cracks and heavy oil stain.

Site ID	Locations	Current Occupants (Company Name)	Approximate Area (m ²)	Observations/ Remarks
WC-30	Northern	[REDACTED]	[REDACTED]	A repair/maintenance workshop for heavy vehicles. Oil drums, lubricant containers and used tyres were observed within the site. The area was partially paved with oil stain.
WC-31	Northern	[REDACTED]	[REDACTED]	A painting workshop / body shop for light vehicles. Oil drums and paint cans were observed within the site. The area was paved with oil stain.
WC-32	Northern	[REDACTED]	[REDACTED]	A maintenance / painting workshop for heavy vehicles. Oil drums, lubricant containers and used tyres were observed within the site. The area was paved with cracks and oil stain.
WC-33	Northern	[REDACTED]	[REDACTED]	An open storage area for waste electronics/metal scraps and an open carpark for trailers and forklifts. The area was unpaved.
WC-34	Western	[REDACTED]	[REDACTED]	A maintenance workshop for heavy construction machineries (cranes). The area was partially paved.
WC-35	Western	[REDACTED]	[REDACTED]	An open carpark for trailers. General refuse and used tyres were observed within the site. The area was unpaved.
WC-36	Western	[REDACTED]	[REDACTED]	A maintenance workshop for heavy vehicles. Oil drums and used tyres were observed within the site. The area was unpaved with heavy oil stain.
WC-37	Western	[REDACTED]	[REDACTED]	A general area for open storage and parking. A few containers and stacks of wooden and plastic pallets were observed within the site. The area was unpaved.
WC-38	Western	[REDACTED]	[REDACTED]	An open storage area for packaged goods and wooden / metal scraps. The area was paved with cracks.
WC-39	Centre	[REDACTED]	[REDACTED]	A waste recycling yard for waste electronics and scrap metal. A shelter and a few forklift were observed within the site.
WC-40	Centre	[REDACTED]	[REDACTED]	The majority of the site consisted of a large open carpark containing containers and a large number of heavy vehicles including oil tankers, garbage trucks and trailers. A metal workshop (near the northeast corner), a LPG refilling station (near the centre) and a car maintenance workshop (adjacent to the eastern boundary) were present within the site. LPG tanks, oil drums and a large number of LPG canisters were observed near the LPG refilling station. Oil drums were observed near the car maintenance workshop. The area was unpaved with oil stain.
WC-41	Eastern	[REDACTED]	[REDACTED]	A maintenance workshop for heavy vehicles. The area was unpaved with oil stain.
WC-42	Eastern	[REDACTED]	[REDACTED]	A repair / maintenance workshop and waste metal recycling yard. A few forklifts and pressed scrap metal were observed within the site. The area was paved with oil stain.

Site ID	Locations	Current Occupants (Company Name)	Approximate Area (m ²)	Observations/ Remarks
WC-43	Eastern	[REDACTED]	[REDACTED]	An open carpark and repair / maintenance workshop for trailers. Used tyres and compressed gas canisters were found within the site. The area was partially paved with oil stain.
WC-44	Eastern	[REDACTED]	[REDACTED]	A maintenance / painting workshop for light vehicles. The area was partially paved with cracks and oil stain.
WC-45	Eastern	[REDACTED]	[REDACTED]	A repair workshop for light vehicles with painting and metal welding activities. The area was paved with cracks and oil stain.
WC-46	Western	[REDACTED]	[REDACTED]	A waste recycling yard with waste metal, wood scrap and C&D wastes. Construction materials and a forklift were observed in the temporary structure. The area was partially paved.
WC-47	Western	[REDACTED]	[REDACTED]	An open storage area for motorcycles. Used tyres, wooden scrap, and C&D waste were observed within the site. The area was partially paved.
WC-48	Western	[REDACTED]	[REDACTED]	An abandoned workshop. Used paint cans, scrap metal, and rusted car parts were observed within the site. The area was paved with cracks.
WC-49	Western	[REDACTED]	[REDACTED]	An open carpark for heavy vehicles and construction equipment. Used oil drums were observed within the site. The area was paved with cracks.
WC-50	Center	[REDACTED]	[REDACTED]	An open carpark for trailers and heavy vehicles. A maintenance workshop was located in the southeast corner. Containers, oil drums, and used car parts were observed within the site. The area was partially paved with cracks.
WC-51	Centre	[REDACTED]	[REDACTED]	An open petrol filling station with two petroleum tankers. The area was unpaved with heavy oil stain.
WC-52	Centre	[REDACTED]	[REDACTED]	An open carpark for heavy vehicles including trucks and trailers. A shelter and a carwash station were observed within the site. The area was unpaved with oil stain.
WC-53	Centre	[REDACTED]	[REDACTED]	An open storage area for LPG canisters and vehicles loaded with LPG canisters. Used tyres, trailers and containers were observed within the site. The area was unpaved.
WC-54	Centre	[REDACTED]	[REDACTED]	An open carpark for heavy vehicles and construction equipment. Oil drums were observed within the site. The area was unpaved with oil stain.
WC-55	Centre	[REDACTED]	[REDACTED]	A repair/maintenance workshop for heavy machineries. Generator sets, oil drums, lubricant containers, and used car parts were observed within the site. The area was unpaved with heavy oil stain.
WC-56	Centre	[REDACTED]	[REDACTED]	An uneven open car park. Trailers and heavy vehicles were observed within the site. The area was unpaved with oil stain.
WC-57	Centre	[REDACTED]	[REDACTED]	A tyre repair workshop and an open storage area for used tyres. The area was unpaved with oil stain.

Site ID	Locations	Current Occupants (Company Name)	Approximate Area (m ²)	Observations/ Remarks
		[REDACTED]		
WC-58	Centre	[REDACTED]	[REDACTED]	A repair / maintenance workshop for light vehicles. Oil drums, used oil cans, used oil filters and a few forklifts were observed within the site. The area was paved with cracks and heavy oil stain.
WC-59	Centre	[REDACTED]	[REDACTED]	A repair / maintenance and metal welding workshop. Oil drums, heavy machinery parts, lubricant containers and compressed gas canisters were observed within the site. The area was unpaved with heavy oil stain.
WC-60	Centre	[REDACTED]	[REDACTED]	An open carpark consisted a few containers and heavy vehicles. A forklift was observed under the shelter. The area was unpaved.
WC-61	Eastern	[REDACTED]	[REDACTED]	A repair / maintenance workshop for green taxis. Oil drums, used car parts and compressed gas canisters were observed within the site. The area was partially paved with cracks and heavy oil stain.
WC-62	Eastern	[REDACTED]	[REDACTED]	An abandoned workshop. Scrap metals, used car parts were observed within the site.
WC-63	Eastern	[REDACTED]	[REDACTED]	A repair workshop for light vehicles. Car parts and scrap metals were observed within the site. The area was partially paved with cracks and oil stain.
WC-64	Eastern	[REDACTED]	[REDACTED]	A repair / maintenance workshop for light vehicles. Oil drums and used car parts were observed within the site. The area was paved with oil stain.
WC-65	Eastern	[REDACTED]	[REDACTED]	A metal workshop under a shelter. Oil drums and forklifts were observed within the site. The area was partially paved with oil stain.
WC-66	Eastern	[REDACTED]	[REDACTED]	An open area consisted of stockpiles of C&D wastes. The area was unpaved.
WC-67	Eastern	[REDACTED]	[REDACTED]	A repair/maintenance workshop for heavy vehicle. Oil drums and lubricant containers were observed within the site. The area was unpaved with oil stain.
WC-68	Eastern	[REDACTED]	[REDACTED]	An open carpark for heavy vehicles and storage warehouse for packaged goods. A forklift, a few LPG canisters were observed within the site. The area was partially paved with oil stain.
WC-69	Eastern	[REDACTED]	[REDACTED]	An open carpark and a maintenance/ metal welding workshop for heavy vehicles. Oil drums, compressed gas canisters and scrap metal were observed within the site. The area was paved with cracks and oil stain.
WC-70	Eastern	[REDACTED]	[REDACTED]	Warehouses for packaged goods. Oil drums and LPG canisters were observed within the site. The area was partially paved with oil stain.

Site ID	Locations	Current Occupants (Company Name)	Approximate Area (m ²)	Observations/ Remarks
WC-71	Eastern	[REDACTED]	[REDACTED]	Two maintenance workshops with welding activities for trailers were located under the shelter. Oil drums, used car parts, and compressed gas canisters were observed within the site. The area was paved with cracks and oil stain.
WC-72	Eastern	[REDACTED]	[REDACTED]	A repair/maintenance workshop for taxis. A station for chemical waste storage was situated in the northeast corner of the site. Stockpile of demolished car parts was observed. The area was paved with oil stain.
WC-73	Eastern	[REDACTED]	[REDACTED]	A container office of a logistic company and a carwash station for heavy vehicles. A chemical waste storage was located at the southern boundary of the site. The area was partially paved with heavy oil stain.
WC-74	Western	[REDACTED]	[REDACTED]	An open carpark for trailers and storage warehouse containing packaged goods. Forklifts, metals scraps and wooden pallets were observed within the site. The area was partially paved with oil stain.
WC-75	Western	[REDACTED]	[REDACTED]	A waste recycling yard of scrap electronics, metal, paper, and PVC plastic. Warehouses and light vehicles were observed within the site. The area was unpaved with cracks.
WC-76	Western	[REDACTED]	[REDACTED]	A vehicle repair / maintenance workshop. Oil drums and compressed gas canisters were observed within the site. The area was partially paved with cracks and oil stain.
WC-77	Centre	[REDACTED]	[REDACTED]	A vehicle repair / maintenance workshop and a metal welding workshop. Oil drums and compressed gas canisters were observed within the site. The area was partially paved with cracks.
WC-78	Centre	[REDACTED]	[REDACTED]	An open area consisted of stockpiles of electronic wastes. The area was unpaved.
WC-79	Centre	[REDACTED]	[REDACTED]	A maintenance / painting workshop and a storage warehouse. Oil drums and oil cans were observed within the site. The area was partially paved with cracks and oil stain.
WC-80	Centre	[REDACTED]	[REDACTED]	An open carpark and maintenance workshop for heavy vehicles. Scrap metal, oil drums, burnt materials, and used car parts were observed within the site. The area was unpaved with heavy oil stain.
WC-81	Western	[REDACTED]	[REDACTED]	A waste recycling yard of wood scrap and metal scrap. The area was partially paved.
WC-82	Western	[REDACTED]	[REDACTED]	An open storage area of packaged goods. Packaged plastic pallets and small shelters were observed within the site. The area was paved with cracks.
WC-83	Western	[REDACTED]	[REDACTED]	A repair / maintenance workshop for heavy machineries. Heavy vehicles parts and scrap metal were observed within the site. The area was unpaved with heavy oil stain.

Site ID	Locations	Current Occupants (Company Name)	Approximate Area (m ²)	Observations/ Remarks
WC-84	Western	[REDACTED]	[REDACTED]	A repair / maintenance workshop for heavy vehicles and machineries. Heavy vehicles parts, scrap metal, oil drums and LPG canisters were observed within the site. The area was unpaved with oil stain.
WC-85	Centre	[REDACTED]	[REDACTED]	A vehicle demolishing workshop and storage area of used vehicle parts. The area was partially paved with cracks.
WC-86	Centre	[REDACTED]	[REDACTED]	An open carpark for light vehicles and trailers. Oil drums were observed within the site. The area was unpaved.
WC-87	Centre	[REDACTED]	[REDACTED]	A repair / metal welding workshop under a shelter. Oil drums, scrap metal, used car parts, paint cans, and compressed gas canisters were observed within the site. The area was unpaved with heavy oil stain.
WC-88	Western	[REDACTED]	[REDACTED]	An open area with one heavy vehicle, one container, and construction debris within the site. The area was unpaved with oil stain.
WC-89	Southeastern	[REDACTED]	[REDACTED]	An open carpark consisted of a container office and several LPG trucks within the site. The area was paved.
WC-90	Southeastern	[REDACTED]	[REDACTED]	A waste recycling yard consisted of several temporary structures with scrap metal stored on open ground. One forklift, one heavy vehicle and a number of oil drums were observed within the site. The area was partially paved with cracks and oil stain.
WC-91	Southeastern	[REDACTED]	[REDACTED]	A waste recycling yard consisted of several temporary structures with scrap metal, wood and plastic stored on open ground. Drain covers, heavy vehicles and stockpiles of waste materials were observed within the site. The area was partially paved with oil stain.
WC-92	Southeastern	[REDACTED]	[REDACTED]	A waste recycling yard consisted of several heavy vehicles and stockpiles of scrap metal. Oil drums were observed within the site. The area was partially paved with oil stain.
WC-93	Southeastern	[REDACTED]	[REDACTED]	An open carpark with a car repair / maintenance workshop within a small temporary structure located in the eastern corner of the site. Several heavy vehicles and a forklift were observed within the site. The area was partially paved with cracks.
WC-94	Southeastern	[REDACTED]	[REDACTED]	A temporary structure and open carpark. Several heavy vehicles and piles of scrap metal were observed within the site. The area was partially paved with cracks.
WC-95	Southeastern	[REDACTED]	[REDACTED]	A repair / maintenance workshop within a temporary structure. Light vehicles, oil drums, car parts were observed within the structure. The area was paved with oil stain.
WC-96	Southern	[REDACTED]	[REDACTED]	An open carpark with a container office located in the western corner of the site. The area was paved.
WC-97	Southern	[REDACTED]	[REDACTED]	A temporary structure with electronic waste materials stored in an open area in the western section of the site. The area was paved with cracks.

Site ID	Locations	Current Occupants (Company Name)	Approximate Area (m ²)	Observations/ Remarks
WC-98	Southern	[REDACTED]	[REDACTED]	An open carpark for light vehicles. The area was paved.

2.12.4.6 Future Land Use and Activities

The relevant RBRGs would be adopted for the land contamination assessment. Four different post-restoration landuses have been developed for the RBRGs, namely “Urban Residential”, “Rural Residential”, “Industrial” and “Public Parks”, to reflect the actual settings which people could be exposed to contaminated soil or groundwater. Definition of post-restoration landuses is given in EPD’s Guidance Note for Contaminated Land Assessment and Remediation and Guidance Manual for Use of RBRGs for Contaminated Land Management.

At this stage, the future land use of the Project site is expected to comprise residential at the southern site and industrial premises at the northern site and they are classified as Urban Residential and Industrial respectively in accordance with the EPD’s *Guidance Manual for Use of RBRGs for Contaminated Land Management*.

2.12.5 Waste

2.12.5.1 Legislation and Standards

The relevant legislation and associated guidance notes related to the study for the assessment of waste management implications include:

- Criteria and guidelines for evaluating and assessing waste management implication as specified in Annexes 7 and 15 of the TM-EIAO;
- Waste Disposal Ordinance (Cap 354);
- Waste Disposal (Chemical Waste) (General) Regulation (Cap 354);
- Land (Miscellaneous Provisions) Ordinance (Cap 28); and
- Public Health and Municipal Services Ordinance (Cap 132) - Public Cleansing and Prevention of Nuisances Regulation.

2.12.5.2 Waste

During the construction phase, activities would generate a variety of wastes including but not limited to the following.

- C&D materials;
- C&D waste;
- Chemical waste;
- Sewage; and
- General refuse.

The handling and disposal of these materials and wastes will require proper management in order not to cause environmental impacts and nuisance.

Further analysis will be conducted in the EIA to quantify the amount of various wastes that would be generated during the construction phase. It is however anticipated that there would not be any insurmountable impacts provided that good site practices and appropriate mitigation measures are implemented.

During the operational phase, general refuse and municipal waste are anticipated to be the main types of waste that would be generated from the Project site. In the YLIEE, industrial waste generation is also anticipated. The waste generating activities during the operational phase will be identified and the quantity of different waste types arising will be estimated in the EIA.

An information enquiry form has been sent to all existing tenants within the YLIE to collate the baseline business operation information including the amount of industrial and special waste generation. The information will allow for a more accurate prediction of operational phase industrial and special waste generation from the proposed YLIEE. **Table 2.12.24** below summarises the baseline information on the industrial and special waste generation from different industrial types in the existing YLIE.

Table 2.12.24 Industrial waste and special generation from different industrial types in existing YLIE

Industrial types	Total amount of Industrial and special wastes (kg/day) ^[1,2]	Total amount of Industrial and special wastes per gross floor area, GFA (kg/day/m ²) ^[1,2]
Pharmaceutical	105.0	1.52 x 10 ⁻³
Metal Parts and Products	Information not provided	Information not provided
Green Technology	82,000	5.22
Dyeing and Finishing	0.692	1.84 x 10 ⁻⁵
Other Manufacturing	173.8	6.73 x 10 ⁻³
Building Materials	23,304	3.09
Plastic Resins and Plastic Products	50	7.20 x 10 ⁻³
Food and Beverages	21,002	2.79 x 10 ⁻¹
Machinery and Parts	85.0	4.91 x 10 ⁻³
Printing and Publishing	23,722	6.30 x 10 ⁻¹
Service & Support	60.0	1.32 x 10 ⁻²
Electronic Parts	Information not provided	Information not provided
Chemicals and Gases	Information not provided	Information not provided

Note:

[1] Commercial waste and refuse generated from workers not included.

[2] Based on information provided by tenants where available

The privacy of the individual, public and private sector organisations is protected under the Personal Data (Privacy) Ordinance (Cap. 486). The Project Proponent is under obligation to protect the privacy of the YLIE companies and have committed that the private business operation information for individual company will be treated confidentially and will not be disclosed and published to the public. The information presented in this Baseline Review Report are only provided to the government departments and will not be presented in the subsequent EIA report.

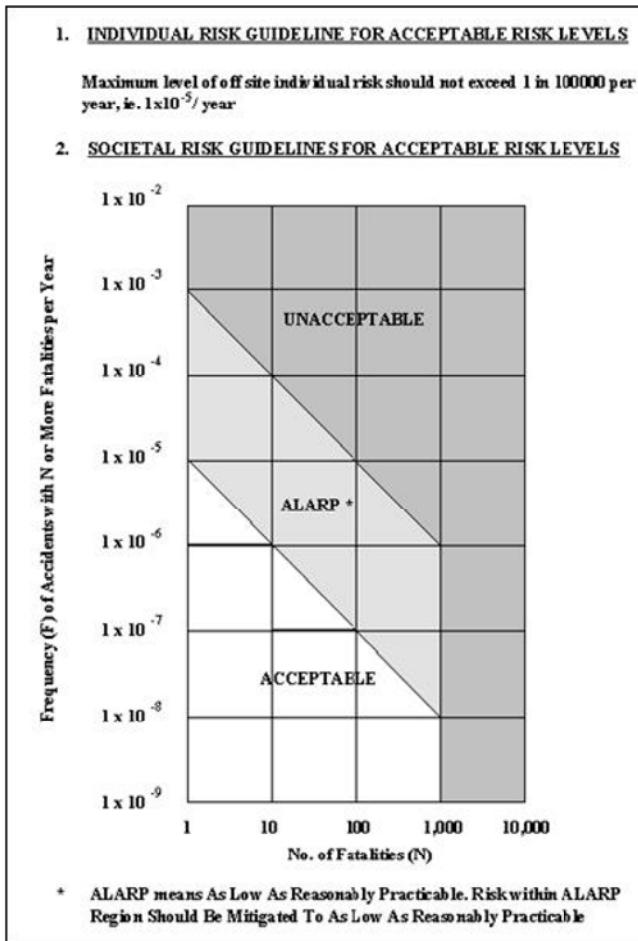
2.12.6 Hazard

2.12.6.1 Risk Guidelines

The estimated risk levels of the hazardous sources shall be compared with the risk guidelines stipulated in the TM-EIAO Annex 4 to determine the acceptability.

As set out in Annex 4 of the TM-EIAO, the risk guidelines comprise two components as follows:

- Individual Risk Guideline: the maximum level of off-site individual risk should not exceed 1 in 100,000 per year, i.e. 1×10^{-5} /year
- Societal Risk Guidelines: it can be presented graphically as follows. The Societal Risk Guideline is expressed in terms of lines plotting the frequency (F) of N or more deaths in the population from accidents at the facility of concern.



2.12.6.2 Baseline Condition

The existing YLIE is located at the immediate east of YLIEE. In order to establish the baseline conditions for hazard to life, a review has been conducted to identify the PHIs and Dangerous Goods (DG) in the vicinity of the Project site.

Existing and Planned PHIs

According to the available information, the Project site does not fall within the consultation zone of any PHIs. The nearest PHI is the Au Tau Water Treatment Work located at more than 3km away. In addition, it has been confirmed by HKSTP that PHI is prohibited within both the existing YLIE and the future YLIEE as well.

Existing DGs

Generally, DG of Cat 1 (Explosives), Cat 2 (Compressed gases), Cat 4 (Poisonous substances), and Cat 5 (Substances giving off inflammable vapours) will likely have hazard to life issue on the proposed development. A request has been sent to Fire Services Department (FSD) and Electrical and Mechanical Services Department (EMSD) to collate all the registered storage capacity of various Categories of DGs within and in vicinity of the Study Area. The Commissioner of Mines has also been consulted and it is confirmed that they have not issued any licence/permit relating to manufacture, storage and use of Cat 1 DG within the Study Area. **Table 2.12.25** summarises various types of DGs within and in vicinity of the Study Area as shown in FSD's and EMSD's inventory and their associated potential hazard.

Table 2.12.25 Types of DGs within and in vicinity of the Study Area that have potential hazard-to-life impacts
(Collected from FSD)

Cat [1]	Chemicals [2]	Class [3]	Potential Hazard & Major Outcomes
Cat 2	Acetylene	C1.3	<ul style="list-style-type: none"> • Main hazard: Inflammable • Major outcome: Flash fire, vapor cloud explosion
	Ammonia	C1.2	<ul style="list-style-type: none"> • Main hazard: Toxic • Major outcome: Toxic release
	Chlorine	C1.2	<ul style="list-style-type: none"> • Main hazard: Toxic • Major outcome: Toxic release
	Hydrogen	C1.1	<ul style="list-style-type: none"> • Main hazard: Inflammable • Major outcome: Flash fire, vapor cloud explosion
	LPG	C 1.2	<ul style="list-style-type: none"> • Main hazard: Inflammable • Major outcome: Flash fire, vapor cloud explosion
Cat 4	Methyl Diphenyl Dissocyanate	C1.1	<ul style="list-style-type: none"> • Main hazard: Toxic • Major outcome: Toxic release
	Trichloroethane	C1.1	<ul style="list-style-type: none"> • Main hazard: Toxic • Major outcome: Toxic release
Cat 5	Acetone	C1.1	<ul style="list-style-type: none"> • Flash point -20°C • Main hazard: Highly inflammable • Major outcome: Pool fire, flash fire, vapor cloud explosion, toxic release
	Alcohol	C1.1	<ul style="list-style-type: none"> • Flash Point: 16.6 °C • Main hazard: Inflammable • Major outcome Pool fire, flash fire, vapor cloud explosion, toxic release
	Ethyl-benzene	C1.2	<ul style="list-style-type: none"> • Flash point: 26°C • Main hazard: Inflammable • Major outcome: Pool fire, flash fire, vapor cloud explosion, toxic release
	Eucalyptus Oil	C1.2	<ul style="list-style-type: none"> • Flash point: 44 °C • Main hazard: Inflammable • Major outcome: Pool fire
	Diesel	C1.3	<ul style="list-style-type: none"> • Flash point of or exceeding: 66 °C • Main hazard: Combustible • Major outcome: Pool fire
	Iso-propanol	C1.1	<ul style="list-style-type: none"> • Flash point: 11.7 °C • Main hazard: Inflammable • Major outcome: Pool fire, flash fire, vapor cloud explosion, toxic release

Cat [1]	Chemicals [2]	Class [3]	Potential Hazard & Major Outcomes
	Kerosene	C1.2	<ul style="list-style-type: none"> Flash point: 38 °C Main hazard: Inflammable Major outcome: Pool fire
	Light Ends	C1.1	<ul style="list-style-type: none"> Flash point: < 23 °C Main hazard: Highly inflammable Major outcome: Pool fire, flash fire, vapor cloud explosion, toxic release
	Methanol	C1.1	<ul style="list-style-type: none"> Flash point: 12 °C Main hazard: Highly inflammable Major outcome: Pool fire, flash fire, vapor cloud explosion, toxic release
	Petrol	C1.1	<ul style="list-style-type: none"> Flash point: < -40 °C Main hazard: Highly inflammable Major outcome: Pool fire, flash fire, vapor cloud explosion
	Toluene	C1.1	<ul style="list-style-type: none"> Flash point: 4.4 °C Main hazard: Highly Inflammable Major outcome: Pool fire, flash fire, vapor cloud explosion, toxic release
	Thinner	C1.1 / C1.2	<ul style="list-style-type: none"> Flash point: < 23 °C / 23 - 66 °C Main hazard: Inflammable Major outcome: Pool fire, flash fire, vapor cloud explosion, toxic release
	Turpentine	C1.2	<ul style="list-style-type: none"> Flash point: 35 °C Main hazard: Inflammable Major outcome: Pool fire
	Styrene	C1.2	<ul style="list-style-type: none"> Flash point: 32 °C Main hazard: Inflammable Major outcome: Pool fire, flash fire, vapor cloud explosion, toxic release
	Xylene	C11	<ul style="list-style-type: none"> Flash point: < 23 °C Main hazard: Highly inflammable Major outcome: Pool fire, flash fire, vapor cloud explosion, toxic release

Note:

- [1] Cat 1 – Explosives
 Cat 2 – Compressed gases
 Cat 3 – Corrosive substances
 Cat 4 – Poisonous substances
 Cat 5 – Substances giving off inflammable vapours
 Cat 6 – Substances which became dangerous by interaction with water
 Cat 7 – Strong supporters of combustion
 Cat 8 – Readily combustible substances
 Cat 9 – Substances liable to spontaneous combustion
 Cat 9A – Combustible goods exempted from Section 6 – 11 of the Dangerous Goods Ordinance
 Cat 10 – Other dangerous substances

- [2] Other than those chemical shown in the 2nd column of the above table, the following DGs are also present within YLIE. However, these following DGs would not constitute a concern on hazard-to-life for the population in the proposed development.

Chemicals	Justification for not constituting concern on off-site hazard-to-life
Acids (hydrochloric acid, nitric acid, acetic acid, formic acid,	<ul style="list-style-type: none"> Liquid phase. Non flammable No immediate toxic gas be given out when release

sulphuric acid)	<ul style="list-style-type: none"> Acid can be contained on site when release
Aluminium powder	<ul style="list-style-type: none"> Solid phase. Non flammable No immediate toxic gas be given out when release Aluminium powder can be contained on site when release
Caustic soda	<ul style="list-style-type: none"> Solid phase. Non flammable No immediate toxic gas be given out when release Caustic soda can be contained on site when release
Compressed air	<ul style="list-style-type: none"> Non flammable or non-explosive Non toxic gas
Carbon dioxide	<ul style="list-style-type: none"> Non flammable or non-explosive Non toxic gas
Chromatic Acid Flake	<ul style="list-style-type: none"> Solid phase. Non flammable No immediate toxic gas be given out when release Flake can be contained on site when release
Gas (Argon gas, Helium, Nitrogen, Oxygen)	<ul style="list-style-type: none"> Non flammable or non-explosive Non toxic gas
Hydrogen peroxide solution	<ul style="list-style-type: none"> Liquid phase. Non flammable No immediate toxic gas be given out when release Solution can be contained on site when release
Ink solvent	<ul style="list-style-type: none"> Liquid phase No immediate toxic gas be given out when release Solvent can be contained on site when release
Printer Ink	<ul style="list-style-type: none"> Liquid phase No immediate toxic gas be given out when release Solvent can be contained on site when release
Mitsogen (Liquid)	<ul style="list-style-type: none"> Liquid phase No immediate toxic gas be given out when release Liquid can be contained on site when release
Plate cleaner	<ul style="list-style-type: none"> Liquid phase No immediate toxic gas be given out when release Solvent can be contained on site when release
Potassium persulphate	<ul style="list-style-type: none"> Solid phase. Non flammable No immediate toxic gas be given out when release Potassium persulphate can be contained on site when release
Refrigerant (Freon 11, Freon (R-22), R507)	<ul style="list-style-type: none"> Liquid / Gas phase. Non flammable No immediate toxic gas be given out when release
Sodium hydroxide	<ul style="list-style-type: none"> Solid / liquid phase. Non flammable No immediate toxic gas be given out when release Sodium hydroxide can be contained on site when release
Solvent	<ul style="list-style-type: none"> Liquid phase No immediate toxic gas be given out when release Solvent can be contained on site when release
Sodium hydrosulphite	<ul style="list-style-type: none"> Solid phase. Non flammable No immediate toxic gas be given out when release Sodium hydrosulphite can be contained on site when release
Sodium persulphate	<ul style="list-style-type: none"> Solid phase. Non flammable No immediate toxic gas be given out when release Sodium persulphate can be contained on site when release

- [3] Cat 2, C1.1 – Permanent gases
 Cat 2, C1.2 – Liquefied gases
 Cat 2, C1.3 – Dissolved gases
 Cat 4, C1.1– Substances giving off a poisonous gas or vapour
 Cat 4, C1.2 – Certain other poisonous substances
 Cat 5, C1.1 – Flash point below 23°C
 Cat 5, C1.2 – Flash point of or exceeding 23°C but not exceeding 66°C
 Cat 5, C1.3 – Flash point of or exceeding 66°C

The information also includes the storage method, quantity and approximate locations of the storage of DGs. Some of these DGs are stored either in tanks or cylinders, and the tanks could be at-ground, above-ground or underground. **Figure 2.12.13** shows the spatial distribution of these DGs which are stored either at-ground or above-ground, and those stored underground respectively. It can be seen that the majority of DGs storage are located within existing YLIE. Some of underground tanks are also sandfilled at ground level as well. Hence the hazard to life due to the underground DG storage will be lower.

It can be seen from **Figure 2.12.13** that the major DGs stored above ground or on ground within and in the vicinity of the Study Area include diesel, ammonia, hydrogen, ethylbenzene, paint and thinner, styrene and other DGs of various classes such as Methanol, Isopropanol, Sodium Methylate, Acrylic Acids, Dimethylaminopropyl, Iomine, Remol HT, Emulsogen IT, Benzly Chloride, Sehlloso A, Vinyl Acetate, Xylene, Petroleum Ether etc. Given that the potential hazard scenario for diesel is pool fire, which is normally confined inside the site boundary, the hazard level due to diesel on the proposed housing site is therefore considered to be lower. Apart from diesel, the locations of the major large quantities of DGs are summarized in **Table 2.12.26**.

Table 2.12.26 Locations of major large quantities of DGs above ground in YLIE (Collected from FSD)

Areas	Major DGs	Quantities	Distance (m) [1]
I	Ammonia	27.6 Ton	650 m
J	Paint and Thinner	250 m ³	520 m
N	Styrene	1,866.5 m ³	955 m
	Ethylbenzene	100.0 m ³	955 m
O	Ammonia	18.0 Ton	730 m
V	Methanol, Isopropanol, Sodium Methylate, Acrylic Acids, Dimethylaminopropyl, Iomine, Remol HT, Emulsogen IT	12.0 Ton	1050 m
	Benzly Chloride, Sehlloso A, Vinyl Acetate, Xylene, Petroleum Ether	20.0 Ton	1050 m
X	Hydrogen	1,116.0 m ³	920 m

Note:

[1] Distance is measured from the source to the boundary of the proposed PHD site.

These potential hazardous sources are relatively distant from the future proposed PHD site (i.e. 520m – 1050m). In addition, the DG stores of the above chemicals will strictly comply with the Dangerous Goods Ordinance (Cap 295), it is therefore anticipated that any potential hazards on the proposed development would have been controlled.

Other than the information collated from FSD and EMSD, additional information enquiry form has been sent to all existing tenants within the YLIE to collate the baseline business operation information including the amount of DG storage and processing. All of the YLIE tenants have returned their information. The capacity of the DGs as advised by the tenants seems to be less than those in the inventory provided by FSD. It is believed that the tenants provided the actual production and storage quantity which are less than the maximum allowable limits as shown in the inventory. Hence, in order to have a more conservative assessment for the purpose of this baseline review, it is recommended to adopt the inventory provided by FSD and EMSD.

Other planned DGs

According to the information in EPD's EIAO web site, an EIA Study Brief for Harvest Fatty Acid Methyl Ester and Edible Oil Plant Development at YLIE had been issued in

2011 (ESB-225/2011 under EIA register). However, as confirmed by HKSTP, the proposed Harvest Fatty Acid Methyl Ester and Edible Oil Plant Development at YLIE was terminated and the HKSTP has taken up the lease of the land lot and are now considering new applications not related to biodiesel or petrochemical projects. Thus, there are no hazard-to-life impacts due to this site.

There are three main focus industries in the proposed YLIEE: biotechnology related production; pharmaceuticals; and machinery and equipment manufacturing. Use and storage of DGs on site cannot be totally precluded. However, given the close proximity to the proposed PHD site, storage and processing of large quantities of DGs and hazardous substances are not recommended. It was initially advised by HKSTP that any special conditions required to be imposed on the future tenants of the YLIEE could be specified and put as the lease conditions. Thus, by means of these kinds of administrative measures, the quantities of DGs and hazardous substances stored and processed inside the YLIEE could be adequately controlled. Chemical / gas processing plants such as biodiesel and petrochemical plants will also be prohibited inside YLIEE. Potential hazard to life impacts due to DGs storage and processing within YLIEE are therefore also not anticipated.

2.12.7 Landscape & Visual

2.12.7.1 Project Site and Context

The Project site is located in the Yuen Long District within the northwest of the New Territories. Key landuses within the site and immediate context include the YLIE, high rise residential development such as the Long Ping Estate, numerous small villages, hillside landscape (including woodland and scrubland) and an extensive area of land used for open storage purposes.

2.12.7.2 Review of the Local Development and Control Framework

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

- The approved OZP S/YL-PS/14 – Ping Shan (18/05/2012) which encompasses the site boundary.
- The approved OZP S/YL/21 – Yuen Long (16/12/2011) which covers the broader study boundary.
- Environmental Impact Assessment Ordinance (Cap.499.S.16) and the TM-EIAO, particularly Annexes 10 and 18.
- Environmental Impact Assessment Ordinance Guidance Note 8/2010;
- Town Planning Ordinance (Cap 131).
- The Forests and Countryside Ordinance (Cap.96) – prohibiting the felling, cutting, burning or destruction of trees, growing plants and forests on Government land. Also noting Section 3 defining the list of protected species in Hong Kong.
- Land Administration Office Instruction (LAOI) Section D-12 - Tree Preservation.
- 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 including “The Register of Old and Valuable Trees – Hong Kong”, maintained by the Leisure and Cultural Services Department.
- ETWB No. 36/2004 - Advisory Committee on the Appearance of Bridges and Associated Structures.
- ETWB TCW No. 19/2005 Environmental Management on Construction Sites.
- ETWB TCW No. 3/2006 - Tree Preservation.
- Hong Kong Planning Standards and Guidelines Chapter 4 and Chapter 10.
- Government General Regulation 740 – setting out restrictions on the preservation and felling of trees in Hong Kong.
- GEO publication No. 1/2000 ‘Technical Guidelines on Landscape Treatment and Bio-engineering for Man-Made Slopes and Retaining Walls’.
- GEO publication No. 1/2011, ‘Technical Guidelines on Landscape Treatment for Slopes’.
- Technical Report of “Study on Landscape Value Mapping of Hong Kong” by PlanD.
- Landscape Character Map of Hong Kong (2005 Edition).
- Development Bureau Technical Circular (Works) No. 2/2012 Allocation of Space for Quality Greening on Roads.
- Development Bureau Technical Circular (Works) No. 3/2012 Site Coverage of Greenery for Government Building Projects.

2.12.7.3 Landscape Sensitivity Baseline Study Methodology

Landscape Resources (LR) and Landscape Characters Areas (LCA) within 500m of the limit of works have been identified using a combination of desktop research and site visits.

The landscape elements within the study area which contribute to the landscape character include:

- Local topography, in particular the Kai Shan hill range and Chu Wong Ling;
- Woodland and shrubland, mainly associated with Kai Shan hill range but also the mature ornamental and avenue tree planting spread throughout the public realm;
- Other vegetation types including grassland visible on the high ground of the Kai Shan hill range;
- The scale and appearance of residential, commercial and industrial built form;
- Patterns of settlement and landuse, particularly associated with the layout of local villages and the interfaces with high density residential areas and industrial areas;
- Land use such as agriculture, open storage, residential and industrial areas;
- Scenic spots such as Kai Shan hill;
- Details of local materials, styles and streetscapes;

- Prominent watercourses; and
- Cultural and religious features.

The process of landscape characterization draws on the information gathered in the desktop and site survey, and provides an analysis of the way in which components of the landscape interact with each other. The Study Area is then divided into broadly homogenous units of similar character which are called LCAs.

LCAs and LRs are described qualitatively and quantitatively, their sensitivities are then evaluated and rated as low, medium and high taking into account the following criteria:

- whether the landscape character / resource is common or rare;
- whether it is considered to be of local, regional, national or global importance;
- whether there are any statutory or regulatory limitations / requirements relating to the resource;
- the quality and condition of the resource;
- the maturity of the resource; and
- the capacity of the landscape character / resource to accommodate change.

The sensitivity ratings are classified as below:

High:	Important LR or LCA of particularly distinctive characteristics, which is sensitive to even relatively small changes.
Medium:	LR or LCA of moderate quality landscape characteristics and value, which is reasonably tolerant to change.
Low:	LR or LCA with low quality landscape characteristics and value, which is largely tolerant to change.

2.12.7.4 Visual Sensitivity Baseline Study Methodology

The Project site for the visual impact assessment is defined by the Visual Envelope (VE) which includes all the points from which the scheme proposals may be visible or the area comprising the view shed formed by natural / manmade features such as existing ridgelines, built form or areas of woodland / large trees. This is identified using a combination of detailed site walkover surveys, desktop map study and analysis of aerial photography. Views from Visual Sensitivity Receivers (VSRs) are recorded, described and relative sensitivity identified.

The level of sensitivity is based on the quality and extent of the existing view. The factors affecting the sensitivity of receivers for evaluation of visual impacts include the following:

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

- Degree of visibility.

The VSRs and their sensitivity can be broadly categorised as follows:

Level	Example of VSR
High Sensitivity	The VSR is highly sensitive to any changes in the viewing experience - Residential properties where the principle view is of the development site, formalised public viewpoints or designed landscape vistas.
Medium Sensitivity	The VSR is moderately sensitive to any changes to the viewing experience - Outdoor workers, office workers, recreational users, residential properties where the secondary view is of the development.
Low Sensitivity	The VSR is slightly sensitive to any changes in the viewing experience - People travelling through the landscape (by car, bus).

2.12.7.5 Sensitivity of LRs, LCAs and VSRs

The following activities would be likely to affect the sensitivity of LRs, LCAs and VSRs:

- Vegetation clearance including trees, shrubs and grassland (permanent and temporary).
- Changes in landuse and visibility of built form.
- Construction works including demolition.
- Obstruction and changes in views from residential areas, work places and public realm;
- Changes in external realm lighting conditions and increased light glare;

Landscape Resources

The LRs of the Study Area are described in **Table 2.12.28** and the sensitivity is assessed in **Table 2.12.29**. The extent of these resources is presented on **Figure 2.12.14**. Representative photographs of the various LRs are shown on **Figure 2.12.15 to 2.12.19**.

Table 2.12.28 Description of LRs within the study area

ID	Landscape Resources (LR)	Description
LR1	Industrial area Area – 53 ha	<ol style="list-style-type: none"> 1. LR comprises the industrial development in Yuen Long including two industrial zones – YLIE and Tung Tau Industrial Area. 2. This LR has an industrial character comprising large scale infrastructure elements such as industrial buildings, sheds and loading and unloading machinery. 3. This LR also includes small areas of amenity planting along the roadsides and within the industrial plots. 4. Tree cover is predominantly avenue planting along the main feeder roads; dominant species include <i>Bauhinia blakeana</i>, <i>Kaya senegalensis</i>. Tree age range between semi-mature and mature; general condition is fair to good. 5. Resource has high capacity to accommodate change. 6. Landscape quality and value is considered to be low.
LR2	Villages Area 57ha	<ol style="list-style-type: none"> 1. LR refers to scattered settlements and village which are scattered across the study area. 2. The area is a low-lying plain. 3. Vegetation cover within this area is mixed in quality and fragmented. 4. Tree species are mixed ornamental and self-seeded associated with gardens, vacant plots or municipal planting covering a small part of the total area. Typical species include <i>Ficus microcarpa</i>, <i>Juniperus chinensis</i>, <i>Roystonea regia</i>, <i>Bomba ceiba</i>, <i>Cinnamomum camphora</i> and <i>Acacia confuse</i>. <i>The age of the trees is mainly semi-mature however there is a scattering of mature and veteran species</i>. Generally the quality of the planting is fair. 5. Resource has a medium capacity to accept change. 6. Landscape quality and value is considered to be medium.
LR3	Agricultural Land Area 3ha	<ol style="list-style-type: none"> 1. LR refers to small scale agricultural land holdings located at the north end of the site associated with Tai Tseng Wai Village. 2. The land has been divided up into numerous small plots which are either open or fenced off; these are fed by a system of shallow irrigation ditches which are fed from natural stream emanating from Kai Shan Hill. 3. The majority of the land is under cultivation therefore tree cover within the plots is very limited. The periphery of the land contains numerous trees; typical species include <i>Macaranga tanarius</i>, <i>Ficus spp.</i>, <i>Acacia confusa</i>, <i>Leucaena leucocephala</i> and <i>Eucalyptus robusta</i>. These trees range from semi-mature to mature and are generally in fair condition. 6. Resource has a medium capacity to accept change. 7. Landscape quality and value is considered to be medium.

ID	Landscape Resources (LR)	Description
LR4	Open storage Area 31ha	<ol style="list-style-type: none"> 1. LR refers to land within the site boundary, to the west of Fuk Hi Street which has been cleared for Open Storage purposes 2. Area consists of open ground (surfaced and un-surfaced) with temporary units, compounds and surface storage area. 3. Tree cover is very limited with several small, isolated clumps of trees associated with ditches or old watercourses. Typical species include <i>Acacia confusa</i>, <i>Leucaena leucocephala</i>, <i>Ficus microcarpa</i>, <i>Ficus spp.</i>, <i>Bombax ceiba</i>, <i>Casuarina equisetifolia</i>. The age of this planting is predominantly semi-mature although several mature specimens exist albeit damaged but the open storage operation. The quality of the planting is considered to be poor. 4. Resource has a high capacity to accept change. 5. Landscape quality and value is considered to be low.
LR5	Mixed woodland, shrubs and grassland. Area – 66 ha	<ol style="list-style-type: none"> 1. LR refers to the highland area of Kai Shan. 2. Vegetation at lower levels is generally taller and more established. Vegetation at higher elevation is lower in height and dominated by scrubland broken by informal paths and exposed ground. 3. Vegetation cover at lower levels is a combination of mature trees and shrubs. Vegetation cover at higher elevations is lower in height and appears more natural and open. 4. Tree cover scattered and relatively thin, typical species include <i>Acacia confusa</i>, <i>Aporosa chinensis</i>, <i>Bridelia tomentosa</i>, <i>Cerbera manghas</i>, <i>Dimocarpus longan</i>, <i>Pinus spp.</i>, <i>Juniperis chinensis</i>, <i>Hibiscus tiliaceus</i>, <i>Macaranga tanarius</i> and <i>Casuarina equisetifolia</i>. The age of the planting ranges from semi-mature to mature and is generally in fair to good condition. 5. Areas of the hillside have been cleared for burials accessed by informal paths. 6. Resource has a low capacity to accept change. 7. Landscape quality and value is considered to be high.
LR6	Woodlands Area – 68 ha	<ol style="list-style-type: none"> 1. LR refers to dense woodland vegetation at the lower levels of Kai Shan, the whole area of Chu Wong Ling, the area behind Uj Uk Tsuen, the area between Chun Hing San Tsuen and Fung Chi Tsuen and the area near to Pak Fa Tsuen. 2. The area is mainly secondary woodland. 3. Several isolated areas of woodland are Feng Shui woodlands belonged to the local villages. 4. Tree cover is dense, typical species include <i>Acacia confusa</i>, <i>Aporosa chinensis</i>, <i>Bridelia tomentosa</i>, <i>Cerbera manghas</i>, <i>Dimocarpus longan</i>, <i>Pinus spp.</i>, <i>Juniperis chinensis</i>, <i>Hibiscus tiliaceus</i>, <i>Macaranga tanarius</i> and <i>Casuarina equisetifolia</i>. The age of the planting ranges from semi-mature to mature and is generally in fair to good condition. 5. Resource has a low capacity to accept change. 6. Landscape quality and value is considered to be high.

ID	Landscape Resources (LR)	Description
LR7	Residential area Area – 16 ha	<ol style="list-style-type: none"> 1. LR refers to the whole area of Long Ping Estate and Yeung Uk San Tsuen. 2. Long Ping Estate is a public housing residential area with ordered landscape features and recreational spaces. 3. Planting consists of a mixture of municipal road-side tree and shrub planting and amenity planting in open spaces and around residential estate. 4. Typical tree species include <i>Ficus microcarpa</i>, <i>Macaranga tanarius</i>, <i>Prunus spp.</i>, <i>Eucalyptus spp.</i>, <i>Ficus spp.</i>, <i>Bombax ceiba</i>, <i>Schinus superba</i>, <i>Liquidambar formosana</i> and <i>Cinnamomum camphora</i>. Generally these are mature specimen trees in good condition. 5. In general the resource has a medium capacity to accept change. 6. Landscape quality and value is considered to be medium.
LR8	Major transportation corridor Area – 18 ha	<ol style="list-style-type: none"> 1. LR refers to the major infrastructure routes including Wang Lok Street, Wang Tat Road, Ma Wang Road, Long Ping Road, Long Tin Road and Castle Peak Road. 2. Shui Pin Wai Interchange is also included. 3. In addition to the road system, the area also consists of a part of the West Rail Line and the Light Rail Line as well as associated miscellaneous roadside land uses. 4. Typical tree species includes <i>Acacia confusa</i>, <i>Cinnamomum camphora</i>, <i>Roystonea regia</i>, <i>Macaranga tanarius</i>, <i>Leucaena leucocephala</i> and <i>Ficus microcarpa</i>. Generally these trees are mature and in good condition. 5. Resource has a high capacity to accept change. 6. Landscape quality and value is considered to be low
LR9	Roads and urban infrastructure Area – 16 ha	<ol style="list-style-type: none"> 1. LR refers to mainly secondary roads, tree avenues, verges and amenity landscape areas associated with access roads and main pedestrian routes. 2. Vegetation includes roadside trees and shrub planting. 3. Typical tree species includes <i>Acacia confusa</i>, <i>Cinnamomum camphora</i>, <i>Roystonea regia</i>, <i>Macaranga tanarius</i>, <i>Leucaena leucocephala</i> and <i>Ficus microcarpa</i>. Generally these trees are mature and in good condition. 4. Resource has a high capacity to accept change. 5. Landscape quality and value is considered to be low.

ID	Landscape Resources (LR)	Description
LR10	Streams Area – 0.9ha Length – 5.452m	<ol style="list-style-type: none"> 1. LR refers to natural watercourses within the Study Area. 2. Smaller streams originating from Kai Shan which then enter Shan Pui River. 3. The drainage system forms a radial pattern. 4. No tree planting associated with stream – see LR 5 & 6. 5. Numerous segments as they run through or close to settlements have been diverted to feed agricultural plots or feed into concrete drainage channels. 6. Resource has a low capacity to accept change. 7. Landscape quality and value is considered to be high.
LR11	Ponds Area – 0.3 ha	<ol style="list-style-type: none"> 1. LR refers to a series of abandoned ponds formed adjacent to the existing stream. 2. Area is overgrown and re-naturalising. 3. No tree planting included within the ponds – see LR 5 & 6. 4. Resource has a low capacity to accept change. 5. Landscape quality and value is considered to be high.
LR12	Wetlands / Fishponds Area – 4 ha	<ol style="list-style-type: none"> 1. LR refers to coastal landscape comprising fish ponds, wetlands / mangroves near to the river mouth. 2. The area has high ecological value and forms an important habitat for local wetland species. 3. Resource has a low capacity to accept change. 4. Landscape quality and value is considered to be high.
LR13	Artificial Channel Area – 8 ha	<ol style="list-style-type: none"> 1. LR refers to a section of Shan Pui River and feed channels which has been channelised by development. 2. No tree planting associated with the channel 3. Resource is assessed to have high capacity to accept change. 4. Landscape quality and value is considered to be low.
LR14	Urban area Area – 23 ha	<ol style="list-style-type: none"> 1. LR refers to a combination of high rise and middle rise residential, commercial, educational and recreational development forming Yuen Long New Town. 2. Planting consists of a mixture of road side tree and shrub planting, tree and shrub planting associated with private residential courtyard areas, specimen tree and shrub planting in recreational spaces. Overall coverage is limited. 3. Typical tree species include <i>Ficus microcarpa</i>, <i>Macaranga tanarius</i>, <i>Prunus spp.</i>, <i>Eucalyptus spp.</i>, <i>Bombax ceiba</i>, <i>Schinus molle</i>, <i>Liquidambar formosana</i> and <i>Cinnamomum camphora</i>. Generally these are mature specimen trees in good condition. 4. In general the resource has a medium capacity to accept change. 5. Landscape quality and value is considered to be medium.

ID	Landscape Resources (LR)	Description
LR15	Utilities Area – 1ha	<ol style="list-style-type: none"> 6. LR refers to covered service reservoir which sits to the north of the Kai Shan Peak. 7. There is no tree planting directly associated with this piece of utility infrastructure. 8. The area comprises hard standing and extensive roof area to the reservoir. 9. In general the resource has a high capacity to accept change. 10. Landscape quality and value is considered to be low.

Table 2.12.29 Sensitivity of Landscape Resources (LRs).

ID.	Landscape Resources	Quality (High, Medium, Low)	Rarity (High, Medium, Low)	Importance (local, regional, national or global)	Any statutory limitations/ requirements (Yes/ No)	Ability to Accommodate Change (Low, Medium, High)	Sensitivity (Low, Medium, High)
LR1	Industrial area	Low	Low	Local	Yes	High	Low
LR2	Villages	Medium	Medium	Local	Yes	Medium	Medium
LR3	Agricultural Land	Medium	Medium	Local	Yes	Medium	Medium
LR4	Open Storage	Low	Low	Local	Yes	High	Low
LR5	Mixed woodland, shrubs and grassland.	High	High	Regional	Yes	Low	High
LR6	Woodlands	High	High	Regional	Yes	Low	High
LR7	Residential area	Low/Medium	Low	Local	Yes	Medium	Low
LR8	Major transportation corridor	Low	Low	Regional	Yes	High	Low
LR9	Roads and urban infrastructure	Low	Low	Local	Yes	High	Low
LR10	Streams	High	High	Local	Yes	Low	High
LR11	Ponds	High	High	Local	Yes	Low	High
LR12	Wetlands / Fishponds	High	High	Regional	Yes	Low	High
LR13	Artificial Channel	Low	Low	Regional	Yes	High	Low
LR14	Urban area	Medium	Low	Local	Yes	Medium	Medium
LR15	Utilities	Low	Low	Local	Yes	High	Low

Landscape Character

As identified in the Landscape Value Mapping of Hong Kong, there are nine district scale LCAs within the Study Area these are described in **Table 2.12.30**, the sensitivity within this context is assessed in **Table 2.12.31**. The extents of the LCAs are mapped on **Figure 2.12.20**.

Table 2.12.30 Description of LCAs within the study area

ID	Landscape Character Area (LCA)	Description
LCA 1	Industrial urban landscape Area – 54ha	<ol style="list-style-type: none"> 1. LCA refers to the industrial areas including YLIE and Tung Tau Industrial Area. 2. This LCA is characterized by low-rise industrial buildings with wider roads and car parking facilities. 3. Avenue trees alongside roads provide value greening. 4. It is considered this area has high tolerance to accommodate changes in the landscape. 5. Landscape character quality and value are considered to be low.
LCA2	Miscellaneous rural fringe landscape Area – 158ha	<ol style="list-style-type: none"> 1. LCA refers to the original rural landscape in Wang Chau which has undergone dramatic changes over recent decades. 2. It consists of agricultural fields, stands of woodland and scattered villages as well as open storage and parking areas which are changed from the abandoned agricultural fields. 3. The dramatic changes on the landscape have resulted in fragmentation in land use and traditional landscape patterns. 4. I Shing Kung, built in 1718, was declared a monument at Tung Tau Wai in 1996. 5. The area has some tolerance to accept changes in landscape. 6. Landscape character quality and value considered to be medium.
LCA 3	Upland and hillside landscape Area – 70ha	<ol style="list-style-type: none"> 1. LCA refers to the elevated upland landscape (mostly above 20m) on Kai Shan. 2. Kai Shan hill range reaches 120m at its highest point and is a local scenic point providing views over the Industrial Estate, surrounding wetlands and local villages. 3. Informal un-surfaced path provides pedestrian access to the top of the hill. 4. Due to lack of development, the character of this area is wild, and feels remote from the surrounding urban developments. 5. The area has low tolerance to accept change. 6. Landscape character quality and value considered to be high.

ID	Landscape Character Area (LCA)	Description
LCA4	Residential urban landscape Area – 16ha	<ol style="list-style-type: none"> 1. LCA refers to the whole area of Long Ping Estate and Yeung Uk San Tsuen. 2. It is characterized by the high-rise residential buildings (public housing) set amongst open space, together with footbridges, school and community facilities. 3. Vegetation includes roadside trees and shrub planting and planting in open spaces and around residential estate. 4. The landscape is fairly homogenous and ordered comprising large built elements. 5. The area has high tolerance to accommodate change. 6. Landscape character quality is considered to be medium. 7. Landscape value is considered to be low.
LCA 5	Transportation corridor landscape Area – 23ha	<ol style="list-style-type: none"> 1. LCA refers to the main transport corridor connecting the Industrial Estate with Yuen Long New Town area onwards to Tin Shui Wai and Tuen Mun. 2. It consists of mainly primary road corridors (e.g. Castle Peak Road), Shui Pin Wai Interchange, part of the West Rail Line and the Light Rail Line as well as associated miscellaneous roadside land uses. 3. Between the roads and rail lines are landscaped embankments and islands, generally with a semi-mature amenity vegetation of trees and shrubs. 4. Landscape character quality is considered to be low. 5. The landscape value of this infrastructure corridor is considered to be low with a high tolerance to accept change.
LCA 6	Urban peripheral village landscape Area – 12ha	<ol style="list-style-type: none"> 1. LCA refers to the whole area of Chun Hing San Tsuen, Fung Chi Tsuen and Shui Tin Tsuen. 2. The area consists of grouped village houses, which include traditional dwellings and temples (Tin Hau Temple), as well as newer houses, all separated by narrow footpaths or lanes. 3. Part of the area has been changed to open storage area. 4. Vegetation consists of scattered mature trees and peripheral woodland, and scrub in abandoned fields. 5. This area is considered to have some tolerance to accept change. 6. Landscape character quality and value is considered to be medium.
LCA 7	Miscellaneous urban fringe landscape Area – 7ha	<ol style="list-style-type: none"> 1. LCA refers to Chun Hing San Tsuen, Fung Chi Tsuen, Shui Tin Tsuen, an isolated area of woodland and scattered trees and shrubs. 2. This LCA contains a more or less equal mixture of developed and undeveloped land; low density of built development; public institutions, temple and monastery. 3. This area is considered to have some tolerance to accept change. 4. Landscape character quality and value is considered to be medium.

ID	Landscape Character Area (LCA)	Description
LCA 8	'Hui' urban landscape Area – 24ha	<ol style="list-style-type: none"> LCA refers to a part of Yuen Long New Town. This LCA comprises a small area of narrow streets on a more or less orthogonal grid. The buildings on these streets are generally medium rise and comprise slightly older building stock. They consist of a mixture of uses at ground floor level, often with residential properties above. Amenity vegetation is generally limited to occasional street tree planting or amenity planting in sitting-out areas. This area is considered to have some tolerance to accept change. Landscape character quality and value is considered to be medium.
LCA 9	Rural coastal plain landscape Area – 5ha	<ol style="list-style-type: none"> LCA refers to coastal landscape comprising fish ponds, wetlands / mangroves near to the river mouth. The area has high ecological value and forms the habitat for many wetland species. Resource has a low capacity to accept change. Landscape character quality and value is considered to be high.

Table 2.12.31 Sensitivity of LCAs

ID.	Landscape Character Area	Quality (High, Medium, Low)	Rarity (High, Medium, Low)	Importance (local, regional, national or global)	Any statutory limitations/ requirements (Yes/ No)	Ability to Accommodate Change (Low, Medium, High)	Sensitivity (Low, Medium, High)
LCA1	Industrial urban landscape	Low	Low	Regional	Yes	High	Low
LCA2	Miscellaneous rural fringe landscape	Medium	Medium	Local	Yes	Medium	Medium
LCA3	Upland and hillside landscape	High	Medium	Regional	Yes	Low	High
LCA4	Residential urban landscape	Medium	Low	Local	Yes	Medium	Medium
LCA5	Transportation corridor landscape	Low	Low	Local	Yes	High	Low
LCA6	Urban peripheral village landscape	Medium	Low	Local	Yes	Medium	Medium
LCA7	Miscellaneous urban fringe landscape	Medium	Low	Local	Yes	Medium	Medium
LCA8	'Hui' urban landscape	Medium	Low	Local	Yes	Medium	Medium
LCA9	Rural coastal plain landscape	High	High	Regional	Yes	Low	High

Visual Amenity

The VSRs within the VE of the Project Site are identified and their sensitivity assessed in **Table 2.12.32**. The location of viewpoints from these VSRs is presented on **Figure 2.12.21** with photographs taken from these points shown on **Figure 2.12.22 to 2.12.31**.

Table 2.12.32 Sensitivity of VSRs

VSRs (no.)	Visually Sensitive Receiver (VSR)	Type of VSRs (Residential/ Recreational/ Pedestrian/ Occupational/ Transportation/ Cultural)	Numbers of Individuals (Many/ Medium/ Few)	Quality of Existing View (Good/Fair/Poor)	Availability of Alternative Views (Yes/No)	Degree of Visibility (Full, Partial/ Glimpse)	Duration of View (Long/ Medium/ Short)	Frequency of View (frequent/ Occasional/ Rare)	Sensitivity (Low, Medium, High)
VSR 1	Chun Hing New Village	Residential	Medium	Fair	Yes	Partial	Long	Frequent	Medium
VSR 2	Long Ping Road	Transportation/ Pedestrian	Many	Fair	Yes	Full	Short	Occasional	Low
VSR 3	Fung Chi Tsuen	Residential	Medium	Fair	Yes	Partial	Long	Frequent	Medium
VSR 4	Fung Chi Road Intersection	Transportation/ Pedestrian	Many	Fair	Yes	Full	Short	Frequent	Low
VSR 5	Roof Garden of Long Ping Estate Market	Residential	Many	Fair	Yes	Full	Long	Frequent	High
VSR 6	Wah Ping House	Residential	Many	High	Yes	Full	Long	Frequent	High
VSR 7	Fuk Hi Street Intersection	Transportation/ Pedestrian	Many	Fair	No	Partial	Short	Frequent	Low
VSR 8	Ting Fook Villas	Residential / Transportation / Pedestrian	Many	Poor	No	Full	Long	Frequent	High
VSR 9	Chu Wong Ling	Recreational	Few	Good	Yes	Full	Medium	Occasional	Medium
VSR 10	Fuk Hi Street adjacent China Inspection Co. Ltd	Occupational / Transportation / Pedestrian	Medium	Poor	No	Partial	Short	Frequent	Medium
VSR 11	Fuk Hang Street	Occupational/ Transportation /	Medium	Poor	No	Partial	Short	Frequent	Medium

VSRs (no.)	Visually Sensitive Receiver (VSR)	Type of VSRs (Residential/ Recreational/ Pedestrian/ Occupational/ Transportation/ Cultural)	Numbers of Individuals (Many/ Medium/ Few)	Quality of Existing View (Good/Fair/Poor or)	Availability of Alternative Views (Yes/No)	Degree of Visibility (Full/ Partial/ Glimpse)	Duration of View (Long/ Medium/ Short)	Frequency of View (frequent/ Occasional/ Rare)	Sensitivity (Low, Medium, High)
VSR 12	Fuk Wang Street	Pedestrian Occupational/ Transportation	Medium	Poor	No	Partial	Short	Frequent	Medium
VSR 13	Fuk Shun Street Intersection	Occupational/ Transportation / Pedestrian	Medium	Poor	No	Partial	Short	Frequent	Medium
VSR 14	Tai Tseng Wai	Residential	Few	Fair	Yes	Partial	Long	Frequent	High
VSR 15	Upland behind Wing Ning Tsuen	Residential	Few	Fair	Yes	Full	Long	Frequent	High
VSR 16	Foothills above Yeung Uk San Tsuen	Cultural	Few	Fair	Yes	Full	Short	Rare	Medium
VSR 17	Uphill Open Grassland Kai Shan	Recreational	Few	Good	Yes	Full	Medium	Occasional	Medium
VSR 18	Kai Shan Peak –facing east	Recreational	Few	Good	Yes	Full	Medium	Occasional	Medium
VSR 19	High point above Shing Uk Tsuen	Recreational/Cultural	Few	Good	Yes	Partial	Medium	Occasional	Medium
VSR 20	Open area & car park, Ng Uk Tsuen	Residential / Transportation / Pedestrian	Many	Fair	Yes	Glimpse	Long	Frequent	Medium

Summary

It is considered that the most sensitive components of the existing landscape resources are natural terrain features including woodland and shrubland, undulating hillside topography and natural watercourses or bodies of water (such as fish ponds and streams). The sensitivity relates to the value these resources have in terms of landscape and visual amenity and their rarity, fragmentation and ongoing degradation as a result of local landuses or activities, in particular areas of open storage or creation of informal burial grounds.

The LCAs within the study area are very distinct as a result of low rise villages meeting high-rise residential blocks and industrial development. The most sensitive landscape characters areas being the upland and hillside landscape associated with Kai Shan hill range and the smaller Chu Wong Ling. Whilst the quality of part of these LCAs has been degraded, they provide a scenic and highly valuable setting to the site.

The existence of a large residential population located in high rise developments such as the Long Ping Estate and low density village settlements spread throughout the site and study area creates numerous potential vantage points. Whilst the visual experience and sensitivity will differ, it is considered that the most sensitive views are those which currently experience a direct and broad connection with the site and Kai Shan hill range.

In addition to the sensitivity of residential receptors, there are numerous hillside trails within the Kai Shan hill range together with several sites of historic or religious importance. It is therefore considered that these points also have a high sensitivity to potential development or visual change.

2.13 Air Ventilation

2.13.1 Site Topology

The proposed development site is surrounded by complex terrains. Mai Po Natural Reserve and Lut Chau are located to the north of the site. Due to the relatively open exposure, winds approaching from the north are unlikely to be significantly interrupted. Kai Shan is located immediately to the west of the proposed development. Moreover, Tin Shui Wai and Yuen Long are located to the west and the south of the proposed development site, respectively. There are a number of residential buildings with heights less than 120 m above ground. Due to the close proximity to these high rise residential buildings and Kai Shan, southerly and westerly winds to the proposed development site are likely to be moderated. To the south east of the site are Long Ping Estate and Tung Tau Industrial Area with building heights ranging from approximately 50 m to 100 m above ground.

Tai Lam Country Park and Lau Fau Shan are significant topographies located to the south and west of the proposed development site respectively. These topographies have peak elevations of over 300 mPD and are likely to have diminishing effects on the southerly and westerly winds approaching the site.

2.13.2 Site Wind Availability

The wind availability at low level, where the wind direction is influenced by the local topography in the surrounding environment, is represented by the Hong Kong Observatory (HKO) wind data. The wind availability at the top of the boundary layer is represented by the Fifth-Generation NCAR / Penn State Mesoscale Model (MM5) wind data.

2.13.2.1 Wind Data from Hong Kong Observatory

The HKO Wetland Park weather station located at about 1300m away is the nearest station to the proposed development in Wang Chau (**Appendix 2.13.1**). The elevation of the station is 4m above the sea level.

Based on the recorded wind data provided by HKO, the most dominant wind throughout the year come from north-eastern, eastern and south-eastern directions. The prevailing wind during summer is from south-eastern direction. The annual and summer (July) wind roses at the Wetland Park weather station for year 2007-2011 are shown in **Appendix 2.13.1**. The monthly mean of the prevailing wind direction and wind speed are given in **Table 2.13.1**.

Table 2.13.1 Monthly mean of the prevailing wind direction and wind speed at Wetland Park weather station (from year 2007 – 2011)

Month	Prevailing Wind Direction (Degree)	Wind Speed (km/h)
January	70	7.2
February	70	6.9
March	80	7.4
April	90	7.5
May	120	7.0
June	160	6.6
July	160	6.8
August	140	6.2
September	80	6.8
October	60	7.0
November	50	6.5
December	50	6.3
Annual	80	6.8

2.13.2.2 Wind Data from MM5

On reviewing the wind availability of Wang Chau, reference has been made to the “*Site Wind Availability Data*” published by the PlanD. The weather data was computed using MM5 version 2.7. The nearest grid to the proposed development is Grid (16, 36). The location of the grid and the annual wind rose at Grid (16, 36) are illustrated in **Appendix 2.13.2**. It can be seen from the wind rose diagram that the most probable wind directions are from east-northeast, northeast, east, north-northeast and east-southeast. The mean wind speed is 7.2 m/s at 596 m above the terrain level. The wind probability data are summarised in **Table 2.13.2** below.

Table 2.13.2 Summary of wind probability data (based on MM5) at 596 m above the terrain level of Grid (16,36)

Wind Direction	Probability (%)
N	3.7
NNE	9.7
NE	13.7
ENE	16.6
E	12.5
ESE	9.3
SE	6.2
SSE	6.5
S	4.6

Wind Direction	Probability (%)
SSW	5.3
SW	4.7
WSW	2.7
W	1.4
WNW	0.9
NW	0.9
NNW	1.3
Total	100.0

2.13.2.3 Wind Data from Other Relevant Studies

Two relevant Air Ventilation Assessment (AVA) studies in vicinity of the Study Area have been reviewed, including the Term Consultancy for AVA Services - Expert Evaluation on Air Ventilation Assessment of Yuen Long Town (AVR/G/11) and Redevelopment of Former Yuen Long Estate (AVR/G/58).

According to the AVA report of Yuen Long Town (AVR/G/11), the prevailing wind direction at 450m above ground level is north-easterly. At this height, the displacement or disturbance from the developments to the wind regime is minimal. When the height is reduced from 450m to 230m, the uni-directional prevailing north-easterly wind will be replaced by three prevailing directions: north-easterly, easterly and southerly, as a result of the proximity of the local massing and topography. When the height is reduced further from 230m to 120m, the urban canopy and topography will play a more influential role and the prevailing wind directions of north-easterly, easterly and southerly become more distinct. Analysis of the site wind availability data from this approved AVA report indicates that the annual prevailing wind directions in the vicinity of the Study Area are north-easterly, easterly and southerly. The southerly wind dominates during the spring and summer months, whilst the easterly and north-easterly wind dominates during the autumn and winter months.

According to the AVA report of Former Yuen Long Estate (AVR/G/58), the wind velocity ranges from 0 to 23m/s from 16 wind directions at 596m above the terrain level and the mean wind velocity is 6.54m/s at 596m above ground. There are eight probable winds which accounted for more than 75% of a year in the grid (16, 36) including ENE, NE, E, NNE, ESE, SSE, SE and SSW.

2.14 Socio-Economics

2.14.1 Housing Mix in the Surrounding Area

As shown in **Table 2.14.1**, the proportion of subsidised housing (PRH and Subsidized Sale Flats) in the TPU Areas (TPU 5.1.5 & 5.1.7, 5.1.6 and 5.2.8; **Figure 2.1.4** refers) and Long Ping Estate is similar to that of all new towns in Hong Kong. This reflects that the current proportion in the Study Area is more or less at an average level. For Yuen Long New Town as a whole, the percentage of public housing is at 22%. This level is comparatively low, showing that there is room for more public housing in Yuen Long.

Table 2.14.1 Proportion of housing type in selected areas/ new towns

Areas/ New Towns	Public Rental Housing	Subsidized Sale Flats	Private Permanent Housing	Others	Total
TPU Areas and Long Ping Estate	31%	26%*	41%	2%	100%
Yuen Long	14%	8%	77%	1%	100%
Tin Shui Wai	59%	21%	20%	0%	100%
All New Towns	35%	22%	42%	1%	100%

Source: For Long Ping Estate: Planning Brief of Long Ping Estate; For others: 2011 Population Census

* Flats in Long Ping Estate that were sold out as at 4 September 2012

2.14.2 Demand for Public Housing and Subsidized Sale Flats

The demand for PRH in Hong Kong has been strong over the last few years. The applicants on the HKHA waiting list for a PRH unit has increased by over 100% from 91,000 in 2004/05 to 189,000 in 2011/12 but only around 11% of the applicants were allocated the PRH units. The average waiting time between 2004 and 2012 is two years (**Table 2.14.2**). HKHA has been striving to achieve its target of maintaining the average waiting time at three years by increasing housing production and encouraging upward mobility among existing tenants. The proposed housing development in the Project site will help HKHA shorten the applicants' average waiting time.

Table 2.14.2 Application for PRH units (2004-2012)

	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012
No. of Live Applicants on the Waiting List	91,000	97,000	107,000	112,000	114,000	129,000	152,000	189,000
Average Waiting Time (Years)	1.8	2.0	1.8	1.9	1.8	2.0	2.0	2.6

Source: Hong Kong Housing Authority

In response to the property slump in the end of 1990s and early 2000s, the production and sale of subsidized flats was halted by the Government in 2002. Until recent years, prices of private properties have surged again and the Government has re-positioned its housing policy to assist low- and middle-income households to achieve home ownership. The resumption of Home Ownership Scheme (HOS) is regarded as one of the immediate measures. As an initial plan, 17,000 new HOS flats would be provided over the four years from 2016/17 onwards, and a general target is to produce an average of 5,000 flats per year when more sites are identified and become available (LegCo Secretariat, 2012). In view of the public's aspiration for early completion of the flats, HKHA has been discussing the implementation details of the New HOS to shorten the time for completing the project (Transport and Housing Bureau, 2012). The Project site can potentially contribute to the sustained supply of HOS flats beyond the above time horizon to meet the medium-term demand for home ownership.

2.14.3 Employment Conditions

The employment conditions of the Project site and the neighbourhood areas should be examined and taken into consideration in the next stages of the Study in order to formulate development proposals optimizing socio-economic benefits for the community, including employment opportunities and relevant community facilities.

Within the total of 9,407 working population in the TPU Areas, the proportion of the population working and residing in the same area is relatively low at 9.8% in comparison with the average in Hong Kong. This suggests that the majority travel elsewhere for employment. Given this, there is a greater percentage of the working population in the area of YLIE (TPU 5.2.8) working in the same area, which is comparable to that in Hong Kong as a whole (16.5% and 17.5%, **Table 2.14.3** refers). All in all, while the proposed YLIEE would certainly create new employment opportunities to the Project site and its vicinity, its effect on providing local employment opportunities for future residents in the Project site should not be overestimated. Good connectivity that allows people to commute to and from the Project site would be conducive to the anticipated dynamic movement of workers.

Table 2.14.3 Proportion of working population with place of work in same district (%)

TPU Areas	Yuen Long Industrial Estate (TPU 5.2.8)	Yuen Long District	HK Territory
9.8	16.5	9.8	17.5

Source: 2011 Population Census

Note: Defined as persons whose place of work and place of residence are both in the same new town or both in areas other than new town areas of the same District Council District. Persons who work at home are excluded

Larger industry employers for residents in the TPU Area are Import/Export, wholesale and retail trades (23%), and Transportation, storage, postal and courier services (13%). On the other hand, the majority of the working population in the TPU Area are employed as associate professionals (23%), clerical support (17%), service and sales (16%) and elementary occupations (15%). The proportion employed as associate professionals and clerical support are greater than in Yuen Long District (18.6% & 16.3%) and in Hong Kong as a whole (19.6% & 15.6%).

Notwithstanding the above, since no information on working population is available for Long Ping Estate along, the employment conditions of residents living in this Estate would need to further understood through further liaison with local residents and the District Officers in order to obtain the full picture.

2.14.4 Future Industrial Estate Development in Hong Kong

It is important that the proposed and future development of industrial estates and related industries account for the YLIEE development. This is to ensure that the new development will integrate with the existing facilities in Hong Kong to create synergies and complementary clusters rather than competing with them directly.

Hong Kong Science Park Phase 3 Development commenced in 2011 and is expected to be completed by 2016 providing world-class infrastructure for technology companies and support services for technological start-ups. In addition, according to the Planning and Development Study in North East New Territories, the northern portion of Ping Che/Ta Kwu Ling will be reserved for high value-added non-polluting I&T related industries. This includes testing and certification services, innovation and technology and environmental industries (NENT NDA, 2009).

During initial meetings, HKSTP expressed their interest in housing more environmentally-friendly manufacturing industries in YLIEE. Examples including biotechnology, pharmaceutical manufacturing, healthy food products, machinery and equipment for specialized manufacturing, telecommunication devices, and etc., which under appropriate control would not cause unacceptable pollution. The proposed plan of the YLIEE

development should cater for and facilitate the intended industrial uses. Close liaison with HKSTP is key to ensure that the proposed development parameters are fit for purpose.

2.14.5 Property Market Conditions

In 2010-2011, the occupancy rate of YLIE reached 99% (HKSTP, 2010/2011). It provides 66.5 ha of developed land and there are about 24,000 m² of site remaining for sale with the land premium currently priced at HK\$ 2,800 per m². In terms of PHD, there are a total 63,600 public housing units situated in Yuen Long District with authorized population of about 188,000. The highest rent within the district is HK\$39 per m² (LegCo, 2011). In terms of private housing development, transactions for private housing in Yuen Long District as at 10th of October 2012 averaged around HK\$ 517 per m² (HK\$ 5,570 per ft²) with a high of HK\$ 683 per m² and a low of HK\$ 348 per m² [12].

¹² Source: Midland Realty

3 KEY ISSUES, DEVELOPMENT CONSTRAINTS AND OPPORTUNITIES

3.1 Land Use Planning

3.1.1 Land Use Interface Issues

The Project site is located at the periphery of Yuen Long Town, featured with semi-rural character and surrounded by a mix of land uses, including villages, YLIE, “CA”, “GB”, roads and rail lines, etc. Some of the uses may not be directly compatible with the proposed public housing and industrial developments on the Project site necessitate interface consideration (**Figure 3.1.1**).

A number of villages are located adjacent to the Project site. Shing Uk Tsuen and Tai Tseng Wai are located to the immediate north of the YLIEE site, with few houses abutting the site boundary. Wang Chau Tsuen and Fung Chi Tsuen are located to the east and south of the Project site. As the villages are dominated by low-rise residential developments, there may be concern on the compatibility with the future developments on the Project site.

The northern part of the PHD site is adjoining the YLIEE site. Although the YLIEE site can potentially be restricted for non-hazardous activities and non-polluting industries only, locating industrial and residential uses in close proximity can potentially be visually and psychologically not in harmony or even cause interface problem.

The western part of the Project site is bounded by “GB” and Kai Shan CA. Without a well balanced scheming, their naturalistic nature may be incompatible with the proposed developments. There are also a considerable number of graves at Kai Shan overlooking the Project site. Any developments on the Project site may be visible from the graves and public objections may be received on fung shui grounds.

There may be interface issues due to conflicting implementation programmes of the YLIEE and the PHD Site, for instance, construction impacts from the YLIEE after occupation of the PHD Site. To ensure compatibility, interface amongst various land uses should be carefully considered and mitigation measures should be proposed to address the issues properly. Opportunities should also be sought to propose future developments that complement and integrate with existing land uses in order to help create a harmonious community.

3.1.2 Integration with Neighbouring Areas

To a certain extent, the Project site is isolated from its neighbouring areas as it is encircled by Kai Shan, a nullah and major roads. There is a nullah along the eastern boundary of the YLIEE Site, separating it from the YLIE. Fuk Hi Street and Hung Tin Road are located along the eastern and southern boundaries of the Project site. They are major roads with heavy traffic which segregating the subject Site from its neighbouring areas.

In order to achieve economies of scale in social and infrastructure planning, better integration of the Project site with its surrounding area should be examined. Opportunities should be explored to improve their connectivity and linkages. Particular attentions should be paid to the existing infrastructures in the vicinity. For example, Long Ping Estate is close to the PHD site with shopping centre, public transport interchange and other community facilities. The neighbouring Long Ping Station provides convenient transportation to urban areas. Opportunities for shared use of community and local commercial facilities should also be exploited. Yuen Long Town, to the further south of the Project site, is a civic and

commercial hub in Yuen Long District. By enhancing the physical, social and economic linkages and connectivity of the Project site with its surrounding areas, an integrated community could be achieved for the benefits of all.

3.1.3 Complementary with Existing Communities and Potential Developments in NWNT

The Project site is located within Yuen Long New Town, close to Yuen Long Town, Tin Shui Wai New Town, Lau Fau Shan and two large-scale potential development projects in the NWNT- Hung Shui Kiu NDA and potential housing sites in Yuen Long South. In view of their proximity and interconnectedness, it would be preferable to clarify their relative positions in terms of housing supply as far as possible although the difference in programme and progress of each study may hinder the practicality. Ownership type (PRH vs. HOS), housing density and the provision of specific housing products could be investigated through this Study.

3.1.4 Optimization on the Use of Land Resources

As mentioned in **Section 2.1.1.1**, there is a strong demand for more industrial estate space and public housing from the society. The Project site has been identified by the PlanD as having potential for PHD and considered by the HKSTP as having potential to accommodate the expansion need of the YLIE. Against this background, there is no doubt that the Project site is valuable land resources capable to help ease the above demands. It is therefore important to use the Project site in an optimum and sustainable manner.

The Project Site is relatively long and narrow at the southern portion and irregular in shape. An efficient layout for the proposed developments should be ensured so as to optimise the use of the land. In formulating development options for the Project site, development parameters and characteristics of the neighbouring developments should be taken into account. The Government's intention of appropriately increasing densities and plot ratios of PRH projects without compromising the living environment, as stated in the 2011-2012 Policy Address, should be considered.

During the layout design process, optimisation of industrial lot sizes and PHD as well as creation of a harmonious setting of a green and people-oriented living environment on the PHD Site and a vibrant industrial cluster in YLIEE site should be taken into account in a comprehensive manner.

3.2 Urban Design

3.2.1 Efficient Use of the Irregular Project Site

The Project Site is relatively long and narrow and irregular in shape. An efficient layout for the proposed development should be produced to optimise the use of the land as well as to create a visually pleasant environment. Further, the opportunities to provide appropriate types and scales of landscape spaces as part of a wider green network such that connections between Kai Shan and existing residents and workers can be preserved or even enhanced.

3.2.2 Development Intensity in Harmony with the Semi-rural Setting

The application of alternative, unconventional housing block types on the Project Site will be fully explored in response to its semi-rural setting of Wang Chau and the demographic characteristic of

the Site Area and Yuen Long. Subject to agreement with client, site specific housing design may be tested as development options in order to maximise the development potential while securing harmony between the proposed developments and the surrounding environment.

3.2.3 Preservation of Vista and Visual Connection to Kai Shan and Chu Wong Ling

The characteristic setting of the Wang Chau site (**Figure 2.2.4**) requires its urban design to resolve the interfacing issues between residential land uses and the industrial estate to the east and CAs to the west, make use of nodal points of reference for the site as provided by the prominent hills that give the area a special identity, and compensate for the lack of accessible landscaped areas that can serve community needs for organised recreational activities. Certain level of visual connection between villages and Kai Shan should be preserved in order not to significantly affect the visual setting of the vicinity and thus result in objection by existing villagers.

To turn this constraint into opportunities, Kai Shan should be capitalised on as the natural backdrop and recreational resources of the future community while future land-use layouts and height profiles within the Study Site is being considered.

Regarding Chu Wong Ling to the east of the site, although it is further away from the Site compared to Kai Shan, its natural setting could also benefit the future community. In this regard, visual connection to Chu Wong Ling should be well preserved as far as possible and this will be taken into consideration in the future development layout plan.

3.2.4 Respecting the presence of graves

With the presence of graves within and along the boundary of the Project Site, building disposition at those locations should pay due regards to the relatively open environment that these graves currently enjoy. A reasonable distance should be kept between these graves and any new development. Effort should also be made to preserve downhill views from the graves such that their favourable environment can be retained. If some graves are located at the centre of development parcels and sanitises the development potential of a significant portion of the Project Site, the feasibility of relocating those graves should also be reviewed to come up with an optimal land-use layout.

3.3 Landscape Design

3.3.1 Pedestrian & Cycle links

The provision of pedestrian links within the site boundary is presently limited, mainly as a result of the OS function over the majority of the landscape. Whilst routes into the Kai Shan hill range exist, these are mainly informal and not legible as publicly accessible routes (see **Figure 3.3.1**). An opportunity exists to establish formal pathways into this area from the wider landscape, local villages and open spaces to provide a recreational resource and to rationalize the numerous informal routes which have been created.

There is potential to consider the connectivity to the built heritage resources of I Shing Kung and Ng Uk Tsuen Tin Hau Temple as part of a series and network of local landscape features. I Shing Kung, which is situated at the southern tip of Chu Wong Ling, was constructed by the villagers in around 1718. Ng Uk Tsuen Tin Hau Temple (rebuilt in 1981) on the other hand is located at the north of the proposed development site.

To promote healthy living and reduce traffic movement, provision of cycle routes within the site linking to existing external routes should be provided, especially to the Long Ping MTR station.

3.3.2 Buffer zone

A significant proportion of the site has been cleared as a result of OS formation and associated facilities. In addition, the interface with the CA and areas of high landscape value to the west of the site has been significantly degraded through creation of informal access tracks and burial grounds. An opportunity exists to address these impacts through landscape restoration and replacement of lost vegetation in order to increase the amount of green space and protect existing resources. This could be achieved through establishment of a 'buffer' zone along the western boundary. This would greatly enhance the visual integrity, natural character and landscape synergy of the proposed development.

3.3.3 Visibility

High ground to the west of the study area, predominantly designated as CA, including the peak of Kai Shan hill and associated ridges provide vantage points for panoramic views across the site. As stated in the HKPSG Chapter 11, it is also generally agreed that 'ridgelines / peaks are valuable assets and their preservation should be given special consideration as far as possible in the process of development'.

The visibility to the site and interrelationship with this area is a key consideration of the landscape and visual assessment which needs to be reflected in the landscape design. In addition, the hillside of Chu Wong Ling also provides opportunities to over look the site from elevated points. An opportunity exists to establish view corridors to maintain the visual connectivity of these areas.

The locations on the buildings of Long Ping Estate, Chu Wong Ling, and Kai Shan range were identified as key VSRs due to their high sensitivity to the proposed development site. The orientation and disposition of the future built form within the site will need to be carefully considered so that clear vistas and view corridors can be maintained and that the existing developments will not suffer from significant detrimental visual impact.

The PHD site when viewed from local visual receptors around the site including the Long Ping Estate and villages such as Tai Tseng Wai, Ng Uk Tsuen, Fuk Hing Tsuen, Chung Sam Wai, Sai Tau Wai and Yeung Uk San Tsuen, is generally considered to be low value in term of visual amenity. An opportunity exists to improve the amenity and visual integration through landscape planting and careful consideration on the layout of built form. Where possible, greening of roofscapes and vertical surfaces should be provided to improve visual characteristics and landscape integration of the scheme.

3.3.4 Recreation and Amenity Green Space

At present there is a lack of valuable amenity green space (parks, recreation grounds) within the immediate vicinity of the site; existing spaces are fragmented and do not sit within an integrated landscape design framework. A strategic landscape design approach which considers the wider setting, function and overall accessibility to the external realm will assist in addressing these issues through provision of appropriate types and scales of landscape spaces as part of a wider 'green network'.

3.3.5 Streetscape

The treatment and quality of landscape and streetscape within the study area varies significantly, especially in relation to the industrial use, which has a negative influence on the overall character of the district. Landscape treatments to streetscape, such as materials, tree and amenity planting should be consistent across these uses in order to maintain a high quality approach to external spaces to improve the overall amenity locally.

3.4 Lands Matter

As mentioned in **Section 2.4**, a small piece of land in the middle portion of the proposed PHD site falls within the boundary of gazetted burial grounds on Kai Shan. Since these permitted burial grounds are set aside for the indigenous residents from the nearby recognized villages, all gazetted burial grounds in the Study Area should be considered as no go areas (**Figure 3.4.1**) unless there is insurmountable constraint.

Some graves including historical clan graves are found within the Project site, in particular at the southern tip and the burial ground area at the PHD site, as well as close to the northwestern boundary of the YLIEE site (**Figure 3.4.1**). The presence of graves does not constitute a no-go area for development. However, it is recommended that these graves shall be retained in-situ as far as possible.

The presence of the identified Tso and Tong lots (**Figure 3.4.1**) does not constitute a no-go area for development. However, these lands would also be considered as potential development constraints.

The proposed development will involve land resumption and clearance costs, etc. In this regard, financial viability may be a constraint of the project. The broad land requirements, broad cost and revenue for the proposed development and infrastructures/ facilities of the recommended development options will be assessed in the “Financial Assessment Study” of the Technical Report No.3 in the later stage of the Study.

3.5 Traffic & Transport

3.5.1 Site Location

The development site is relatively remote and is located to the north of Long Ping Road, to the west of Fuk Hi Street and adjacent to the YLIE and Long Ping Estate. The proposed site occupies a strip of land starting from the elevated section of West Rail at Long Ping Road, follows Long Ping Road then Fuk Hi Street and is terminated at Tai Tseng Wai. At present, the development site contains village houses clustered around Long Ping Road, and some cottage industries located on Fuk Hi Street. A vehicle access is located on Long Ping Road leading to the village houses while the cottage industries on Fuk Hi Street have their own frontal vehicle access.

Fuk Hi Street is of single 2 carriageway configuration with at least 10m wide accompanying footpaths on both sides of the carriageway. At present, Fuk Hi Street carries medium level of traffic which is predominately heavy goods vehicles (HGV) and container traffic for YLIE. Traffic is occasionally intervened by the manoeuvring vehicle entering and leaving the premise on Fuk Hi Street. Adding development occupying 34.4 ha of land will put the carrying ability of Fuk Hi Street to the limit.

3.5.2 Industrial Estate and Industrial Area

At present, the HGV and container traffic dominate in YLIE. Although the YLIE can be accessed via two roads, Fuk Hi Street and Wang Lok Street, Fuk Hi Street was observed to be the preferred one. It is undesirable to have a road carrying traffic of high proportion of HGV adjacent to a densely populated residential development. Besides the environmental issue, developing ingress / egress arrangement would also be a challenge. It would be preferable to divert the HGV using Wang Lok Street rather than Long Ping Road and southern portion of Fuk Hi Street.

Situated next to Long Ping Estate is the Tung Tau Industrial Area. Traffic for the Tung Tau Industrial Area would either use Po Yip Street, Fu Yip Street or the slip road connecting Long Yip Street and Kwong Yip Street. The HGV traffic will use Long Yip Street, Wang Tat Road or Ma Wang Road. The industrial area definitely contributes substantial amount of HGV traffic to the junction of Long Yip Street and Wang Lok Street and the junction of Long Yip Street and Po Yip Street.

High proportion of HGV and container traffic using a junction will hamper the junction performance. HGV and container truck are bulky and require extra space to manoeuvre, accelerate, queue and stop. In dense area like Yuen Long, ensuring a satisfactory operation of junction and road network with HGV as dominant traffic would be another key issue.

3.5.3 Road Network Deficit

Long Ping Road is of dual 2 carriageways configuration connecting Fuk Hi Street and Shui Pin Wai Interchange. It carries medium to low level of traffic. A kerbside access is located on Long Ping Road leading to the village houses. Since majority of traffic is east bound, lesser traffic is observed on Long Ping Road. Traffic accessing the strategic highway will use Long Yip Street, Castle Peak Road and then Pok Oi Interchange to Route 3 which is perceived as a quicker and shorter route. Nonetheless, Long Ping Road offers an alternative, but direct connection to the strategic highway via Shui Pin Wai Interchange.

Fuk Hi Street is the main access to the development site at the moment. Fuk Hi Street carries medium level of traffic with high proportion of HGV. The resilience will be poor if Fuk Hi Street continues to be the major access road of the development site. The proposed public housing site will accommodate more than ten thousand units of flat and generating 2 ways traffic of 750 PCUs in the morning peak and 550 PCUs in the evening peak. The traffic generation is considered to be moderate and could be handled by a single signal junction. Depending on the development layout plan, the development site can be accessed via Fuk Hi Street or Long Ping Road since both roads are of same standard. From traffic point of view, it is preferable if the vehicular access is provided at Long Ping Road which can offer a direct and uninterrupted access to the Yuen Long Highway via Shui Pin Wai Interchange.

The proposed YLIEE, on the other hand, will occupy the existing open storage area where high proportion of HGV is generally observed. In view of the different travel characteristics of the existing and the proposed landuse, the traffic generation and attraction will be further reviewed in due course.

The Shui Pin Wai interchange and junction of Long Tin Road and Ma Wang Road and Wang Tat Road are not all movement junctions. Traffic from Ma Wang Road right turn into Long Ping Road north bound is not possible without using the Tong Yan San Tsuen Interchange. A long detour is resulted.

The presence of nullah, columns of West Rail and the densely developed area adjacent to Long Yip Street limit the scope for junction improvement. Long Yip Street is the major

trunk road connecting Route 3 and Wang Chau area. Since most of the Yuen Long traffic is east bounded, a substantial amount of traffic will use Long Yip Road and then Pok Oi Interchange to Route 3. In other words, the development potential of Wang Chau would hinge on the performance of road network along Long Yip Street.

3.5.4 Walkway Deficit

There are three ways to access the development site from Yuen Long on foot. They are via the at-grade crossing at the junction of Fuk Hi Street and Long Ping Road, via the at-grade junction of Long Ping Road and Fung Chi Road, and the elevated walkway next to Long Ping Estate. The occupants at present do not generate or attract substantial amount of traffic, people movement is observed to be small. The proposed development would accommodate about thirty thousands of peoples and the people movement generated is expected to surge as a result.

The nullah forms a physical barrier which impedes the people movement crossing the Long Yip Street, Ma Wang Road and Wang Tat Road. The raising of Long Ping West Rail station provides a couple of elevated walkway over the Wang Tat Road and the nullah, which further connects to Castle Peak Road on the south and to Long Ping Estate on the north. Residents welcome a continual connection between Long Ping Estate and the Castle Peak Road by means of the elevated walkway. The feasibility of providing an elevated walkway connecting the existing walkway system should be explored, while the impact of increased pedestrian movement on the resident of Long Ping Estate and their level of acceptance need to be taken into account.

Currently the feasibility of extending the elevated walkway from Long Ping Station to Yuen Long South is under investigation. If the proposal is feasible, it will offer a direct and undisrupted journey between the proposed development and Castle Peak Road and Yuen Long South. At this, no attempt is made to quantify the traffic impact; however traffic generation is expected to reduce.

Providing an elevated walkway connecting the proposed development and Long Ping Station and further to Yuen Long Town Centre will offer a direct and undisrupted journey for pedestrian. Currently the feasibility of extending the elevated walkway from Long Ping Station to Yuen Long South is under investigation.

3.5.5 Congested Area in Yuen Long

The newly established residential developments in Wang Chau area include, The Parcville and One Regent Place. They altogether provide approximately 900 residential units. The traffic situation in Wang Chau area is observed to be worsened, in particular at Junction J4 J/O Wang Tat Road, Ping Wui Road and Ma Mui Road and Junction J6 J/O Long Yip Street and Po Yip Steet.

Further development potential at Wang Chau area partly hinges on the performance of the junction and the road network. Amongst the critical junctions, junction of Long Yip Street and Po Yip Street (J6) and junction of Fung Chi Road and Ma Wang Road and Wang Tat Road (J4) are pivotal as they bottleneck the connection between the Wang Chau and the strategic road network.

Majority of traffic from Yuen Long is east bounded and will access to the route 3 via the Pok Oi Interchange. Situated to the west of Yuen Long is the Long Tin Road and the Tong Yan San Tsuen Interchange which is mainly used by the traffic to/from Tin Shui Wai. Traffic to/from Wang Chau has an option of accessing route 3 via Pok Oi Interchange and Tong Yan

San Tsuen Interchange. Nevertheless, the route via Long Yip Street then Pok Oi Interchange is observed to be the preferred one.

East bound traffic using Long Tin Road and Tong Yan San Tsuen Interchange to route 3 will travel farther. Whilst it is feasible to divert the traffic from Wang Chau to use Long Tin Road and Tong Yan San Tsuen interchange for route 3, the diverted traffic will ultimately realize the diverted route, i.e. Long Tin Road and Tong Yan San Tsuen Interchange, is a longer route. A simple strategy of road sign erection to divert traffic to use Long Tin Road and Tong Yan San Tsuen may not be adequate.

Yuen Long is a dense area with many old buildings. Roads in Yuen Long are narrow and are characterized with busy kerbside activity and heavy people movement. It is evidenced that the scope for improving the traffic situation in Yuen Long is limited. Ways to reduce the traffic to/from the developed area of Yuen Long, in particular to/from the Castle Peak Road shall be further studied.

3.5.6 Public Transport Service

Public transport service servicing the development site is scarce. There are two public transport services running on Fuk Hi Street at the moment, MTRCL feeder bus K68 and green mini-bus (GMB) 74. K68 runs between YLIE and Yuen Long Park while GMB 74 runs between Shing Uk Tsuen and Yuen Long.

Adjacent to the development site is the Long Ping Estate within which a PTI containing both franchised bus services and GMB services are found. The franchised bus services include both long distance service like 268B for Hung Hom and 268C for Kwun Tong, and also the intra-Yuen Long service like 68A and 76K. The GMB services supplement to bus and rail service running between Tin Shui Wai and Yuen Long and between Lok Ma Chau and Yuen Long. The GMB services 77, 77P and 79S, run between Tin Shui Wai Town Centre and Lok Ma Chau, and service 77A, runs between Tin Shui Wai Town Centre and Pok Oi Hospital, and stops at Long Ping PTI. Besides, Long Ping PTI is also an intermediate stop to a couple of MTRCL feeder services, including K66, K68, K73 and K74.

Most of the southern part of the development site falls within the catchment area of the Long Ping PTI, i.e. 500m from the PTI; which offers opportunity to share the Long Ping PTI with the proposed development. Analysis shows the Long Ping PTI are of ample capacity. With suitable re-arrangement, the Long Ping PTI can accommodate more public transport services. There is also possibility to provide on-street bus stop on Long Ping Road for complementary purposes.

3.5.7 Rail Service

The development site is elongated and is narrowly overlapped with the catchment area of Long Ping Station. An elongated development site imposes difficulty to provide access to the mass transportation service very often via a single point. An elongated site also implies that, a long walk to Long Ping Station is anticipated for certain parts of the site which would discourage the use of the West Rail. Consideration should be given to extend the catchment area of Long Ping Station, such as providing an elevated walkway to offer an undisrupted connection with the Long Ping station.

The farthest point in the development site is 1.6km away from Long Ping Station. It is considered to be too far to walk and too close to provide dedicated service. Shared service is considered the best option but the potential is hindered by the sporadic development surrounding the site. Surrounding the Project site are the green, villages, such as Tai Tseng

Wai, and YLIE where development density is low. It is a balancing act between ensuring the financial viability and attractiveness of the PT service at the same time.

There is only one West Rail feeder bus service K68 running between YLIE and Long Ping Estate. It offers a free feeder service to the rider of West Rail for YLIE. Currently K68 runs on the Fuk Hi Street. Liaison with MTRCL is necessary for any re-arrangement and, possibly, enhancement of the existing feeder bus service K68 to service the proposed development. However, there is no obligation for MTRCL to provide free feeder bus service for the new development.

3.6 Geotechnics

3.6.1 Foundation Conditions

Given the anticipated thickness of superficial deposits and likely loadings of buildings constructed at the proposed YLIEE and PHD sites, it is likely that deep foundations bearing on Grade III or better rock will be required.

Although there is insufficient data to determine the variation in Grade III rockhead level below the proposed YLIEE and PHD sites, it is anticipated that this may be up to -40mPD based on information from the adjacent sites.

As described in Section 2.6, above, the solid geology of the Study Area is complex, and comprises areas of marble in addition to meta-sandstones and siltstones, and localised granodiorite. There is insufficient existing ground investigation data to confirm the complexity of ground conditions below the proposed YLIEE and PHD sites.

Where the marble has been subject to dissolution, palaeokarst conditions may pose significant problems for foundation design and construction. Such problems previously experienced in the Yuen Long area include an anomalously deep rockhead, with rock locally in excess of 150m below ground level. A steeply inclined and irregular rockhead profile makes the construction of end-bearing piles very difficult. In addition, cavities formed within the marble may be infilled with weak and highly compressible material at considerable depth. The ongoing dissolution and collapse of the marble rock mass results in thick superficial deposits comprising collapse material and weak cavity-fill. Such conditions are problematic for driven pile construction as piles have to penetrate very deep to pass through the cavities and weak material.

A comprehensive ground investigation will be required to develop a suitably detailed ground model for the YLIEE and PHD sites, including the identification of any such features in critical areas of the proposed development. The plan for development may need to be revised to avoid localised areas of deep rockhead or cavities. The foundation designers may also need to consider the use of unconventional techniques if such conditions are identified.

3.6.2 Ground Investigation

Searches of existing ground investigation records held by the GIU, HKGS, BD and by Arup have confirmed that there is insufficient existing ground investigation data to develop a suitably detailed ground model for this study. As such, ground investigation works will be required within the proposed YLIEE and PHD sites.

As the ground investigation will be planned and is likely to be partially completed before a preferred development option has been determined, the ground investigation can only be designed to develop a preliminary ground model for the site in general.

Gaining access to undertake ground investigation works at the proposed YLIEE and PHD sites is proving to be particularly problematic. As described in **Section 2.6.6**, the majority of the proposed YLIEE and PHD site is currently in use for industry, parking, residential or agricultural purposes. The preliminary walkover was used to identify a number of potential areas where ground investigation works could practically be undertaken with minimal disruption to the current operations and local residents. However, according to the currently available land status information, the sites are divided into a large number of small private lots, with government land in between. This makes access very difficult to arrange, particularly as the current operations at the site are not necessarily restricted to individual lots. Liaison with the land lot owners and operators for the site access for ground investigation is still ongoing. Another important consideration is the large number of feral dogs at the site, which pose a potential risk to health and safety, and may prevent safe access for the ground investigation contractor.

In addition to invasive ground investigation, consideration is also being given to the use of geophysical surveying which could be used to identify any major variations in ground conditions and significant features such as faults and cavities. This would involve taking microgravity readings and surveying on a 25m grid across the entire site. Whilst this will be much quicker and less disruptive than drilling, for this type of survey to provide useful information, full coverage of site or at least large areas of the site would be required. Without sufficient coverage, the value of undertaking this type of survey will be undermined. This technique will therefore only be used if access allows sufficient coverage.

It is not possible to predict how long it might take to get access agreed and the scope of works confirmed at this stage. Given the proposed ground investigation works will also need to be reviewed and approved by GEO and the ICU once the scope has been agreed, these problems may cause delays to the proposed ground investigation programme.

Given the current land access restrictions, and the development options not yet evolved, the ground investigation completed at this stage of the project is not targeted to provide adequate data for the design of foundations for individual structures that form part of the preferred development option. It will, however, provide useful information for the development of the preliminary ground model for the YLIEE and PHD sites. This model can also be used to plan further ground investigation works during the detailed design phase. A phased approach to ground investigation is always preferred, especially for complex ground conditions such as those anticipated at this site.

3.6.3 Natural Terrain Hazards

Assuming the facilities within the proposed development will be constructed right up to the proposed YLIEE and PHD boundaries, and subject to the findings of the NTHS, the construction of natural terrain mitigation measures may be required along the lower slopes of the natural terrain hillside immediately adjacent to the proposed YLIEE and PHD sites. Alternatively, prohibiting the construction of buildings within a 50 m buffer zone within the proposed YLIEE and PHD site boundary adjacent to the slopes would negate the need for a NTHS and mitigation measures as the facilities would not meet the inclusion criteria for NTHS.

3.6.4 Site Formation

Assuming the facilities within the proposed development will be constructed right up to the proposed YLIEE and PHD boundaries, and that a relatively flat platform will be required within these boundaries, some modification of existing natural and man-made slopes located close to the western boundary of the site will be required to form the site. **Figures 2.6.2a to**

2.6.2f shows the areas where existing registered features and the toe of the natural slopes fall within the YLIEE and PHD site boundaries. The condition of the existing slopes, requirements for slope modification and any slope stabilisation measures will be further reviewed once the proposed layout for the development has been determined. The findings will be presented in the Geotechnical Assessment and Site Formation report, and NTHS report (if required).

In addition to slope modifications, there is some potential for compressible materials underlying the site which may necessitate the requirement for ground improvement. Such materials may include soft clays and silts within the Alluvium and possible Marine or Estuarine clays and silts. There is not sufficient existing GI data available for the YLIEE and PHD sites to confirm the absence of these materials below these sites. This issue will be considered further once the project specific GI has been completed and further details of the superficial deposits underlying the site are confirmed.

The management of fill and spoil from excavation is an important consideration for site formation. Where possible, the design should seek to balance cut and fill volumes to avoid the need to import fill and dispose spoil off site.

3.7 Drainage

The general stormwater discharge approach for the Project Site is to convey the runoff collected to Shan Pui River via the existing drainage system. In the DMP Review, more than a half of the Project site was considered as paved area in the ultimate landuse scenario. If the landuse characteristics of the site could be retained as far as practicable (no change in paved/unpaved areas), there should be no significant drainage impact on the existing drainage system from the proposed development subject to further investigation.

Due to the low flood protection level of main drainages, any increase in peak runoff to those drainages might worsen the flooding problem, i.e. any increase in peak runoff to Tai Tseng Wai Channel might worsen the flooding problem along the stream at Tai Tseng Wai area. If there is an increase in paved area, further flood mitigation measures might be required subject to further investigation and discussion with DSD. Drainage improvement works such as channel widening might be one of the options but it is difficult to implement due to the required land resumption. Provision of retention tanks, on the other side, might be required as last resort to limit the discharge from the Project site to the existing drainage system at the existing level.

Nevertheless, the section of the watercourse within the Project site will be replaced with the proposed drainage system which will discharge the surface runoff into the Shan Pui River. Peripheral drains will also be constructed alongside Project site boundary to intercept flow from hillside to the proposed drainage system within the Project site. This will be further investigated in the drainage impact assessment studies under the TR-3 – Detailed Assessment on Preferred Option.

3.8 Sewerage

Based on the information from HKSTP on the Water Supply and Sewage Treatment Allocation for YLIE, it is revealed that HKSTP had already paid for a reserve of 36,000 m³/day (ADWF) at YLSTW (refer to **Appendix 2.8.1**) and currently only 4,000 m³/day (ADWF) is used in YLIE with an internal allocation of 12,000 m³/day to all grantees. Therefore, the YLSTW shall retain a reserved capacity to cater for flow up to 36,000 m³/day (ADWF) including additional flow from future extension subject to further investigation and the upgraded capacity of YLSTW.

Further discussion with EPD and DSD regarding the need for upgrading of YLSTW capacity or any other discharge options has been made. It was agreed in principle that considering the remoteness of San Wai Sewage Treatment Work (SWSTW) and the programme implication in SWSTW upgrading works, the option of conveying sewage flows from the proposed Wang Chau developments to YLSTW and designing the proposed EPS upgrading works at YLSTW to cater for the additional sewage flow from the proposed developments is the most preferable. The EPS Study for YLSTW to be carried out by DSD will review the design capacity requirement to take into account the additional sewage arising from this development site. As the YLSTW falls within Deep Bay Water Control Zone where the requirement of “No net increase in pollution loads to Deep Bay” shall be met, pollution load from the additional sewage from the proposed developments has to be offset by removing other existing pollution sources from the catchment. It is also understood that adoption of advanced sewage treatment technologies at YLSTW would also be investigated under the EPS Study.

3.9 Water Supply and Utilities

3.9.1 Water Supply

It was found that the existing NTMWTW alone should have no spare capacity to cater for the additional water demand from the Project site. On the other side, the existing Tuen Mun Water Treatment Works (TMWTW) and Sheung Shui Water Treatment Works (SSWTW) would have no spare capacity to cater for any additional water demand and hence shifting of supply zone amongst various WTWs is not feasible. It is proposed to use ATWTW in parallel with NTMWTW in long term and make connections to the existing DN900 MS fresh water distribution main to supply fresh water to the Project site subject to further investigation. Capacities of WCFWSR, NTMFWPSR, and the associated DN900 MS fresh water distribution main would be checked once the information on the existing water demands is available.

Currently, fresh water is used for flushing within the Project site. The planned salt water supply system currently being under construction did not cover the Project site. Hence, there shall be no spare capacity in the system to supply salt water to the Project site subject to further investigation. Nonetheless, a separate water supply system for flushing within the Project site is still recommended since it could allow flexibility to change the source from fresh water to others (i.e. salt water or treated sewage effluent) for flushing by WSD in the future if required.

3.9.2 Gas Supply

HKCG's future plan for gas supply to the Project site would depend on the predicted gas demand arising from the proposed developments. There are existing medium pressure gas mains along the roads next to the Project site and it is proposed to have new pipeline branched out into the Project site if the predicted future gas demands of the proposed developments do not exceed the spare capacity of the existing pipeline. Otherwise, a new gas pipeline would need to be installed along the existing roads.

The general requirement for gas pipe installations as stipulated in Hong Kong Planning Standards and Guideline (HKPSG) and Highways Department (HyD) Technical Circular (TC) 3/90 shall be followed. The general requirement for installations is summarised in **Table 3.9.1** below.

Table 3.9.1 General requirement for underground gas pipe installation

Common Utilities	Minimum Cover		Separation from Other Utilities & Planting
	Footpath/Areas without Vehicular Traffic	Road/Areas with Vehicular Traffic	
HKCG pipes			
Low Pressure	700 mm	1,000 mm	300 mm
Medium Pressure	1,000 mm	1,000 mm	

3.9.3 Power Supply

Based on the information on the existing power supply network, it is proposed to install new 11 kV cable circuits from the existing cable circuits along Fuk Hi Street and Long Ping Road to the Project site depending on the future demand.

The engineering feasibility and construction programme shall be investigated in next stages of the Study. The general requirement for power cable installations as stipulated in HKPSG and HyD TC 3/90 shall be followed. The general requirement is summarised in **Table 3.9.2** below.

Table 3.9.2 General requirement for underground power cable installation

Common Utilities	Minimum Cover		Separation from Other Utilities & Planting
	Footpath/Areas without Vehicular Traffic	Road/Areas with Vehicular Traffic	
CLP Cables			
132 kV	1,000mm	1,200mm	Working clearance of 300mm from other utilities
11 kV	750mm	900mm	150mm (1m between 132 kV and 11 kV)

3.9.4 Communications

Telecommunication service for the Project site can be branched off from the existing PCCW, HGC, Wharf T&T and Cable TV cables along Fuk Hi Street and Long Ping Road depending on the future demand. The general requirement for cable installations as stipulated in HKPSG and HyD TC 3/90 shall be followed. The general requirement is summarised in **Table 3.9.3** below.

Table 3.9.3 General requirement for underground communication cable installation

Common Utilities	Minimum Cover		Separation from Other Utilities & Planting
	Footpath/Areas without Vehicular Traffic	Road/Areas with Vehicular Traffic	
PCCW cables	450 mm	900 mm	N/A
HGC cables			
HKBN cables			
Wharf T&T cables			
NWT cables			
CTV cables			

3.10 Ecology and Fisheries

3.10.1 Ecology

Project Site

There is no key issue and no no-go area identified within the Project site as the area has been developed and is currently exposed to continuous human disturbance.

Secondary woodland may be identified in the wooded areas within the Project site. The secondary woodland, if any, and its species list will be identified during the vegetation survey to be conducted. Should mature secondary woodland be identified this should be preserved if possible.

Study Area

Any areas or habitats of conservation importance within the Study Area will be identified through desktop study and supplemented by site visits where necessary. Where such areas or habitats might be significantly adversely impacted by development and measures to mitigate such impacts to an acceptable level are impractical, such areas are identified as “no-go areas”.

The locations of the no-go areas within Study Area identified at the desktop review stage are illustrated in **Figure 3.10.1**.

The ponds and the surrounding wet habitats (to be verified during the ecological surveys) in the north and northwest of the Study Area are ecologically linked to the continuous and contiguous pond area in the Deep Bay area. They are located at the edge of the Deep Bay pond area and exposed to a comparatively higher level of disturbance than the inner part of the pond area, but these wet habitats serve as a buffer area surrounding the inner fishponds and protect them from human disturbance. As such, these wet habitats should be protected from development.

As described in **Sections 2.10.1.3 and 3.10.1.2**, there are over 100 butterfly species recorded in Kai Shan (Chan *et al.*, 2012) including 15 species of conservation interest (Fellowes *et al.*, 2002) in which 13 species are considered as rare or very rare in AFCDC (2011). Kai Shan is the only peak in the area and attracts butterfly species which show hill-topping behaviour. It is dominated by grassland/shrubland with some hillside watercourses. Encroachment of the proposed development to these habitats in Kai Shan should be avoided.

Two pieces of land zoned as Conservation Area are located to the west of the proposed PHD Site. In accordance with this zoning, they are also classified as no-go areas to protect their existing natural landscape from the development.

3.10.2 Fisheries

Project Site

As described in **Section 2.10.2.5**, no ponds are present within the Project site. As such, there will be no direct impact on aquaculture activities due to the Project. No no-go area is identified within the Project site.

Study Area

The locations of the no-go areas identified at the desktop review stage are illustrated in **Figure 3.10.2**.

The fishponds within the Study Area should be protected from indirect impacts (such as pollution) on the aquaculture activities, if any.

The ponds to the west of the YLSTW should be protected from development and/or pollution from the development as they are of relatively large area in comparison with other ponds within the Study Area. They are currently inactive (based on a site check conducted in September 2012), which means they can be easily resumed to fish culture, and loss of these fishponds is relatively significant compared to other smaller ponds within the Study Area.

3.11 Cultural Heritage

3.11.1 Archaeology

Overall it can be stated that the proposed sites for public housing and YLIEE have low, very low or no archaeological potential despite the historical background of the area. This is largely due to existing development impacts and topographical low-lying areas. **Figure 2.11.2a** marks areas of no, low and very low archaeological potential. The areas of no potential (green) marked along the east of the Study Area mainly consist of marine muds reclaimed for YLIE and Long Ping Estate, but also the low-lying areas within the YLIEE site at elevations of 3-4mPD which were filled to enable the current open storage areas and light industrial activities.

The area of no potential to the west of the historic village cluster south of Chu Wong Ling is assessed due to a combination of previous impacts including a pond (1974 aerial photograph; **Inset 9-Appendix 2.11.1**) and current major residential development.

Areas marked in brown on **Figure 2.11.2a**, are deemed to have very low archaeological potential. The northern end of YLIEE site, both within and immediately adjacent, consist of an area currently in wet agricultural or residential use. The areas are low-lying at elevations around 4mPD, but have less known adverse impacts than the areas of no potential mentioned above.

Kai Shan hills are deemed to be of very low archaeological potential, due to the thin soil coverage but may include buried ancient graves. The area in the south of the Study Area is also assessed to be of very low archaeological potential and includes adverse development impacts by roads, west rail, new residential developments, and burial grounds. Some potential may exist, but the area is deemed village zone, conservation area and burial ground and is identified as no-go areas for proposed development.

Finally areas of low archaeological potential are marked in light blue on **Figure 2.11.2a**. It consists of most of the Public Housing site area. The area has known adverse impacts from residential development, including concrete paths, steps, surface covering, terracing, utilities and buildings as well as from the road construction. In addition, areas of erosion are visible on the surface. The area is deemed to be of low archaeological potential. The close proximity to areas of potential interest such as in the north west of the public housing site may mean that isolated artefacts could be present; however, existing impacts have severely affected potential for archaeological deposits.

It is anticipated that archaeology will not present a major obstacle to the proposed development with the exception of two areas where field investigation is needed to further assess the archaeological potential. These are:

Area in the northwest of the proposed public housing site (see **Figure 3.11.1b Areas A and C**).

Preliminary assessment shows that this area marked on **Figure 3.11.1b** has the potential to yield Ming to Early Qing dynasty archaeological deposits. Area A is within the proposed public housing site while Area C is outside the current Project boundary (see **Figure 3.11.1b**). The area of interest is defined by topographical elements; it is bounded by a wet low-lying area to its north and east, while to the west the stream with its adjacent wet areas and steep slopes to the south form the boundary. A field survey will have to be carried out to assess the impacts of the proposed development on this area (see **Table 3.11.1**). The area is mostly private and permission is required from the owners or tenants to carry out the field investigation works. Field visit was conducted in November 2012 and permission was sought for the six test pit excavations. In area where no owner/tenant could be found alternative locations were sourced; only one test pit could be positioned on Government Land. No permission was granted to excavate on private land.

Area along the western edge of the YLIEE site (see **Figure 3.11.1b, Area B**).

Despite existing impacts such as hill cutting and filling, pockets of original landform with archaeological potential along the western edge of the site at the foothills of the hill may exist at topographically higher areas (+7mPD). No previous archaeological investigation have been undertaken and the area is topographical and geological similar to sites of known archaeological interest such as Mong Tseng and Cheung Shung Wai. The area is difficult to access since it is entirely occupied by private open storage spaces. It is proposed that a field investigation (see **Table 3.11.1**) be conducted at the same time as area mentioned above and after land resumption.

In addition, the assessment identifies areas outside the Project site, such as the historic village cluster to the north of the proposed sites, southwest of Long Ping Estate and south of Chu Wong Ling as historical activity areas which have moderate to high archaeological potential.

Table 3.11.1 provides a summary of the existing impacts, archaeological potential and proposed action for each section:

Table 3.11.1 Identification of no-go areas

Section	Area	Proposed works impacts	Assessment of potential	Archaeological potential	Proposed Action
Public Housing	Area A in the northwest of the proposed public housing site (i.e. Area A shown in Figure 3.11.1b)	Direct	Area in the northwest of the proposed housing site where surface finds dating to Ming/Early Qing dynasty were noted. The area is in agricultural use and residential/ temporary housing and bounded to the north by a perennial stream. No previous archaeological testing has been conducted within this area. Existing impacts consist of terracing, concrete surfacing and agricultural activities. The surface finds indicate an archaeological deposit exists in this area despite the disturbance from ongoing activities.	Moderate archaeological potential due to the surface finds identified during site walks. Exact location of archaeological potential to be established through field testing.	Field testing including fieldscan, 20 auger tests and four test pit excavations are proposed. Area of interest marked on Figure 3.11.1b (Area A). It should be noted however, that the area is private lands and currently

Section	Area	Proposed works impacts	Assessment of potential	Archaeological potential	Proposed Action
					largely in use. Liaison with the local land owners and tenants has been made and access for site investigation was not permitted.
	Remaining Area in the proposed public housing site	Direct	Perennial stream with area of stream diversion in north; And Lower hill slopes with temporary and residential buildings; concrete covered areas and paths; graves; open erosion patches. The existing development would have adversely affected any potential archaeological deposits and any exposed cut and surface area showed natural soils only.	Low archaeological potential due to existing impacts (see Figure 2.11.2a).	No further action.
YLIEE	Area B. Western edge (Area B shown in Figure 3.11.1b)	Direct	Some areas with minimal existing impacts are located along western edge of the site along the foothills at elevations of +7mPD. Archaeological testing has not previously been conducted. Landform has similarities with landform of known archaeological interest.	Moderate archaeological potential due to topography, similar to sites of known interest.	Field testing including fieldscan, 30 auger tests and 8 test pit excavations are proposed. Area of interest marked on Figure 3.11.1b (Area B). The area is difficult to access since it is entirely occupied by private open storage spaces and largely in use.
	Remaining Area in the YLIEE site	Direct	Previous agricultural fields with minimal known impacts; impacts exist of artificially raised area and partially cut slopes; concrete covered surface; small agricultural area at north is in use shows wet low lying area.	Very low to no archaeological potential due to topographical low location and some existing impacts (see Figure 2.11.2a).	No further action.

Section	Area	Proposed works impacts	Assessment of potential	Archaeological potential	Proposed Action
Other Area (Outside the Project Site)::					
1.Kai Shan	Area C. Kai Shan - Area in the northwest of the proposed public housing site but outside the Project boundary (Area C shown in Figure 3.11.1b)	Indirect	<p>Surface finds dating to Ming/Early Qing dynasty were noted in exposed cuts. The area is in agricultural use and residential/ temporary housing. No previous archaeological testing has been conducted within this area. Existing impacts consist of terracing, concrete surfacing and agricultural activities (orchard).</p> <p>The surface finds indicate an archaeological deposit exists in this area despite the disturbance from ongoing activities.</p>	Moderate archaeological potential due to surface finds identified during site walks.	<p>Field testing including field scan, 5 auger tests and two test pit excavations are proposed.</p> <p>Area of interest marked on Figure 3.11.1b (Area C).</p> <p>It should be noted however, that the area is largely private lands. Liaison with the local land owners and tenants has been made and access for site investigation was not permitted. One alternative test pit can be placed on Government Land.</p>
	Kai Shan - Remaining areas bordering public housing site.		<p>Graves occupy the hill to the north of the public housing area as well as residential buildings and concrete surfacing. While ancient graves may be present and even buried on the slopes the area is deemed of very low potential for archaeology aside of graves due to this soil cover.</p>		<p>Very low archaeological potential due to thin topsoil and sensitive area due to graves, but may contain buried ancient graves (Figure 2.11.2a).</p>

Section	Area	Proposed works impacts	Assessment of potential	Archaeological potential	Proposed Action
					graves is required.
	Kai Shan - Areas bordering YLIEE site	Indirect	Numerous graves occupy the hill slopes; oldest grave may date back to the Song dynasty; aerial photographs (such as 1924) show large bald erosional areas indicating thin surface soil coverage. While ancient graves may be present and even buried on the slopes the area is deemed of very low potential for archaeology aside of graves due to this soil cover.	Very low archaeological potential due to thin topsoil and sensitive area due to graves, but may contain buried ancient graves (Figure 2.11.2a).	Most of the area are gazetted burial ground and has been identified as "no go area" identified in TR-1 Baseline Review Report. However, if associated works are proposed, detailed review of impact on potentially buried ancient graves is required.
2.Chu Wong Ling	Area D. Chu Wong Ling (Area D shown in Figure 3.11.1a)	Indirect - Separated from direct impacts by road	The historic villages have an ongoing recorded history of several hundred years; in addition the location of the villages at the base of a hillock seems to have been a preferred location for ancient settlers. Existing impacts are related to ongoing village development and utility provisions and will have affected potential deposits.	Moderate archaeological potential of the area south of the hillock currently occupied by the villages and new residential areas.	No-go area.
3.Long Ping Estate	Long Ping Estate	Indirect - Separated from direct impacts by road	On reclamation.	No archaeological potential (Figure 2.11.2a).	No further action.
	Area E. Long Ping Estate - Historic villages to south of Long Ping Estate (Area E shown in Figure 3.11.1a)	Indirect - Separated from direct impacts by road	The area south of Wang Chau bears resemblance to locations with historic villages dating back to Ming dynasty. Existing impacts are related to ongoing village development and utility provisions and will have affected potential deposits.	Moderate archaeological potential of the area south of the hillock currently occupied by the villages and new residential areas.	No-go area.
4.Yuen Long Industrial Area	Yuen Long Industrial Area	Indirect - Separated from direct	Former sea inlet and mudflat area which has been reclaimed for the development of the industrial area.	No archaeological potential due to reclaimed area (Figure 2.11.2a).	No further action.

Section	Area	Proposed works impacts	Assessment of potential	Archaeological potential	Proposed Action
		impacts by road			
5.Northern historic villages area	Area F. Northern historic villages area (Area F shown in Figure 3.11.1a)	Indirect - Borders the YLIEE site	The historic villages have an ongoing recorded history of at least 500 years; in addition the location of the villages south of the hillock seems to have been a preferred location for farmers settling in to the area several 100 years ago. Existing impacts are related to ongoing village development and utility provisions and will have affected potential deposits; despite this the longevity of the village is of high archaeological interest.	High archaeological potential of the area south of the hillock currently occupied by the villages and new residential areas.	No-go area.

The review has identified archaeological no-go areas within the Other Area (i.e. outside Project site) which have been marked on **Figure 3.11.1a** and include the villages of Fung Chi Tsuen and Shui Tin Tsuen or south of Chu Wong Ling in the villages of Fuk Hing Tsuen, Tung Tau Wai San Tsuen, Lam Uk Tsuen, Chung Sam Wai and Tung Tau Wai or in the historic villages of Ng Uk Tsuen, Tai Tseng Wai and Shing Uk Tsuen.

The review identified three areas with archaeological potential: in the northwest of the proposed public housing site (i.e. Area A within the Project Site and Area C outside the site boundary) and along the western edge of the YLIEE site (i.e. Area B within the Project Site), marked on **Figure 3.11.1b**. An archaeological field investigation should be undertaken prior to final design and construction phase but after land resumption to adequately assess the area.

It should be noted that the Archaeological Desk-based Review and Proposal for Archaeological Field Survey has been separately submitted to AMO in parallel with this report. The details of assessment of archaeological potential, methodology and scope of archaeological survey, and recommendation for further review studies should be referred to Archaeological Desk-based Review and Proposal for Archaeological Field Survey.

3.11.2 Built Heritage

PHD site

The proposed site does not contain any Declared or Proposed Monuments or Graded Historic Buildings. The desk based study and site visits identified the following nil grade built heritage resources: 1 Pak Kung Shrine (S1), 1 well and shrine (W1) and 12 Graves (10 historic clan graves, 1 abandoned grave site and 1 grave that could not be accessed due to the presence of a large number of wasp nests; the location of this inaccessible grave is shown in **Figures 2.11.4c and 3.11.2**). It is recommended that if the proposed site is developed the grave be recorded after land resumption. The presence of these built heritage resources does not constitute a no-go area for development. However, it is recommended that the shrine and graves be retained as part of the housing site and that the layout plans include retention of the graves and shrine in-situ as far as possible.

YLIEE Site

The proposed extension area of the industrial estate has no built heritage potential. No further investigation will be required for the construction or operational phase.

Other Area

This area contains eleven historic villages, one Declared Monument, twelve Graded Historic Buildings and the Kai Shan burial ground of the Tang Clan. The preliminary assessment has found the following results:

The historic villages are all situated at some distance from the proposed housing and YLIEE sites and there will be no direct impact to these villages during either the construction or operational phases. The traditional rural setting of the villages is no longer in existence and all of the villages have existing visual impacts in the form of modern residential villas, nullahs, modern roads, West Rail, the existing YLIE and the Long Ping Public Housing Site. The proposed extension is not expected to adversely impact the environmental setting of the historic villages during either the construction or operational phases.

The Declared Monument and Graded Historic Buildings are situated within village boundaries and there will be no direct impacts to these resources during either the construction or operational phases of the project. During the operational phase there is potential for adverse visual impact if site boundaries are located in proximity, however, as all of the above buildings are presently located in an environment that has been radically altered in the recent past and no works are planned in areas near to these resources, adverse visual impacts are not expected during either the construction or operational phases.

The Kai Shan burial ground is the property of the Tang Clan and the western boundary of the proposed public housing and YLIEE sites has been designed to avoid this area. The burial ground is a no go area (See **Figure 3.11.2**). They are mainly located outside the Project site boundary but a small portion encroaches onto the proposed PHD site. The western boundaries of the two sites cannot be shifted further to the west. No direct impacts will arise from the proposed projects. Indirect impacts from ground borne vibration may occur if construction works occur in proximity to the graves.

3.12 Other Environmental

3.12.1 Air Quality

3.12.1.1 Potential Constraints due to Existing Local and Regional Air Pollutant Sources

The Study Area is located within the Deep Bay airshed zone, in which the surrounding environs are topographically confined by hills and air pollutant dispersion in this area may be inhibited. A review of EPD's AQMS monitoring data in **Section 2** above has identified that the recent 5 year air quality in Yuen Long showed compliance with the respective new AQO limits for daily SO₂, hourly and daily CO and daily O₃, however, the highest 1-hour average and annual average NO₂ concentrations, as well as daily and annual RSP and FSP concentrations had exceeded the new AQO limits. The high ambient pollutant levels were contributed by both the existing local pollution sources such as roads, chimney, as well as regional pollution emission from the PRD side.

The new AQOs stipulates that the 1-hour average NO₂ limit shall not be exceeded more than 18 times per year, the 24-hour RSP and FSP limit shall not be exceeded more than 3 times per year, while the annual average limit for all pollutants shall be fully complied. Based on the past monitoring data records, it can therefore be concluded that the NO₂, RSP and FSP concentrations are the critical pollutant parameters which would determine the feasibility of

developing the PHD site at Wang Chau. It shall however be noted that the HKSAR governments and Guangdong Provincial Government have been jointly working to reduce the regional emission and a host of comprehensive emission reduction measures is programmed to be implemented for improving Hong Kong's air quality. It is expected that both local and regional emissions would be progressively reduced and the background air quality levels would be much improved in the near future. Potential development constraints identified would be subject to the effect of all planned emission control measures.

3.12.1.2 Potential Constraints due to the Project Development itself

There are no available initial development options at this baseline review stage. However, new associated infrastructure facilities for supporting the development such as new internal/access roads, required widening roadworks, PTI, etc are anticipated. Planned chimneys are also expected within the proposed YLIEE. The potential development constraints due to these sources are briefly described in the sections below. As the current baseline review study is qualitative, the development constraints identified are only based on the general guidelines as stipulated in the HKPSG. The extent of the development constraints would be further addressed and evaluated by detailed air quality assessment in next stage.

Road Emissions

Any new road network within the development areas would generate traffic and hence associated vehicular emissions. In accordance with the HKPSG, a minimum buffer distance shall be allowed for different types of road, as shown in **Table 3.12.1**.

Table 3.12.1 Guidelines on usage of open space site (road and highways)

Pollution Source	Parameter	Buffer Distance	Permitted Uses
Road and Highways	Type of Road		
	Trunk Road and Primary Distributor	>20m	Active and passive recreational uses
		3 - 20m	Passive recreational uses
		<3m	Amenity areas
	District Distributor	>10m	Active and passive recreational uses
		<10m	Passive recreational uses
	Local Distributor	>5m	Active and passive recreational uses
<5m		Passive recreational uses	
Under Flyovers	-	Passive recreational uses	

Note:

[1] The buffer distance is the horizontal, shortest distance from the edge of road kerb to the boundary of open space sites.

[2] Amenity areas are permitted in any situation.

Public Transport Interchange

PTI might also be planned within the Project site. Nevertheless, since 15 December 2011, the Motor Vehicle Idling (Fixed Penalty) Ordinance (Cap. 611) had come into effect that the driver of a motor vehicle must not cause or permit the vehicle to be idling on a road for more than three minutes in any 60-minute period. As such, although there would be vehicles idling within the PTI, the idling period would be very short, and significant impact to any air sensitive uses nearby is therefore not expected. Hence, constraint on the development from the PTI is therefore not anticipated from air quality point of view.

Planned Chimney inside YLIEE

Chimney emission from the YLIEE is one of the key Industrial/Residential (I/R) interface issues that would have potential constraints on the proposed PHD site itself and nearby existing ASRs. According to the HKPSG, the setback distances have been stipulated for industrial chimney, as tabulated in **Table 3.12.2** below.

Table 3.12.2 Guidelines on usage of open space site (industrial areas)

Pollution Source	Difference in Height between Industrial Chimney Exit and the Site	Buffer Distance	Permitted Uses
Industrial Areas	<20m	>200m	Active and passive recreational uses
		5 - 200m	Passive recreational uses
	20 - 30m (*)	>100m	Active and passive recreational uses
		5 - 100m	Passive recreational uses
	30m - 40m	>50m	Active and passive recreational uses
		5 - 50m	Passive recreational uses
	>40m	>10m	Active and passive recreational uses

Note:

- [1] In situations where the height of chimneys is not known, use the set of guidelines marked with an asterisk for preliminary planning purpose and refine as and when more information is available.
- [2] The buffer distance is the horizontal, shortest distance from the boundary of the industrial lot and the position of existing chimneys to the boundary of open space sites.
- [3] The guidelines are generally applicable to major industrial areas but NOT individual large industrial establishments which are likely to be significant air pollution sources. Consult EPD when planning open space sites close to such establishments.
- [4] Amenity areas are permitted in any situation.

The land lease application practice for existing YLIE industrial lots is currently approved by HKSTP on a case by case basis. Hence the future tenants to occupy the proposed YLIEE will not be known until application has been submitted. However, as advised by HKSTP there are 3 target industries in the proposed YLIEE: biotechnology related production; pharmaceuticals; and machinery and equipment manufacturing. The best estimation on the potential chimney sources and corresponding fuel consumption rates is to make reference to the existing industries of similar nature and types in the YLIE. Detailed air quality assessment to be conducted in next stage will work out the maximum allowable fuel consumption rate inside the YLIEE. The total fuel consumption rate shall be capped. SP industries are the major air pollution emitters which would likely cause potential development constraints on the PHD site and hence shall not be considered for YLIEE.

3.12.1.3 Potential Constraints due to the Odorous Sources

Shan Pui River Channel, [REDACTED] and YLSTW are potential odorous sources within the Study Area, but they are all at a large separation distance away from the Project site (480m and 540m from Shan Pui River Channel inflatable dam to PHD and YLIEE, 1020m and 590m from [REDACTED] to PHD and YLIEE, 1260m and 830m from YLSTW to PHD and YLIEE). Based on reconnaissance surveys, odorous smell was only perceived at and near the inflatable dam of Shan Pui River Channel. No odorous smell was perceived at the Project site. It is also found that there are some existing sensitive developments located much closer than the proposed YLIEE and PHD site to these potential odorous sources, including the Ng Uk Tsuen at 240m from [REDACTED] and 460m from YLSTW, Tung Tau Wai San Tsuen at 60m from Shan Pui River Channel inflatable dam. Given the large separation distance to the proposed

development site and based on site surveys, potential odorous impacts associated with these sources are not anticipated. There are no development constraints due to odour.

3.12.2 Noise

3.12.2.1 Potential Constraints due to Construction Noise

Potential noise impact during construction phase would be due to the operation of powered mechanical equipment (PME). Construction noise impacts will not be insurmountable given that noise mitigation measures such as movable noise barrier, enclosure, Quality Powered Mechanical Equipment (QPME) are suitably adopted. Hence it would not impose any development constraints on the proposed site.

3.12.2.2 Potential Constraints due to Road Traffic Noise

A traffic survey has been conducted by Arup. The existing peak traffic flows for Long Ping Road and Fuk Hi Street are about 1,250 (42% heavy vehicle, HV) and 550 (32% HV) respectively. A preliminary prediction on the existing road traffic noise levels at various setback distances from Long Ping Road and Fuk Hi Street has been conducted and the results are presented in **Table 3.12.3**. The noise levels are derived by assuming all receivers are facing with 180° angle of view on existing Long Ping Road and Fuk Hi Street at a speed of 50 km/h on an at grade concrete road. It shall be noted that **Table 3.12.3** only provides a preliminary indication of the existing noise exposure level and the approximate setback distances required for achieving the criteria for different uses.

Table 3.12.3 Hypothetical existing road traffic noise level

Existing Roads[1]	Setback, m	Criteria, dB(A)[2]	L10 (1hr) for different floor levels[4], dB(A)				
			1F – 10F	11F – 20F	21F – 30F	31F – 40F	41F – 50F
Long Ping Road	20	R - 70dB(A) ^[3]	75 – 77	73 – 75	71 – 73	70 – 71	69 – 70
	50		72 – 73	71 – 72	70 – 71	69 – 70	68 – 69
	100		70	69 – 70	69	69	68
	200	E - 65dB(A)	67				
Fuk Hi Street	20	H - 55dB(A)	70 – 72	68 – 70	66 – 68	65 – 66	64 – 65
	50		68 – 69	67 – 68	66 – 67	65 – 66	64 – 65
	100		65 – 66	65	65	64 – 68	63 – 64
	200	63			62		

Notes:

- [1] Based on existing traffic flow and percentage of HV from traffic survey conducted by Arup Traffic Group in Year 2012.
- [2] R – residential premises, E – educational institutions, H – clinics / home for the aged.
- [3] For residential premises, 4m ground level is assumed.
- [4] Assuming 180° view angle.

It can be seen from **Table 3.12.3** that there would likely be noise exceedance at 50m and 20m setback from Long Ping Road and Fuk Hi Street respectively for residential uses. The educational institutions would likely exceed the more stringent noise criterion of 65dB(A), even at a setback distance of 200m from Long Ping Road and 100m from Fuk Hi Street. For clinics / home for the aged with the most stringent criterion of 55dB(A), compliance would be difficult to achieve if no mitigation measures are provided.

It is considered that other than direct mitigation at source, noise tolerant uses, building orientation, building layout design, structural fins, fixed window etc shall be considered and adopted in order to achieve the noise criterion for planned sensitive uses.

It shall be noted that the noise levels presented in **Table 3.12.3** above are based on the existing traffic flow data. When the traffic forecast for the future worst years are available, a detailed road traffic noise assessment will be carried out on the proposed development layout, taking into account the planned internal roads, induced traffic, any proposed road widening etc.

3.12.2.3 Potential Constraints due to Railway Noise

A preliminary prediction has been made based on the WR EP and VEP information. The prediction assumption is summarised in **Table 3.12.4** below.

Table 3.12.4 Rail noise assessment assumption

Parameters	Assumption
<i>Operational data</i>	
L _{max} dB(A)	82.5 on ballast track at a distance of 25m
Number of train cars	9 cars (currently 7 cars condition)
Train speed	80 – 100 km/h
Headway	Total headway of 40 per hour
<i>Assumptions taken in the preliminary prediction</i>	
Number of train cars	9 cars as per EP and VEP
Rail deterioration	3 dB(A)
Deck Reflection	Non-ballast track = 2.5 dB(A)
Façade Correction	2.5 dB(A)
Viaduct Correction	15 dB(A) and 10 dB(A) reduction for near and far tracks respectively, due to plenum effect

The preliminary setback distance required to achieve the respective noise criteria is summarized in **Table 3.12.5**.

Table 3.12.5 Preliminary setback distance required

Area Sensitivity Rating	Nighttime Noise Criteria, dB(A)	Setback Distance, m ^[1]
B	55	200

Notes:

[1] The setback distance base on 180° angle of view.

It can be seen from **Table 3.12.5** that in order to achieve noise criteria for Area Sensitivity Rating of B, the required setback distance would be approximately 200m. At-source mitigation measures such as barrier, semi-enclosure, enclosure should therefore be considered subject to MTRCL's agreement. On the other hand, noise tolerant use, building orientation, building layout, structural fins for the PHD site should also be investigated.

It should be noted that the setback distances presented in **Table 3.12.5** above are based on the preliminary prediction using WR EP and VEP. A detailed rail noise assessment will be carried out on the proposed development layout based on the updated MTRCL's information in next stage.

3.12.2.4 Potential Constraints due to Fixed noise

Fixed noise sources arising from the YLIEE and YLIE is one of the key I/R interface issues that would have potential constraints on the proposed PHD site and nearby existing NSRs, and hence would need to be planned and controlled carefully. Besides, the rural industrial operation to the east of the PHD site including small scale vehicle repair/maintenance

workshops may also impose development constraint. To the west of the PHD site, there is no identified existing or planned noise source.

Open air industrial operations with high noise level generation would impose development constraints and hence are not recommended. Suitable noise mitigation designs such as sound insulating building structures, facade sound insulation, acoustic doors, noise barriers, silencers etc might need to be considered for the new industrial buildings for YLIEE. Subject to detailed fixed noise assessment to be carried out in next stage, suitable passive building design for mitigating noise for the first NSR layer of the PHD site fronting the YLIEE will be considered, if necessary.

3.12.2.5 Potential Constraints due to Helicopter Noise

As mentioned in **Section 2.12.2**, there are difficulties in identifying the details of the helicopter flights as all PLA's information are confidential. Preliminary on-site measurement has been conducted to determine the potential helicopter noise impact on the proposed PHD site. The noise measurement was conducted at the rooftop of Yuet Ping House in Long Ping Estate, proposed YLIEE site, proposed PHD site and rooftops of two buildings in YLIE. **Figure 3.12.1** shows the locations of the helicopter measurement points (HNM). **Table 3.12.6a** below summarizes the measured helicopter noise levels.

Table 3.12.6a Helicopter noise levels

Locations	HNM ^[1]	Noise Impacts, L _{max} dB(A)	Flight path based from site observation
Rooftop at Yuet Ping House ^[2]	HNM01	63	From Yuen Long Plaza towards Yuen Long Trading Centre
		66	From Yuen Long Trading Centre to Yuen Long Plaza
		60	Two helicopters flying over north of YLIE
		70	From Wang Chau to Chu Wong Ling
		62	From Chu Wong Ling to Wang Chau
		68	From Wang Chau to Chu Wong Ling
Northern end of YLIEE site ^[3]	HNM02	74	From YLIE to Chu Wong Ling
		73	From Tai Tseng Wai to YLIE
Southern end of PHD site near Wing Ning Tsuen ^[3]	HNM03	60	From Kingswood Villas to Wang Chau
Rooftop at Ushio ^[3]	HNM04	67	From Hong Kong School of Monitoring to Sewage Treatment Works
		77	From Hong Kong School of Monitoring to Sewage Treatment Works
		67	From Hong Kong School of Monitoring to Sewage Treatment Works
		72	From Hong Kong School of Monitoring to Sewage Treatment Works and then return
Rooftop at Yau Sang ^[3]	HNM05	74	From Tai Tseng Wai to Sewage Treatment Works

Notes:

[1] Helicopter noise measurement locations refer to **Figure 3.12.1**.

[2] Helicopter noise measurement has been conducted on 27 September 2012.

[3] Helicopter noise measurement has been conducted on 9 October 2012.

Based on site measurement, the helicopter noise levels were in the range of 60 – 77 L_{max} dB(A) which is well within the noise criterion of 85 L_{max} dB(A). Thus, excessive helicopter

noise impacts on the proposed PHD site are unlikely and development constraints are not anticipated. Further noise measurements will be conducted at rooftop of Kam Ping House, Long Ping Estate which is at the highest mpd level and in the closest proximity to the proposed PHD site and hence could represent the worst case scenario.

In addition, Civil Aviation Department (CAD) has also been consulted to collate the information on the helicopter noise complaints near Wang Chau. The complaints records in the last 5 years are shown in **Table 3.12.6b** below.

Table 3.12.6b CAD's record on helicopter noise complaint in Wang Chau area

Year	2008	2009	2010	2011	2012
Records	1	6	2	0	0

According to the complaints records, it can be found that the number of complaints has been reduced from 2009 to 2012. There were no complaints recorded in recent 2011 and 2012.

3.12.3 Water Quality

Three natural streams are identified at Kai Shan. Runoffs from Kai Shan catchment are currently collected by these natural streams. The existing discharge points of north, east and south streams are located at the drainage nullah at the west of YLIE, box culverts at Fuk Hi Street and box culverts at Long Ping Road respectively. Water quality impact and the associated aquatic ecological impact may be arisen if stream diversion is proposed. Potential change of hydraulic regime and groundwater tables may lead to side effect as a result of stream diversion.

During construction phase, site runoffs will be a key issue to the nearby water quality sensitive receivers. Uncontrolled construction runoff may cause physical, biological and chemical effects. The physical effects include potential blockage of drainage channels and increase of Suspended Solid (SS) levels in the Deep Bay WCZ. Runoff containing significant amounts of concrete and cement-derived material may cause primary chemical effects such as increasing turbidity and discoloration, elevation in pH, and accretion of solids. A number of secondary effects may also result in toxic effects to water biota due to elevated pH values, and reduced decay rates of faecal micro-organisms and photosynthetic rate due to the decreased light penetration. It is however anticipated that there would not be any insurmountable impacts provided that good site practices and appropriate mitigation measures are implemented. Hence, it would not impose any development constraints on the Project Site.

Additional sewage loading to Deep Bay catchment is anticipated from the proposed development during operational phase. In addition to the provisions of the TM-EIAO, the 'No Net Increase in Pollution Loads to Deep Bay Requirement' shall also be met to provide protection to the inland and marine water quality of the Deep Bay WCZ. The pollutions entering into Deep Bay have already exceeded the assimilative capacity of the water body. Increasing pollution loads to the water body is environmentally undesirable. In accordance with TPB Guideline No.12B, the pollution loads of concern should be offset by equivalent reduction of current loads for new discharge into Deep Bay. As such, pollution loads offsetting, either on-site or off-site, will be required. The sewerage and sewage implication shall be referred to Sections 2.8 and 3.8.

3.12.4 Land Contamination

Since a large portion of the Project site is currently occupied by different types of industrial uses including vehicle maintenance workshop, petrol filling stations, metal workshops, waste

recycling workshops, open storage areas, container yards and open carparks etc., site investigation (SI) is considered necessary and a significant quantity of contaminated soil is anticipated. The possible contaminants would be heavy metals, petroleum, volatile organic chemicals (VOCs), semi-volatile organic chemicals (VOCs), polychlorinated biphenyls (PCBs) etc. All contaminated soils will need to be remediated in accordance with EPD's Practice Guide for Investigation and Remediation of Contaminated Land with the agreement from EPD. Nevertheless, the aforesaid issue would not be insurmountable and would not impose any development constraint provided that all contaminated soils could be fully remediated in spite of the remediation cost, notwithstanding that it may have an implication of the implementation programme subject to the extent and nature of decontamination works.

3.12.5 Waste

Potential impacts due to waste generation during both construction and operational phases of the Project would not be insurmountable, given proper and appropriate mitigation measures and waste management strategies are implemented. No constraints on the development layout are also anticipated.

3.12.6 Hazard

As discussed in **Section 2.12.6**, the nearest existing PHI is located at more than 3km away. PHIs are prohibited inside the YLIE and the proposed future YLIEE. Potential hazard-to-life impacts due to PHIs are therefore not anticipated.

It is confirmed by HKSTP that the proposed Harvest Fatty Acid Methyl Ester and Edible Oil Plant Development at YLIE has been terminated. The quantities of storage and processing of DGs and hazardous substances inside the proposed YLIEE will be controlled by means of administrative measures. Chemical / gas processing plants such as biodiesel and petrochemical plants will also be prohibited inside YLIEE. Development constraints due to DGs storage and processing within YLIEE are also not anticipated.

The key issue on hazard-to-life is therefore associated with the potential toxic, fire and explosion risk to the potential housing site arising from existing DG storage and processing within and in the vicinity of the Study Area (including YLIE). The Commissioner of Mines has confirmed that they have not issued any licence/permit relating to manufacture, storage and use of Cat 1 DG within the Study Area. An inventory of other DGs provided by FSD and EMSD has been collated. The majority of the DGs are stored in underground storage tanks and hence any hazard has been reduced. Those DGs stored on or above ground would pose a relatively higher risk as compared to those underground storage tanks.

Further agreement with EPD on whether a hazard to life assessment is necessary will be sought. Should the risk level due to the DG storage inside YLIE be identified as significant, buffer distance shall be allowed inside the proposed PHD site. It may also pose constraint on the population density in the proposed housing development.

3.12.7 Landscape and Visual

3.12.7.1 Preservation of High Quality Landscape Resources

LRs with high sensitivity include the mixed woodland, shrubs and grassland (LR3), woodlands (LR4), wetlands/fishponds (LR8) and streams/drainage (LR9). It is recommended that impacts to these LR in particular shall be avoided and all suitable measures shall be taken to ensure they are preserved.

The main landscape issue for LR3 and LR4 is the potential impact that the proposed development would have on the trees in these areas. It is recommended that all trees/woodlands within the Project site should be protected and preserved as far as possible in accordance with ETWB TCW No. 3/2006 'Tree Preservation' and ETWB TCW No. 29/2004 'Registration of Old and Valuable Trees, and Guidelines for their Preservation'. These trees/woodland species provide valuable greening, act as a primary cover for soil erosion control, provide habitat for the local species (e.g. bird and butterfly species) and landscape amenity.

In the case of tree felling occurring as a result of the development, ETWB TCW No. 3/2006 recommends that compensatory planting of trees should be provided, as far as possible following a ratio not less than 1:1 in terms of quality and quantity within the Project Site. This means, the total numbers and the aggregated trunk girth size of compensatory trees within the site and off-site, should not be less than that of the trees to be felled. Proposals which deviate from this principle would have to justify the deviation, in order to ensure that the greening opportunity within the site is optimised where feasible. In addition, sufficient space would have to be provided for the planting of the compensatory trees, taking into account the minimum space required to cater for the establishment and healthy growth of the trees.

The wetlands/fishponds (LR8) in the north and northwest of the Study Area are ecologically linked to the continuous and contiguous wetland in the Deep Bay area. They serve as an important habitat as well as a buffer for the wetland species. This landscape resource should be protected from development as well.

The hillside streams/drainage (LR9) should also be protected from the development as they provide important and valuable natural features within a highly altered landscape.

3.12.7.2 Preservation of High Quality Landscape Character Areas

LCAs with high sensitivity include Upland and hillside landscape (LCA3) and rural coastal plain landscape (LCA9). It is recommended that impacts to these LCAs in particular shall be avoided and all suitable measures shall be taken to ensure they are preserved.

As a large part of the proposed development site boundary borders the LCA3 on the west, it is anticipated that this LCA may be affected directly or indirectly from the proposed development. Protective measures should be taken to prevent from any adverse impact to this LCA.

As LCA9 lies well beyond the PHD site it is unlikely to be affected by the proposals and is of low significance in relation to the project.

3.12.7.3 Protection of Visually Sensitive Receivers

VSRs with high sensitivity include residential receptors with the Long Ping Estate and views (where possible) from villages to the east and north of the site including Ng Uk Tsuen, Fuk Hing Tsuen and Sai Tau Wai. It is important that potential visual impacts to these VSRs be avoided or minimised.

The elevated terrain of the Kai Shan Range provides numerous opportunities for panoramic views across the site; the visibility to the site and interrelationship with these locations should be protected.

3.13 Air Ventilation

The buildings to the northeast of the Project site consist of low rise buildings i.e. YLIE and Tai Tseng Wai. These buildings will have less impediment effect on the wind flow. It is anticipated that the wind breezeway will not be reduced significantly at the proposed development site.

Chu Wong Ling with height of around 52m is located to the east of the Project site. Wind from eastern direction will accelerate when it climbs up and passes the slope of Chu Wong Ling. But deceleration occurs when the wind descends towards the proposed site. This will result in a small reduction in wind velocity when it reaches the proposed site.

The buildings to the southeast of the Project site consist of low rise village houses and moderate high buildings (around 50m to 100m above ground) in Long Ping Estate and Tung Tau Industrial Estate. In Long Ping Estate and Tung Tau Industrial Estate, the main streets are aligned in southeastern direction, and the disposition of open spaces and amenity areas are interlinked. Hence, wind from south easterly direction will be less affected.

The following issues will be considered in planning the proposed development layouts:

- Breezeways in the proposed developments should be aligned primarily along the prevailing wind direction (i.e. north easterly and south easterly directions) as far as possible to allow effective air movements to remove heat, gases and particulates and to improve the micro- climate.
- Main streets/wide main avenues between the proposed developments should be aligned in parallel, or up to 30 degrees to the prevailing wind direction (i.e. north easterly and south easterly directions) as far as possible to maximise the penetration of prevailing wind through the district.
- Height variation across the proposed developments with decreasing heights towards the direction where the prevailing wind comes from (i.e. north easterly and south easterly directions) should be allowed as far as possible for better air movements.
- Adequately wide gaps should be at a face perpendicular to the prevailing wind (i.e. north easterly and south easterly directions) as far as possible to enhance air permeability.
- The angle between the axis of the building blocks and the prevailing wind direction (i.e. north easterly and south easterly directions) should be within 30 degrees as far as possible to allow the building blocks to capture more wind for better indoor natural ventilation.

3.14 Socio-Economics

Demands for affordable housing and industrial estates are high in Hong Kong and the proposed development in the Project site has potential to play an important role in delivering real socio-economic benefits to the community. On the contrary, socio-economic issues arising from the proposed development are unlikely provided that it is appropriately integrated within the surrounding community with adequate provision of G/IC facilities and enhanced connectivity and accessibility. In addition, the proposed development needs to be considerate of existing land uses and any relocation or resumption of land is undertaken in an open and sensitive manner. These issues will need to be further investigated as part of the Study.

The proposed development needs to take into account the existing land uses and any relocation or resumption of land is undertaken in an open and sensitive manner. These issues will need to be further investigated as part of the Study.

3.15 Community Engagement

3.15.1 Concerns from the Public

The proposed development on the Project site is in close proximity to Kai Shan CA. On the other hand, the proposed high-rise PHD will likely be visible from Kai Shan as well as the neighbouring villages and Long Ping Estate. Any proposed development may arouse scepticism from local people on its potential environmental and visual impacts. The potential disturbance to the existing graves and burial grounds within the Project site and its vicinity is anticipated to catch the attention of the locals. Since the proposed development would involve the loss of “GB” areas and affect the existing OS uses, there may be strong views from green groups, local residents, OS operators and other stakeholders. The future development will also bring in new residents and workforces, which may raise locals’ concerns on crowdedness of the vicinity.

Yuen Long District Council has been active in the communities and would be a proper channel to establish relationship between the locals and the Project team. In view of housing development, they have a strong urge for the timely resumption of the HOS and the provision of more PRH flats to meet the housing needs of the community. More public housing sites in the district are also desired^[13]. Particular attention should also been paid to the provision of community facilities, considerate traffic system and minimized environmental impacts in regard to the other new development sites in the district^[14]. Also, consultation and/or engagement activities would need to investigate local concerns on industrial use, agriculture, open storage, cultural heritage and green belt conservation, etc.

In view of the above, business operators, green groups, local concern groups, statutory and advisory bodies including Heung Yee Kuk, Ping Shan Rural Committee^[15] and Yuen Long Town Area Committee, as well as the DC, local communities and general public are expected to have a stake on the Project. To facilitate smooth implementation of development on the Project site, Initial Development Options and the Preferred Development Option will be prepared with due consideration to the demand and potential reactions of these stakeholders. Opportunities would also be seized to engage them during the public consultation/engagement period.

[13] Minutes of the 3rd Meeting of Yuen Long District Council in 2011.

([http://www.districtcouncils.gov.hk/archive/yl_d/english/agenda_and_minute/DC/2011/Minutes/YLDC\(2011\)_3rd_Summary\(Eng\).doc](http://www.districtcouncils.gov.hk/archive/yl_d/english/agenda_and_minute/DC/2011/Minutes/YLDC(2011)_3rd_Summary(Eng).doc), accessed at 15:20 on 3 Sept 2012)

[14] Such as the cases of the proposed housing developments in the Former Yuen Long Estate and rezoning of Tung Tau Industrial Estate to residential uses. “Progress Report of Town Planning and Development Committee”, 28 April 2011.

(http://www.districtcouncils.gov.hk/archive/yl_d/chinese/discuss_paper/DC_Paper/2011/DC_Paper_2011_027.pdf)

[15] There are a total of six Rural Committees in Yuen Long district, namely Ha Tsuen, Ping Shan, Shap Pat Heung, Pat Heung, Kam Tin and San Tin.

4 SUMMARY OF DEVELOPMENT OPPORTUNITIES AND CONSTRAINTS

Table 4.1 below summarise the key issues, development opportunities and constraints for different planning, engineering, traffic and environmental aspects, etc of the Project. The context is not fully comprehensive as some of the information are yet to be available at this stage. They need to be continuously reviewed during the course of the Study. Although the baseline desktop studies cannot reach a conclusion on the exact development constraints which can only be determined by detailed assessment, the baseline information can still provide a basis for formulation of initial development options in next stage.

Table 4.1 Summary of issues, development opportunities and constraints

Key Issues	Development Opportunities	Development Constraints
Land Use Planning		
Land use interface issues	<ul style="list-style-type: none"> Propose future developments that complement and integrate with existing land uses would help create a harmonious community. 	<ul style="list-style-type: none"> Interface amongst various land uses should be carefully considered and mitigation measures should be proposed to ensure compatibility.
Integration with neighbouring areas	<ul style="list-style-type: none"> Improved connectivity and linkages between the Study Site and its neighbouring areas would enhance accessibility to local services and transport facilities. 	<ul style="list-style-type: none"> N/A
Complementary with existing communities and potential developments in NWNT	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A
Optimization on the use of land resources	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> An efficient layout for the proposed developments should be ensured.
Urban Design		
Efficient use of the irregular site	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> The irregularity of the Project site may result in development potential lower than a more regular site with the same land area.
Development intensity in harmony with the semi-rural setting	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A
Preservation of vistas and visual connections to Kai Shan	<ul style="list-style-type: none"> Kai Shan as the natural backdrop and recreational resources of the future community. 	<ul style="list-style-type: none"> The preservation of visual connection to Kai Shan either imposes height restrictions and/or non-building areas (for visual corridors) on the Project Site.
Respecting the presence of graves	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> The preservation of graves and the openness of their vicinity reduces the development potential of the Project Site.
Landscape Design		
Improvement of the pedestrian and cycle links	<ul style="list-style-type: none"> An opportunity exists to establish formal pathways into the Kai Shan hill range from the wider landscape, local villages and open spaces to provide a recreational resource and to rationalize the numerous informal routes which have been created. 	<ul style="list-style-type: none"> N/A

Key Issues	Development Opportunities	Development Constraints
	<ul style="list-style-type: none"> • An opportunity also exists to consider the connectivity to I Shing Kung and Ng Uk Tsuen Tin Hau Temple as part of a series and network of local landscape features. • Provision of cycle routes within the site which link to the existing external network, such as the Yuen Long Cycle Track (to the south and east of the site) will be explored. The Yuen Long Cycle Track links the site to Long Ping MTR station although the route does not connect between Long Ping Road and Fuk Hi Street. The track also links into the wider New Territories Cycle Network; the existing route between Yuen Long and Tuen Mun is proposed to receive improvements. A route connecting to Sheung Shui and eventually linking to the Ma On Shan and Sai Kung routes is also proposed. • The proposed cycle track extension project 'Cycle Tracks Connecting North West New Territories with North East New Territories – extension' – Nam Sang Wai Section - will pass to the north of the site through the industrial estate and linking to the Hong Kong Wetland Park area, this presents an opportunity to better connect the development site to this important landscape area. 	
Creation of buffer zone	<ul style="list-style-type: none"> • The creation of buffer zones of wetlands/fishponds to protect important landscape resources within or immediately adjacent to the site will be considered as far as possible. 	<ul style="list-style-type: none"> • N/A
Improvement of visibility	<ul style="list-style-type: none"> • An opportunity exists to establish view corridors to maintain the visual connectivity with Kai Shan ridges and Chu Wong Ling. • When viewed from local visual receptors around the site including Long Ping Estate and villages such as Tai Tseng Wai, Ng Uk Tsuen, Fuk Hing Tsuen, Chung Sam Wai, Sai Tau Wai and Yeung Uk San Tsuen, is generally considered to be fair in term of visual amenity. An opportunity exists to improve the amenity and visual integration through landscape planting and 	<ul style="list-style-type: none"> • N/A

Key Issues	Development Opportunities	Development Constraints
	<p>careful consideration on the layout of built form.</p> <ul style="list-style-type: none"> Greening of roofscapes and vertical surfaces can be provided to improve visual characteristics and landscape integration of the scheme. 	
Provision of recreation and amenity green space	<ul style="list-style-type: none"> Existing spaces are fragmented and do not sit within an integrated landscape design framework. An opportunity exists to provide appropriate types and scales of landscape spaces as part of a wider 'green network' in considering the wider setting, function and overall accessibility to the external realm. 	<ul style="list-style-type: none"> N/A
Improvement of streetscape	<ul style="list-style-type: none"> The treatment and quality of landscape and streetscape within the study area varies significantly. An opportunity exists on landscape treatments to streetscape, such as materials, tree and amenity planting should be consistent across these uses in order to maintain a high quality approach to external spaces to improve the overall amenity locally. 	<ul style="list-style-type: none"> N/A
Lands Matter		
Burial Grounds	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> All burial grounds within the Study Area are no go areas (Figure 3.4.1).
Graves and Tso Tong lots	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> The identified graves and Tso Tong lots within the Project site (Figure 3.4.1) are potential development constraint and they should be retained as far as possible.
Relocation or resumption of land	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Relocation of existing uses may be required and any relocation or resumption of land should be undertaken in an open and sensitive manner.
Land resumption cost	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Land resumption cost, clearance costs, etc. will have implication on the financial viability of the project.
Traffic & Transport		
Fragmented pedestrian connection to the development site	<ul style="list-style-type: none"> An elevated walkway connecting the walkway system of Long Ping Estate and finally the Long Ping Station. 	<ul style="list-style-type: none"> Development site was narrowly overlapped with the catchment area of Long Ping Station.
High density development proposed in a remote site.	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Likely objection from neighbour regarding the surge in traffic volume.
Adjacent to YLIE where high volume of heavy vehicle traffic is found	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Potential environmental issues for a residential development next to a road with high volume of HGV traffic.

Key Issues	Development Opportunities	Development Constraints
Congestion in Yuen Long area	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> In view of a surge of population in Yuen Long, connection to strategic route from YL may be inadequate.
The elongated and irregular shape of the development site	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> An elongated site hindered the attractiveness of walking to the Long Ping Station.
Inadequate signage to divert development away from the congested area in Yuen Long	<ul style="list-style-type: none"> Divert traffic to use Long Tin Road and Tong Yan San Tsuen Interchange for Route 3 to circumvent the congested area of Yuen Long. 	<ul style="list-style-type: none"> Accessing Route 3 via Tong Yan San Tsuen Interchange was actually a longer route. A simple strategy by means of signage would be inadequate to divert the traffic from using Pok Oi Interchange.
Poor existing PT service servicing the development site	<ul style="list-style-type: none"> Proximity of Long Ping PTI offers opportunity to share PT services. 	<ul style="list-style-type: none"> Limited existing PT service to service the proposed development.
Network deficit	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> The junction of Ma Wang Road, Wang Tat Road and Long Tin Road was not an all movement junction. A big detour was resulted.
Geotechnics		
Complex ground conditions including potential for parts of the site to be underlain by karstic marble which may exhibit cavities, very deep and steeply dipping rockhead.	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Buildings are likely to require piled foundations, bearing on Grade III or better rock with a minimum Total Core Recovery of 85%. Very deep or steeply dipping rockhead and cavities within the marble can add much additional cost to construction. Subject to the identification of such features during the ground investigation for the study, the development plan may seek to avoid localised areas where such features have been identified if possible.
Potential impact of natural terrain hazards on areas adjacent to natural slopes.	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> To avoid the potential impact of natural terrain hazards from the adjacent slopes, a buffer prohibiting construction with 50m of the site boundary adjacent to the natural slopes could be applied. Alternatively, natural terrain hazard mitigation measures may be constructed along the site boundary. The requirement for and nature of such measures is subject to the findings of the NTHS.
Drainage		
Flooding risk on the Project site	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Provision of retention tanks as last resort might be required which would result in land implication.
Sewerage and Sewage		
Spare capacity at YLSTW to cater for the additional sewage flow from the Project site	<ul style="list-style-type: none"> YLSTW might be used for sewage treatment and disposal. Discussion with EPD and DSD was made and it was agreed in principle that the option of conveying sewage flows from the 	<ul style="list-style-type: none"> Limited capacity of 36,000m³/day has been reserved at YLSTW for YLIE. Any further increase in sewage flow should seek EPD and DSD's advice.

Key Issues	Development Opportunities	Development Constraints
	proposed Wang Chau developments to YLSTW and designing the proposed EPS upgrading works at YLSTW to cater for the additional sewage flow is the most preferable.	
Water Supply and Utilities		
Spare capacity to cater for the additional water demand from the Project site	<ul style="list-style-type: none"> Existing DN900 MS fresh water distribution main along Fuk Hi Street might supply water to the Project site. ATWTW should operate in parallel with NTMWTW. 	<ul style="list-style-type: none"> Limited capacity at the existing distribution main and the service reservoirs. Limited capacity at both existing NTMWTW and SSWTW.
Spare capacity of utilities services to cater for additional demand from the Project site	<ul style="list-style-type: none"> Utilities services for the proposed developments can be branched off from the existing utilities along Fuk Hi Street and Long Ping Road depending on the demand from the Project site. 	<ul style="list-style-type: none"> Limited capacity at the existing utilities surrounding the Project site.
Ecology and Fisheries		
Mature secondary woodland may be identified in the wooded area within the Project site during ecological surveys	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Identified mature secondary woodland within the Project site, if any, should be preserved as far as practicable (Figure 3.10.1).
Potential habitat destruction at wet habitats in the northern and northwestern parts of the Study Area if the Project site boundary is extended.	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Avoid development and/or indirect impacts on these no-go areas (Figure 3.10.1), which are currently outside the Project site.
Potential habitat destruction at Kai Shan if the Project site boundary is extended.	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Avoid development and/or indirect impacts on these no-go areas (Figure 3.10.1), which are currently outside the Project site.
Potential habitat destruction at the Conservation Area if the Project site boundary is extended.	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Avoid development and/or indirect impacts on these no-go areas (Figure 3.10.1), which are currently outside the Project site.
Potential loss of comparatively large area of inactive fishponds to the west of the YLSTW if the Project site boundary is extended.	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Avoid development and/or indirect impacts on these no-go areas (Figure 3.10.2), which are currently outside the Project site.
Cultural Heritage		
Archaeological resources	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> No-go areas are identified within the Study Area but outside the Project site on Figure 3.11.1a. They include the villages of Fung Chi Tsuen and Shui Tin Tsuen or south of Chu Wong Ling in the villages of Fuk Hing Tsuen, Tung Tau Wai San Tsuen, Lam Uk Tsuen, Chung Sam Wai and Tung Tau Wai or in the historic villages of Ng Uk Tsuen, Tai Tseng Wai and Shing Uk Tsuen. Three areas, Area A, B and C marked on Figure 3.11.1b identified for further investigation. Field investigation is

Key Issues	Development Opportunities	Development Constraints
		needed to adequately assess the impacts of the proposed development.
Built Heritage Resources	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> The burial ground is identified as no go area and a small portion of the PHD site falls within the boundary of the burial ground. The western boundary of the proposed PHD site and YLIEE site cannot be moved further to the west (Figure 3.11.2). The 10 identified historical clan graves (and pending evaluation of the inaccessible grave), Pak Kung Shrine (S1) and well and shrine (W1) located in the proposed PHD site are a constraint and should be retained in-situ as far as possible (Figures 2.11.4c and 3.11.2).
Air Quality		
Vehicular emissions from nearby roads, new internal/access roads, road widening works	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> HKPSG's recommended setback distance shall be considered, i.e. 5m from local road, 10m from district distributor, 20m from trunk road or primary distributor. To be further verified and assessed by detailed modeling in next stage.
Existing and planned Chimney inside YLIEE	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> HKPSG's recommended setback distance shall be considered, i.e. >50m for site with 30-40m height difference from chimney exit, >100m for site with 20-30m height difference, >200m for site with <20m height difference. To be further verified and assessed by detailed modeling in next stage. Emission control on existing chimneys if required needs to be further investigated and agreed. Major polluting industries in YLIEE shall be located as far as possible from ASRs. The maximum fuel consumption rate inside the YLIEE shall be capped. SP industries shall not be allowed inside YLIEE.
Potential odour nuisance from Shan Pui River Channel. YLSTW, [REDACTED]	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> No odour identified based on site survey and hence no development constraints.
Noise		
Construction noise impacts	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> No development constraints. Quiet plant, temporary noise barrier, enclosures etc shall be provided.
Road traffic noise impacts	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Provision of barrier, low noise surfacing, enclosure etc shall be investigated.

Key Issues	Development Opportunities	Development Constraints
		<ul style="list-style-type: none"> SAB design, building orientation/ layout, fins etc for the proposed PHD near the major roads shall be considered.
Potential rail noise impacts on the PHD near the WR	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> SAB design, building orientation/ layout, fins etc for the proposed PHD near the WR shall be considered. Where necessary, barrier or full enclosure on the viaduct shall be considered subject to MTRCL's agreement.
Fixed noise impacts	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Fixed noise sources at the YLIEE shall be properly planned and controlled to acceptable noise limits. Open air industrial operations with high noise level generation are not recommended. Suitable noise mitigation designs such as sound insulating building structures, acoustic windows, acoustic doors, noise barriers, silencers etc shall be considered for the new industrial buildings for YLIEE. SAB design for the first NSR layer of the PHD site fronting the YLIEE shall be considered, if necessary.
Helicopter noise impacts	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> No development constraints but subject to further measurements at rooftop of Kam Ping House
Water Quality		
Construction runoff	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> No development constraints. Good practice and suitable mitigation measures shall be provided.
Sewage discharge	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Have to comply the "no net increase in pollution loads to Deep Bay" requirement. Also see sewerage above.
Land Contamination		
Large quantity of contaminated soil is anticipated.	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> No development constraints in spite of the remediation cost.
Waste		
Generation of waste during construction and operational stages	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> No development constraints.
Hazard		
Potential toxic, fire and explosion risk to the potential housing site arising from existing DG storage and processing within and in vicinity of the Study Area.	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Further agreement with EPD on whether a hazard to life assessment is necessary will be sought. Should the risk level due to the DG storage inside YLIE be identified as high, buffer distance shall be allowed inside the proposed PHD site. It may also pose constraint on the population density in the proposed housing development.

Key Issues	Development Opportunities	Development Constraints
Landscape & Visual		
Preservation of high quality landscape resources	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Avoid development and/or indirect impacts on those areas including the mixed woodland, shrubs and grassland (LR3), woodlands (LR4), wetlands/fishponds (LR8) and streams/drainage (LR9). Compensatory planting of trees should be provided (based on the ETWB TCW No. 3/2006) in case that loss of existing trees would be occurred.
Preservation of high quality landscape character areas	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Avoid development and/or indirect impacts on those areas including Upland and hillside landscape (LCA3) and rural coastal plain landscape (LCA9).
Air Ventilation		
Optimised development layout for better air ventilation by considering the following as far as possible:	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> No development constraints but the following recommendations are made for better air ventilation: <ul style="list-style-type: none"> Breezeways primarily along the prevailing wind direction (i.e. north easterly and south easterly directions). Main streets/wide main avenues in parallel, or up to 30 degrees to the prevailing wind direction. Height variation across the proposed developments with decreasing heights towards the prevailing wind direction. Adequately wide gaps at a face perpendicular to the prevailing wind. Angle between the axis of the building blocks and the prevailing wind direction within 30 degrees.
Socio-Economics		
Potential relocation of existing uses	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Relocation of existing uses may be required and any relocation or resumption of land should be undertaken in an open and sensitive manner.
Community Engagement		
Concerns from the public	<ul style="list-style-type: none"> Local wisdom of the existing communities should be incorporated into the proposal to help create a people-oriented community. 	<ul style="list-style-type: none"> Concerns, demand and potential reactions of the different groups of stakeholders (e.g. anticipated strong views from stakeholders on the possible loss of "Green Belt" and "Open Storage") should be properly collected and addressed during the course of preparation and implementation of the proposed development.

Key Issues	Development Opportunities	Development Constraints
		<ul style="list-style-type: none">• Public engagement strategies should be carefully designed and fit in with the programme of the Study.

5 REFERENCE

Land Use Planning

Census and Statistics Department (2012). 2011 Population Census, available at <http://www.census2011.gov.hk/en/> [Last Revision Date of Website: 25 September 2012]

Development Bureau (2011). “Legislative Council Panel on Housing – Supply of Private Housing Land”, CB(1) 2778/10-11(02), 19 July 2011.

HKSTP (2012). “Industrial Estate”, available at http://www.hkstp.org/HKSTP/en_html/en_corporation3_3.jsp, accessed on 5 October 2012.

The Standard (2012). “Sino Land, K Wah snap up MTR site in \$1.7b joint bid”, 18 October 2012.

TPB (2011). “Broad development Parameters of the Applied Use/Development in respect of Application No. A/YL/182”, 22 July 2011.

Yuen Long District Council (2011). “Yuen Long Town and Tin Shui Wai New Town”, available at <http://www.districtcouncils.gov.hk/yl/en/dchighlights.html>, accessed on 1 Oct 2012.

Geotechnics

Frost, D.V. (1992). Geology of Yuen Long. (Hong Kong Geological Survey Sheet Report No. 1), Geotechnical Engineering Office, Hong Kong.

Geotechnical Control Office (1986). Geology of Hong Kong Island and Kowloon, Hong Kong Geological Survey Memoir No.2, 1:20000 Sheet 11, Geotechnical Control Office, Hong Kong.

Maunsell Geotechnical Services Ltd and Fugro (Hong Kong) Ltd Joint Venture (2007). Final Report on the compilation of the Enhanced Natural Terrain Landslide Inventory (ENTLI).

Scott Wilson (Hong Kong) Ltd (1999a, 1999b) Database of Large Natural Terrain Landslides

Sewell, R.J., Campbell, S.D.G., Fletcher, C.J.N., Lai, K.W. & Kirk, P.A. (2000). The Pre-Quaternary Geology of Hong Kong. Hong Kong Geological Survey, Geotechnical Engineering Office, Hong Kong, 181 p.

Strange, P.J. & Shaw, R. (1986). Geology of Hong Kong Island and Kowloon. Geological Survey Memoir No. 2. Geotechnical Control Office, Hong Kong, 134 p.

Ecology and Fisheries

AFCD, Agriculture, Fisheries and Conservation Department, 2003. Hong Kong Herbarium. Available at <http://www.hkherbarium.net/Herbarium/frame.html>.

AFCD. 2005. *A Field Guide to the Amphibians of Hong Kong*. Friends of Country Parks.

AFCD. 2006. *A Field Guide to the Venomous Land Snakes of Hong Kong*. Friends of Country Parks.

AFCD. 2007. Camera Trap Survey of Hong Kong Terrestrial Mammals in 2002-06. *Hong Kong Biodiversity – AFCD Newsletter* 15: 1-11.

AFCD. 2010. Breeding Record of Black-winged Stilt (*Himantopus himantopus*) in Hong Kong Wetland Park. *Hong Kong Biodiversity – AFCD Newsletter* 18: 9-12.

AFCD. 2011. A Review of the Local Restrictedness of Hong Kong Butterflies. *Hong Kong Biodiversity - AFCD Newsletter* 21: 1-12.

Anon, 2007. Summer 2007 Report: Egretty Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.

Anon, 2008. Summer 2008 Report: Egretty Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.

Anon, 2009. Summer 2009 Report: Egretty Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.

Anon, 2010. Summer 2010 Report: Egretty Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.

Anon, 2011. Monthly Waterbird Counts Data April 2010 – March 2011: Waterbird Monitoring at the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Watching Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.

Anon, 2012a. Summer 2011 Report: Egretty Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.

Anon, 2012b. Summer 2011 Report on Waterbird Monitoring at the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Watching Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.

Anon, 2012c. Winter 2011-12 Report on Waterbird Monitoring at the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Watching Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.

Ballantyne, L., Fu, X.H., Shih, C.H., Cheng, C.Y. and Yiu, V. 2011. *Pteroptyx maipo* Ballantyne, a new species of bent-winged firefly (Coleoptera: Lampyridae) from Hong Kong, and its relevance to firefly biology and conservation. *Zootaxa* 2931: 8-34.

Carey, G.J., Chalmer, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville, D.S., Turnbull, M., Young, L. 2001. *The Avifauna of Hong Kong*. Hong Kong Bird Watching Society. Hong Kong.

CH2M HILL Hong Kong Limited, 2008. Environmental Impact Assessment of Proposed Development at Fung Lok Wai, Yuen Long Lot 1457 R.P. in D.D. 123.

Chan, H.S.R., Chau, W.K., Cheng, W.K., Chow, S.M., Ho, S.C.J., Kan, S.C.J., Lau, W.H.S. and Ng, K.L.E. 2012. *Encyclopedia of Hong Kong Butterflies - Search for Butterflies*. Hong Kong Lepidopterists' Society Limited.

Fellowes, J. R., Lau, M. W. N., Dudgeon, D., Reels, G. T., Ades, G. W. J., Carey, G. J., Chan, B. P. L., Kendrick, R. C., Lee, K. S., Leven, M. R., Wilson, K. D. P. and Yu, Y. T. 2002. Wild animals to watch: terrestrial and freshwater fauna of conservation concern in Hong Kong. *Memoirs of the Hong Kong Natural History Society* 25:123-159.

Karsen, S.J., Lau M.W.N. and Bogadek, A. 1998. *Hong Kong Amphibians and Reptiles*. Urban Council, Hong Kong.

Lee, V. L. F., Lam, S. K. S., Ng, F. K. Y., Chan, T. K. T. and Young, M. L. C. 2004. *Field Guide to the Freshwater Fish of Hong Kong*. Agriculture, Fisheries and Conservation Department, Friends of the Country Parks and Cosmos Books Ltd., Hong Kong.

Lo, P.Y.F., Hui, W.L. 2010. *Hong Kong Butterflies*. Friends of the Country Parks.

Shek, C.T. 2006. *A Field Guide to the Terrestrial Mammals of Hong Kong*. Cosmos Books Ltd., Hong Kong.

Tam, T.W., Leung, K.K., Kwan, B.S.P., Wu, K.K.Y., Tang, S.S.H., So, I.W.Y., Cheng, J.C.Y., Yuen, E.F.M., Tsang, Y.M., Hui, W.L. 2011. *The Dragonflies of Hong Kong*. Friends of the Country Parks.

Wu, S.H. Lee, W. T-c. 2000. Pteridophytes of Hong Kong. *Memoirs of the Hong Kong Natural History Society* 23: 5-20.

Xing, F.W., Ng, S.C., Chau, L.K.C. 2000. Gymnosperms and angiosperms of Hong Kong. *Memoirs of the Hong Kong Natural History Society* 23: 21-136.

Yiu, V. 2011. A new species of firefly from Hong Kong – *Pteroptyx maipo* Ballantyne, 2011 米埔屈翅螢. *Hong Kong Entomological Society Newsletter* 3: 2-6.

Cultural Heritage

AMO files on Sheung Cheung Wai, Tung Tau Tsuen and Mong Tseng Sites of Archaeological Interest

Au Ka Fat, 2001. Report on the archaeological survey on the project of stormwater drainage construction at Sheung Cheung Wai archaeological site, Yuen Long. 元朗屏山鄉上璋圍排洪渠道工程考古調查工作報告(YL35)

Au Ka-fat 1998. Ping Ha Road Widening archaeological investigation. (YL11)

Drainage Services Department. EIA and TIA Studies for the Stage 2 of PWP Item No. 215DS – Yuen Long and Kam Tin Sewerage and Sewage Disposal (YLKTSSD). 2004 (unpublished, AMO, Ref. no. YL47)

Fung Chi Ming 1996. Yuen Long Historical Relics and Monuments, Yuen Long. District Board, Hong Kong.

Fyfe, J.A. Campbell, S.D.G and Lai, K.W. 2000. *The Quaternary of Hong Kong*, Geotechnical Engineering Office, Civil Engineering Department, Hong Kong SAR Government; pp.27 and Figure 2.2.

Hayes, James 1974. *The Hong Kong Region: Its Place in Traditional Chinese Historiography and Principal Events Since the Establishment of Hsin-An County in 1573*. In: Journal of the Royal Asiatic Society Hong Kong Branch Vol. 17 1977.

Hayes, James 1977. The Tang Clan in the New Territories and its Oldest Graves. In: Journal of the Royal Asiatic Society Hong Kong Branch Vol. 17 1977

Hong Kong Geology map sheets 2 (edition 1989) and 6 (edition 1988)

http://www.epd.gov.hk/eia/register/report/eiareport/eia_0942004/pdf/eia_report.pdf

http://www.epd.gov.hk/eia/register/report/eiareport/eia_1492008/EIA%20Report/pdf/FLW_EIA_TOC.pdf

Johnson David, Andrew James Nathan, Evelyn Sakakida Rawski; and Judith A Berling, 1986. *Popular Culture in Late Imperial China*. Studies on China, vol. 4. Berkely University Press

Mo Tsz and Lee Tsz Man 1999. Mong Tseng Wai Hok Chau Ling Archaeological Sites, Journal of the HKAS 15: 1-17

Mutual Luck Investment Limited 2008. *Proposed Development at Fung Lok Wai, Yuen Long Lot 1457 R.P. in D.D. 123*.

Ng Peter Y.L. 1983. *New Peace County. A Chinese Gazetteer of the Hong Kong Region*. Hong Kong University Press.

Ove Arup, 2004. *EIA and TIA Studies for the Stage 2 of PWP Item No. 215DS- Yuen Long and Kam Tin Sewerage and Sewage Disposal*. DSD.

Siu, Kwok-kin, Anthony 1990. 'Mong Tseng Wai, Yuen Long'. Journal of the Hong Kong Archaeological Society. 12(1986-8), pp.163-4.

Historical Documents

Enclosure No. 1 in the Colonial Secretary's Minute of the 24th of April 1899. Translation of Written Statement of Ng K'i-ch'eung, dated 21st April 1899.

Liang Guang yan fa zhi (兩廣鹽法志) 1884. (Ed.) Kunyi Liu. Ancient Chinese book with Chapter on salt making. 55 rolls

Report by Mr. Stewart Lockhart on the Extension of the Colony of Hong Kong, 1898

Aerial photographs

1924 reference H32/12; taken at a height of 11,500'

1974 reference 9872; taken at a height of 12,500'

1998 reference CN21743; taken at a height of 8,000'

Old maps

1914 reference HF, sheet 2 and 5, scale 2inch to one mile

1939 reference HB5, sheet 10, scale 1:20,000

1945 reference HB6, sheet 10, scale 1:20,000

1957 reference L881, sheet 10, scale 1:25,000

1966 reference 912.5125 PUB, sheet 10, scale 800feet to one inch; partially revised in 1967, plotted on revised colonial grid 1963

Socio-Economic

HKSTP (2010/2011). Annual Report 2010/2011.

LegCo (2011). Domestic Rents for New Estates from Memorandum for the Subsidised Housing Committee of the Hong Kong Housing Authority.

NENT NDA (2009). Stage Two Public Engagement Digest November 2009 of North East New Territories New Development Areas Planning and Engineering Study.

LegCo Secretariat (2012). “Special meeting on 14 March 2012, Updated background brief on re-launching of the Home Ownership Scheme and Tenants Purchase Scheme prepared by the Legislative Council Secretariat (Position as at 8 March 2012)”, Panel on Housing, LC Paper No. CB(1) 1259/11-12(04), 8 March 2012.

Transport and Housing Bureau (2012). “Housing Issues”, Panel on Housing, CB(1) 2355/11-12(01), July 2012.