14. EIA on Underpass Road Serving the Planned WKCD

14.1 Introduction

14.1.1 Background

The idea and form of developing a site of approximately 40 ha on the northern shore of the magnificent Victoria Harbour of Hong Kong for arts and cultural facilities has had a rich history of discussion in the Hong Kong community. As a result of those discussions, a community consensus has been reached that the vision of Hong Kong should be to develop the area, now called the West Kowloon Cultural District (WKCD), into a world-class integrated arts, cultural, entertainment and commercial district. Those discussions have suggested a list of Core Arts and Cultural Facilities (CACF) including 15 performing arts venues, a cultural institution with museum functions (named “M+”) and an Exhibition Centre (EC).

In terms of planning, the community remarked that the WKCD should not be seen as an isolated development. Accessibility from and connectivity to the neighbouring community should be carefully thought through to help integrate the arts and cultural facilities in the WKCD with its neighbouring areas with a view to cultivate cultural ambience in the district and its immediate vicinity. Ample open space and a vibrant harbour-front should be provided to respond to the growing trend towards lowering building density, greater public awareness about good harbour-front planning and rising public aspiration for quality of life.

The West Kowloon Cultural District Authority (WKCDA), empowered by the WKCDA Ordinance (Cap. 601), was set up by the Government with the full support of the Legislative Council (LegCo) in October 2008 to take forward the WKCD project.

The WKCDA is responsible for the preparation of a comprehensive Development Plan (DP). The DP was submitted to the Town Planning Board (TPB) on 20 December 2011 in accordance with the WKCDA Ordinance (Cap. 601). The draft DP (No. S/K20/WKCD/1) was gazetted under section 5 of the Town Planning Ordinance (Cap. 131) on 30 March 2012. On 8 January 2013, the Chief Executive in Council, under section 9(1)(a) of the Town Planning Ordinance (Cap. 131), approved the draft DP. The approved DP (No. S/K20/WKCD/2) now serves as the basis for implementation. The project area and project layout to be taken forward in this Schedule 2 EIA is shown in **Figures 14.1.1**.

14.1.2 Designated Projects under the EIA Ordinance

The Project referred to in this chapter is the individual Schedule 2 Designated Project “an underpass more than 100m in length under the built areas (Item A.9, Part I, Schedule 2)”, which forms part of the Schedule 3 project for the WKCD development.

14.1.3 Objectives of the EIA Study

In accordance with the EIA Study Brief (ESB-237/2011) issued on 21 November 2011, the EIA Study aims to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and associated works that will take place concurrently. This information will contribute to decisions by the Director of Environmental Protection on:

(i) the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project and associated works, and their staged implementation;

(ii) the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences; and

(iii) the acceptability of residual impacts after the proposed mitigation measures are implemented.

Section 2.1 of the EIA Study Brief sets out the specific objectives of the EIA study as follows:

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

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

(iii) to provide information on the consideration of alternative options of the Project including alternative scale/size, extent, layout, configuration/orientation, alignment, design and construction methods with a view to avoiding and minimizing potential environmental impacts to environmentally sensitive areas and sensitive uses; to compare the environmental benefits and dis-benefits of different options; to provide reasons for selecting the preferred option(s) and to describe the part environmental factors played in the selection of preferred option(s);

(iv) to identify and quantify emission sources, including air and gaseous emission, noise emission, sewage and wastewater emission, waste generation, contaminated materials, and determine the significance of impacts on sensitive receivers and potential affected uses;

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

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

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

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

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

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

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

(xii) to identify, within the study area, any individual project(s) that fall under Schedule 2 of the EIAO; to ascertain whether the findings of this EIA study have adequately addressed the environmental impacts of those projects; and where necessary, to identify the outstanding issues that need to be addressed in any further detailed EIA study; and

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

14.1.4 Key Environmental Issues

The EIA study shall address the likely key issues specified under Clause 3.2 of the EIA Study Brief, together with any other key issues identified during the course of the EIA study:

(i) the potential air quality impact on sensitive receivers from the construction and operation of the Project and associated works, and the potential air quality impact on the Project from the air pollutant emission sources (such as vehicular emission, exhaust gas from ventilation buildings, emission from marine vessels); the potential odour impacts and nuisances from New Yau Ma Tei Typhoon Shelter, with a view to assessing and recommending sound engineered mitigation proposal(s) to avoid or minimize such impacts and nuisances to the maximum extent practicable;

(ii) the potential noise impact on sensitive receivers caused by the Project and associated works, including the impact from construction equipments during construction and operational noise impacts from road traffic, fixed noise sources, marine traffic, railways and helicopter (if applicable);

(iii) the potential water quality impact caused by the Project and associated works, such as works associated with modification of seawalls, drainage and sewerage provisions, spent cooling water discharges, overflow bypass of sewage pumping stations (if applicable) and dredging works of other marine structures (if applicable);

(iv) the potential sewerage and sewage treatment implications, taking into account the staged implementation of planned developments within the Project;

(v) the potential impacts of various types of wastes, including excavated materials from construction works, construction and demolition wastes, and chemical wastes generated from the construction and operation of the Project and associated works;

(vi) the potential land contamination issue within the Project site;

(vii) the potential landscape and visual impacts caused by the construction and operation of the Project, which involves the introduction of a new urban development at a prominent location of the Victoria Harbour, including day-time and night-time visual impact from the Project;

(viii) the potential impact on ecological sensitive areas, the assessment of which shall be based on a field survey of at least 4 months covering the wet and dry seasons;

(ix) the potential fisheries impacts, if the dredging works associated with the construction of the possible piers/viewing platform will be involved in the Project; and

(x) potential cumulative environmental impacts of the Project, through interaction or in combination with other existing, committed and planned projects in the vicinity of the Project (such as Hong Kong Section of Guangzhou - Shenzhen - Hong Kong Express Rail Link, Road Works at West Kowloon, Proposed Road Improvement Works in West Kowloon Reclamation Development Phases I and II, Central Kowloon Route), and that those impacts may have a bearing on the environmental acceptability of the Project.

14.1.5 Use of Relevant Studies

This Schedule 2 EIA has made use of previous findings from the preliminary environmental assessments conducted as part of the Conceptual Plan Options for the WKCD project completed between 2010 and 2011. Previously approved EIA reports have also been referred to in this study, including the following:

- Hong Kong Section of the Guangzhou – Shenzhen – Hong Kong Express Rail Link;

- Road Works at West Kowloon; and
- Kowloon Southern Link.

14.1.6 Structure of the Schedule 2 EIA Report

This Schedule 2 EIA report has been structured as follows:

- *Section 14.2 – Project Description* presents a description of the project including consideration of alternative options and concurrent projects
- *Section 14.3 – Air Quality Impact* presents the approach, findings and recommendations from the air quality impact assessment
- *Section 14.4 – Noise Impact* presents the approach, findings and recommendations from the noise impact assessment
- *Section 14.5 – Water Quality Impact* presents the approach, findings and recommendations from the water quality impact assessment
- *Section 14.6 – Sewerage and Sewage Treatment Implication* presents the approach, findings and recommendations from the sewerage and sewage assessment
- *Section 14.7 – Waste Management Implication* presents the approach, findings and recommendations from the waste assessment
- *Section 14.8 – Land Contamination* presents the approach, findings and recommendations from the land contamination assessment
- *Section 14.9 – Ecological (Terrestrial) Impact* presents the approach, findings and recommendations from the terrestrial ecology impact assessment
- *Section 14.10 –Landscape and Visual Impact* presents the approach, findings and recommendations from the landscape and visual impact assessment
- *Section 14.11 – Environmental Monitoring and Audit Requirements* summarises the environmental monitoring and audit requirements specified in Section 14.3 to 14.10
- *Section 14.12 – Conclusions* summarises the findings and recommendations from the environmental impact assessment
- *Section 14.13 – Implementation Schedule of Mitigation Measures* summarises the schedule for implementation of mitigation measures specified in Section 14.3 to 14.10

14.2 Project Description

14.2.1 Existing Site Conditions

The site for the underpass road is located within the proposed WKCD site as shown in **Figure 14.1.1**. The site is currently zoned as “West Kowloon Cultural District Development Plan Area” under the Approved South West Kowloon Outline Zoning Plan (No. S/K20/28) gazetted on 8 January 2013, and combined with the proposed WKCD basement, comprises approximately 15ha of land bordering the Jordan/Tsim Sha Tsui area. The site reserved for the underpass road is currently occupied by works sites, local roads, temporary storage / parking facilities, some existing infrastructure and utility facilities, the existing Tsim Sha Tsui Fire Station and the works site and temporary works areas for the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) project.

14.2.2 Project Components

The underpass road forms part of the infrastructure and supporting facilities for the WKCD development, in particular it is an integral part of the WKCD basement structure. The underpass road is located mainly on the WKCD Basement Level 1 (B1) (between +0.6mPD and +1.65 mPD), except at the vehicular access points where the underpass road connects to existing ground level roads adjacent to the WKCD site. There are three access points to the underpass road (shown in **Figure 14.2.1**), one at Lin Cheung Road underpass, one at the junction with the proposed WKCD Park drive (extension of Nga Cheung Road), and one at Canton Road. Due to the delayed relocation of the Tsim Sha Tsui Fire Station, the access point at Canton Road will not be constructed until after relocation of the Fire Station, and an interim access point will be provided at Austin Road West until the permanent access point at Canton Road is constructed, after which the interim access road will be closed off permanently. After entering WKCD, there will be a carriageway route along the centre of the basement at +0.6mPD which provides access to each building development. In addition, the access also connects the carpark, coach parking and loading/unloading areas inside the basement.

The proposed underpass road is approximately 1400m in length which is comprised of three distinct sections (shown in **Figure 14.2.1**).

Section I comprises the underpass road with approach ramps linking up the Canton Road / Interim Austin Road West entrance (at level +5mPD) and the central roundabout at the Lin Cheung Road entrance (at level +0.6mPD) is a 10.3m standard wide single 2 lane carriageway with service roads on either side for loading / unloading facilities. A full highway standard headroom of 5.1m is provided such that all vehicle types can enter into the basement level. The central Lin Cheung Road roundabout is designed as a free flow roundabout with 30m inner radius. The roundabout will enable traffic from the Lin Cheung Road Access to go into the internal circulation system of WKCD without delay.

Section II (at level +0.6mPD) continues from Section I as a 6.75m standard dual 2 lane road east-west to an internal roundabout of 45m in diameter. Pick up/drop off lay-bys are provided along the basement driveway. This section has links to a service road running along the northern perimeter of the site, and access points to the carpark at Basement Level 2 (B2) (at level -5mPD).

Section III continues from the internal roundabout and routes south and then west before rising in level to clear the existing MTRC railway tunnels and connect to the Park Drive. This section is a 10.3m standard wide single 2 lane carriageway with lay-bys and servicing accesses. The west entrance will be connected to the new at-grade access road running along the outside perimeter of the portal of the Western Harbour Crossing which will connect to both the at-grade and elevated junctions of Austin Road West and Nga Cheung Road.

Vehicles accessing the district will mainly use the depressed junction at Austin Road West and Lin Cheung Road. The alignment and profile of the underpass road is shown in Figures 14.2.2a to 14.2.2j.

14.2.3 Need of the Project

14.2.3.1 Purpose and Objective of the Project

The main purpose of the underpass road is as one of the measures to meet the 'accessibility and connectivity' aspect of the overall WKCD development objectives mentioned in **Section 14.1.1**. With a site area of approximately 40ha, the WKCD development requires a central road network to ensure effective

movement of people and goods from east to west. The original design for the underpass road is based on Foster + Partners Conceptual Plan (CP) for the WKCD, in which one of the main objectives of the WKCD is to provide a people-dominated and traffic-free environment at ground level. This led to integration of this east – west road with the WKCD basement to form the underpass road under this study.

14.2.3.2 Environmental Benefits of the Project

The main environmental benefit that can be attained from the Project is with respect to noise. As the main 'spine' of the vehicular network within the WKCD site, locating this at basement level will avoid any traffic noise impact above ground, and will also free up more space at ground level to maximise pedestrianisation and to allow for provision of landscaping and planting to enhance the landscape and visual aspect of the WKCD development.

14.2.3.3 Scenario with the Project

The WKCD is an important strategic project that will support Hong Kong's development as a creative economy and global metropolis, and is a major initiative to meet the long-term infrastructure needs of Hong Kong's arts and cultural development. To support this large-scale development with its vast range of travel needs while meeting the goal to provide access and mobility for all, an efficient and effective internal transportation system is necessary. The underpass road forms the main spine of the vehicular network within the WKCD site, and serves to connect all the Core Arts and Cultural Facilities (CACF) and Other Arts and Cultural Facilities (OACF) as well as hotel, offices and residential (HOR) facilities with a centralised road network that provides the major entry and exits points to and from the WKCD. With the underpass road in place, all road access/egress to/from the WKCD are interconnected and traffic from any one of the major external road networks adjacent to the WKCD (such as Canton Road, Austin Road West and Lin Cheong Road) can easily navigate to each and any of the major WKCD facilities, allowing for convenient spreading of traffic loads and minimisation of vehicle mileage. The provision of an internal WKCD road network also relieves pressure on adjacent roads by taking traffic destined for WKCD away from 'through traffic' passing by along adjacent roads, thus reducing potential speed conflicts and traffic queues associated with frequent pull-in/pull-out of vehicles at pickup/dropoff laybys.

14.2.3.4 Scenario without the Project

In the absence of this main underpass road through WKCD, there will be no direct vehicular access to WKCD facilities. Access will be restricted to the adjacent external roads at the northern and eastern perimeter of the WKCD development, where visitors/workers have to disembark and complete the remainder of their journey by foot. While this may be acceptable for tourists and commuters, it would be impractical for operation of the CACF and other facilities, which would involve a large crowd of people attending various functions, events or performance activities and require regular transfer of potentially large and fragile goods/equipment for specific arts/cultural events. Alternative access may be provided by individual local vehicular access routes to each WKCD facility, but this will create a very inefficient road network that not only takes up valuable space but may also create traffic and congestion problems. The environmental implications of this includes increased idling vehicular emissions, possible noise nuisance from irritated drivers, and cumulative impacts on operation of nearby road networks such as Canton Road and Austin Road West.

14.2.4 Consideration of Alternative Development Options

The underpass road was conceived as part of the CP design by Foster + Partners. Their justification for proposing an underground road was to provide a people-dominated and traffic-free environment at ground level, i.e. to prioritise pedestrians and public transport over private vehicles. However, possible alternative options for this main WKCD road include provision of a ground level road, or an elevated (bridge) road. **Table 14.2.1** compares the environmental benefits and disbenefits of these three road options.

Table 14.2.1: Comparison of environmental benefits and disbenefits of options for the main WKCD road

	Underpass Road	Ground Level Road	Elevated Road	Preferred Option
Air Quality	Dust will be generated during construction phase. During operation phase, vehicular emissions confined within enclosed space, requires extraction via ventilation systems. ASRs such as residences and visitors to WKCD amenities mostly indirectly affected.	Dust will be generated during construction phase. During operation phase, vehicular emissions unconfined and emitted at ground level. ASRs such as residences and visitors to WKCD amenities may be directly affected.	Dust will be generated during construction phase. During operation phase, vehicular emissions unconfined and emitted above ground level. ASRs such as residences and visitors to WKCD amenities may be directly affected.	Underpass Road may be preferable as emission points can be planned and designed for least impact on nearby ASRs.
Noise	Noise will be generated from use of PME during construction phase. During operation phase, vehicular noise confined to underground space. No noise impact on above ground NSRs.	Noise will be generated from use of PME during construction phase. During operation phase, vehicular noise unconfined at ground level. NSRs at or near ground level may be directly affected.	Noise will be generated from use of PME during construction phase. During operation phase, vehicular noise unconfined above ground level. NSRs above ground level may be directly affected.	Underpass Road
Waste	Excavation activities will generate a relatively larger amount of C&D materials.	A small amount of C&D materials will be generated from site formation activities.	Some C&D materials will be generated from site formation and substructure construction works.	Ground Level Road
Landscape & Visual	Construction site will generate landscape and visual impacts during construction phase. During operation phase, ground level areas will be free for landscaping and planting. Visual impact limited to temporary ventilation shafts.	Construction site will generate landscape and visual impacts during construction phase. During operation phase, there will be permanent loss of area for landscaping. Visual impact can be mitigated with streetscaping.	Construction site will generate landscape and visual impacts during construction phase. During operation phase, there will be some loss of area for landscaping. Significant visual impact to nearby VSRs. May not be effectively mitigated.	Underpass Road

Based on the comparison results, the underpass road option is clearly the most environmentally preferable option to adopt, with the exception of waste generation. However, avenues for reuse and recycling of excavation materials, both within WKCD site and by other projects within Hong Kong will be sought to minimise the amount of waste requiring disposal. Some of the excavated materials, if suitable, may be re-used and backfilled to form the profile of the Park, subject to scheduling and other constraints. This will improve the environmental performance of the waste aspect related to the underpass option. Further details relating to waste management options are provided in **Section 14.7**.

14.2.5 Consideration of Alternative Construction Methods and Sequences of Works

For construction of the underpass road, the major construction activities comprise excavation, road paving, and utilities laying (for associated roadside lighting and signs). Excavation is by far the most significant component of the construction activities involved, and alternatives for road paving and utilities laying are insignificant in comparison, hence only the alternative construction methods for excavation is discussed. It should be noted that the underpass road is an integral component of the WKCD basement, and must be constructed as part of the basement. Therefore, construction of the underpass road is affected by the same constraints affecting construction of the WKCD basement, and only the cut and cover excavation method is feasible for the soft ground that comprises the WKCD site.

Two options for open cut excavation are available: open cut with temporary cut slopes, or via excavation lateral support (ELS) system. The temporary cut slope option is the simplest method for open cut excavation, however this requires extensive working space surrounding the excavation to provide stable temporary cut slopes. As the WKCD basement extends close to the site boundary which is bounded by Victoria Harbour to the south and trunk roads to the north and east, this option would not be feasible. The ELS system method is considered appropriate as it allows excavation with vertical sides using lateral support by either diaphragm walls or similar ELS system, which can meet the site constraints. From an environmental perspective, the ELS system method minimises the excavation area and may reduce the potential construction dust release compared with the cut slope option. Excavation via ELS system by bottom-up open cut method is recommended as details of the superstructures above the basement are not available at this stage, hence this construction method would be technically more straightforward than other methods (such as top-down excavation). A permanent diaphragm wall is required to provide lateral support to the ground and limit groundwater inflow during construction. In view of the deep excavation, a stiff lateral support system is required to control the lateral movement as well as prevent potential settlement to adjacent ground, structures and property. Variations to this recommended method, such as use of open cut battered side slopes within the basement footprint, may be adopted by the Contractor, and will be verified during detailed design stage.

For disposal of the excavated materials, two options are considered: disposal by trucks, or disposal by barges. Construction of the WKCD basement is anticipated to generate large quantities of excavated materials that require off-site disposal on a daily basis. Disposal by trucks must make use of the existing road network and may generate additional dust and noise impacts. The trucks will also add to the already high traffic volumes on Canton Road and the adjacent urban road network, which may induce disturbance to traffic flows and simultaneously hamper the efficiency of the disposal process. As the WKCD site is on the harbourfront, disposal by barge is recommended. There is an existing barging point situated within the WKCD site which is being operated by MTRC for construction of the West Kowloon Terminus. It is proposed that the WKCD project will make use of the barging point for disposal of excavated materials as far as practical to match the construction programs, and trucks will mainly be transporting the excavated materials from the excavation area to the barging point. As the barging point is located within the WKCD site, the use of public roads and associated impacts will be minimised.

The construction sequencing for the underpass road is directly tied to that for the WKCD basement, and there are two sequencing options available:

- Construction as one whole entity at the same time; or
- Construction as subdivided zones at different times.

To construct the basement as one whole entity would require a huge number of construction plant and equipment working in synchronisation. While this is technically feasible, from an environmental perspective, this option would potentially generate the greatest magnitude of construction phase impacts due to the huge extent and number of plant operating on the WKCD site at the same time. Construction as subdivided zones provides greater flexibility for construction of the basement as it allows different parts of the basement to be constructed at different times according to a more optimised schedule, which is technically preferred as it reduces the construction of the basement to more manageable units and the magnitude of environmental impacts, particularly construction dust and noise impacts, can be reduced.

14.2.6 Preferred Scenario

Based on the considerations described in **Section 14.2.5**, the preferred construction scenario for the underpass road is excavation via ELS and disposal by barges (with trucks used for transporting the excavated materials from the excavation area to the barging point) as this method offers the best technical solution for the specific requirements and constraints of the WKCD site, and environmental impacts are minimised compared to other options. The preferred construction sequence is to adopt construction as subdivided zones as this as this enables more optimised scheduling of construction and reduces the magnitude of environmental impacts.

14.2.7 Proposed Project Programme

It is targeted to commence construction of the critical elements of the WKCD in 2013 so as to commission the Phase 1 arts and cultural facilities in stages starting from 2014/2015. As construction of the underpass road is integrated with construction of the WKCD basement, the programme for this Schedule 2 Project is the same as that for the basement in Zones 1 to 3 shown in **Appendix 2.4**, i.e., scheduled to be completed by 2017.

14.2.8 Concurrent Projects

The following major projects under planning and/or construction are likely to interface with this Schedule 2 EIA:

- West Kowloon Cultural District Development;
- Hong Kong Section of the Guangzhou – Shenzhen – Hong Kong Express Rail Link;
- Road Works at West Kowloon;
- Road Improvement Works in West Kowloon Reclamation Development – Phases I and II; and
- Central Kowloon Route.

A summary of the concurrent projects for which potential cumulative impacts have been considered is shown in **Table 14.2.2**.

Table 14.2.2: List of concurrent projects for cumulative impact assessment

	Potential Cumulative Impacts	
Concurrent Project	**Construction Phase**	**Operation Phase**
West Kowloon Cultural District Development	All Areas	All Areas
Hong Kong Section of the Guangzhou – Shenzhen – Hong Kong Express Rail Link	Fugitive Dust Airborne Noise	Fixed Plant Noise Groundborne Noise

	Potential Cumulative Impacts	
Concurrent Project	**Construction Phase**	**Operation Phase**
	Landscape & Visual	Landscape & Visual
Road Works at West Kowloon	Fugitive Dust	Vehicular Emissions
	Airborne Noise	Traffic Noise
	Landscape & Visual	Landscape & Visual
Road Improvement Works in West Kowloon Reclamation Development – Phases I and II	Fugitive Dust	Vehicular Emissions
	Airborne Noise	Traffic Noise
	Landscape & Visual	Landscape & Visual
Central Kowloon Route	Fugitive Dust	Vehicular Emissions

14.3 Air Quality Impact

This section presents the assessment of potential air quality impacts associated with the construction and operational phase of the proposed underpass roads within the WKCD site. Dust generated from various construction activities is the primary concern during the construction phase. During the operation phase the major sources of air pollution include, but are not limited to; vehicular emissions in the vicinity of and within the project area including from open roads, ventilation shafts, tunnel portals and from the nearby Western Harbour Crossing (WHC) portal; marine emissions from the nearby China Ferry Terminal, Ocean Terminal and New Yau Ma Tei Public Cargo Working Area (NYPCWA). Representative Air Sensitive Receivers (ASRs) within 500 m of the subject site have been identified and the worst case impacts on these receivers will be assessed. Suitable mitigation measures, where necessary, have been recommended to protect the nearby sensitive receivers and to achieve the legislative criteria and guidelines.

14.3.1 Air Quality Legislations, Standards and Guidelines

The following legislation and regulations provide the standards and guidelines for evaluation of air quality impacts and the type of works that are subject to air pollution control:

- Environmental Impact Assessment Ordinance (EIAO) (Cap. 499.S16), EIAO-TM, Annexes 4 and 12;
- Air Pollution Control Ordinance (APCO) (Cap. 311) and the Air Quality Objectives (AQO);
- Air Pollution Control (Construction Dust) Regulation;
- Control of Air Pollution in Car Parks (ProPECC PN 2/96);
- Practice Note on Control of Air Pollution in Vehicle Tunnels, and;
- Guidance Note on the Best Practicable Means for Cement Works (Concrete Batching Plant) BPM 3/2

14.3.1.1 Technical Memorandum on Environmental Impact Assessment Process

The criteria and guidelines for evaluation of air quality impacts are laid out in Annex 4 and Annex 12 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM). Annex 4 stipulates the criteria for evaluating air quality impacts. This includes meeting the Air Quality Objectives and other standards established under the *Air Pollution Control Ordinance*, as well as meeting the hourly Total Suspended Particulate concentration of 500 $\mu g/m^3$. Annex 12 provides the guidelines for conducting air quality assessments under the EIA process, including determination of air sensitive receivers, assessment methodology and impact prediction and assessment.

14.3.1.2 Air Pollution Control Ordinance

The principal legislation for the management of air quality is the *Air Pollution Control Ordinance (APCO) (Cap 311)*. The APCO specific Air Quality Objectives (AQOs) which stipulate the statutory limits of air pollutants and the maximum allowable numbers of exceedance over specific periods. The AQOs are summarised in **Table 14.3.1**.

Table 14.3.1: Hong Kong Air Quality Objectives

Pollutant	Averaging Time	AQO concentration (µg/m³)	Allowable exceedances
Sulfur Dioxide (SO_2)	1 hour	800	3
	24 hour	350	1
	Annual	80	0
Total Suspended Particulates (TSP)	1 hour(1)	500(1)	
	24 hour	260	1
	Annual	80	0
Respirable Suspended Particulates (RSP)	24 hour	180	1
	Annual	55	0
Nitrogen Dioxide (NO_2)	1 hour	300	3
	24 hour	150	1
	Annual	80	0
Carbon Monoxide (CO)	1 hour	30,000	3
	8 hour	10,000	1
Ozone (O_3)	1 hour	240	3
Lead	3 month	1.5	0

Note (1) The criterion under EIAO-TM not an AQO

14.3.1.3 Air Pollution Control (Construction Dust) Regulation

The *Air Pollution Control (Construction Dust) Regulation* enacted under the APCO defines notifiable and regulatory works activities that are subject to construction dust control, as listed below:

Notifiable Works:

1. Site formation
2. Reclamation
3. Demolition of a building
4. Work carried out in any part of a tunnel that is within 100 m of any exit to the open air
5. Construction of the foundation of a building
6. Construction of the superstructure of a building
7. Road construction work

Regulatory Works:

1. Renovation carried out on the outer surface of the external wall or the upper surface of the roof of a building

2. Road opening or resurfacing work
3. Slope stabilisation work
4. Any work involving any of the following activities:
    a. Stockpiling of dusty materials
    b. Loading, unloading or transfer of dusty materials
    c. Transfer of dusty materials using a belt conveyor system
    d. Use of vehicles
    e. Pneumatic or power-driven drilling, cutting and polishing
    f. Debris handling
    g. Excavation or earth moving
    h. Concrete production
    i. Site clearance
    j. Blasting

Notifiable works require that advance notice of activities shall be given to EPD. The Regulation also requires the works contractor to ensure that both notifiable works and regulatory works are conducted in accordance with the Schedule of the Regulation, which provides dust control and suppression measures.

14.3.1.4 Practice Note on Control of Air Pollution in Car Parks and in Vehicle Tunnels

The practice note for professional persons *ProPECC PN 2/96* and the *Practice Note on Control of Air Pollution in Vehicle Tunnels* prepared by EPD provide guidance on the control of air pollution in car parks and vehicle tunnels respectively. These two practice notes include air quality guidelines required for the protection of public health and factors that should be considered in the design and operation of car parks and vehicle tunnels in order to achieve the required air quality. The limits for air pollutants as recommended by the two practice notes are summarised in **Table 14.3.2**.As there will be fully enclosed vehicle roads and car parks inside the proposed WKCD basement, the air quality within the basement will need to comply with the relevant air pollutant limits as given in the Table.

Table 14.3.2: Limits of air pollutant concentrations inside car parks

Air Pollutant	Averaging Time	Maximum Concentration (µg/m^3)	Parts Per Million (ppm)	Remark
Carbon Monoxide (CO)	5 minutes	115,000	100	Applicable to both car parks and vehicle tunnels
Nitrogen Dioxide (NO_2)	5 minutes	1,800	1	Ditto
Sulfur Dioxide (SO_2)	5 minutes	1,000	0.4	Applicable to vehicle tunnels only

* Concentrations at reference conditions of 298K and 101.325kPa.

14.3.1.5 Guidance Note on the Best Practicable Means for Cement Works (Concrete Batching Plant) BPM 3/2

This note lists the minimum requirement for meeting the best practicable means for *Cement Works (Concrete Batching Plant)*. The guidance note includes: emission limits; fugitive emission control recommendations; monitoring requirements; commissioning details, and; operation and maintenance provisions. This guidance note is relevant because concrete batching plant currently used by the adjacent XRL project would be handed over to and used by the WKCD Project during the construction phase.

14.3.2 Baseline Conditions

14.3.2.1 Site Description

The underpass road lies within the WKCD site on the south-western tip of the Kowloon Peninsula with Victoria Harbour to the west and south of the site and the existing urbanised areas to the north and east.

Land uses surrounding the proposed underpass road are mainly comprised of residential, commercial and government/institution/community (GIC) use. The underpass road boundary is flanked by primary distributor roads: Austin Road West, running immediately adjacent to the northern edge of the WKCD boundary; Canton Road, running adjacent to the eastern boundary; Lin Cheung Road, perpendicular to the mid-northern boundary, and; the Western Harbour Crossing on the northwest boundary. The Ocean Terminal and China Ferry Terminal are to the south-east of the site.

The site for the proposed underpass road is flat to undulating with a ground level of 5 to 23 mPD, the surrounding terrain is flat.

14.3.2.2 Meteorology

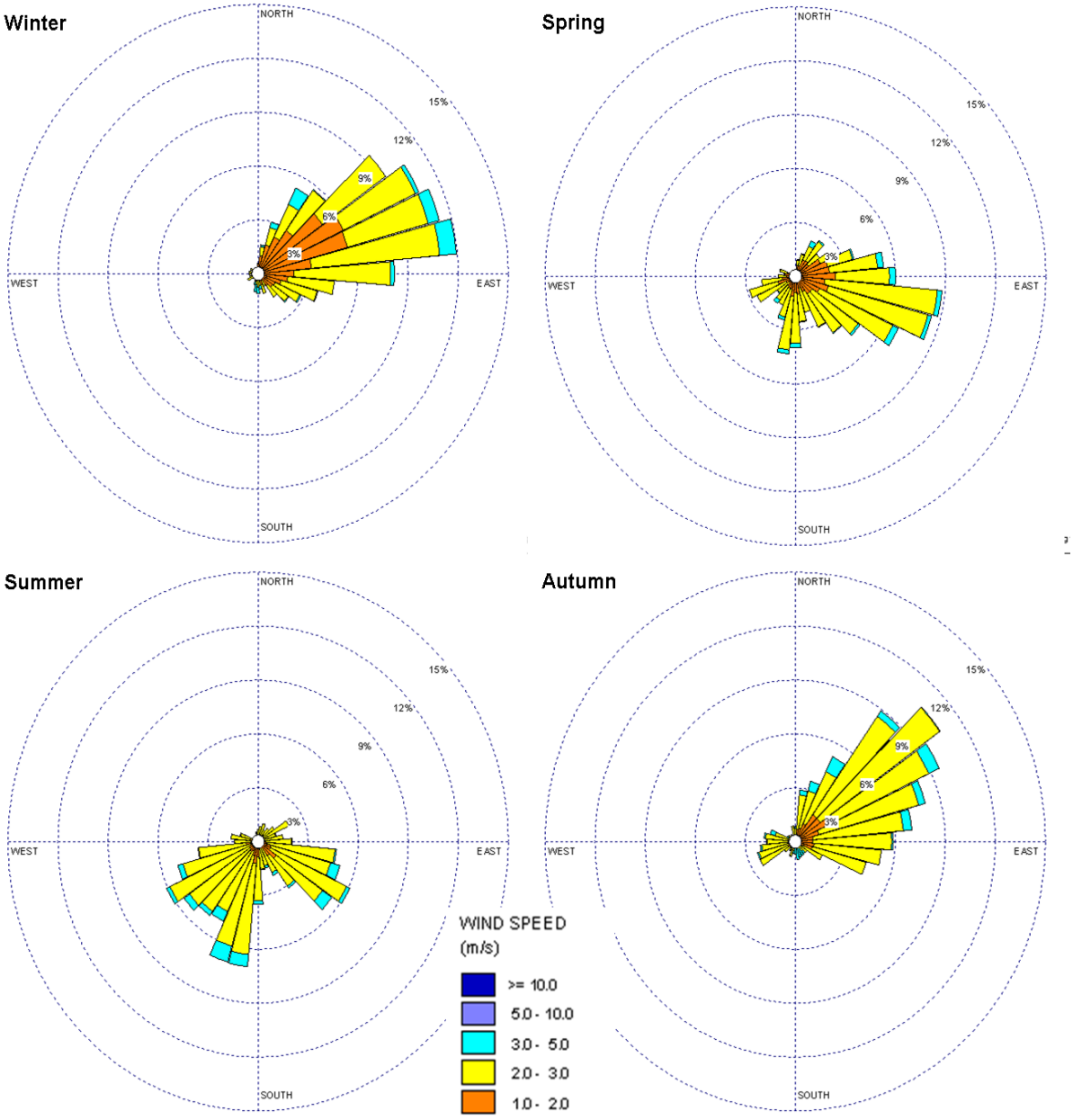
The PATH (Pollutants in the Atmosphere and their Transport over Hong Kong) model, a regional air quality prediction model developed by EPD, is used to predict the meteorology at the site of the underpass road. The PATH model is also used to predict background air quality as a result of various sources in Hong Kong and the surrounding regions including the Pearl River Delta Economic Zone (PRDEZ).

Features of the wind profile that are significant for the site are both the wind speed and wind direction. Low wind speeds are significant for dispersion of non buoyant area sources. At high wind speeds, dust emissions can become significant.

At the site, winds from the northeast are frequent in the autumn and winter. Significant sources that lay to the northeast of the site include Austin Road West and Lin Cheung Road. Easterly winds are dominant in spring. Kowloon Peninsula lays to the east of the site. During summer the winds are predominately from the southeast to southwest. The major source from the southwest is marine emissions in transit to and from at the China Ferry and Ocean Terminals; Victoria Harbour lays to the southeast of the site.

Graph 14.1 shows seasonal windroses for the site from PATH data at grid (28, 27). PATH uses wind data based on meteorology information from 2010.

Graph 14.1: Seasonal windroses for the underpass road site from 2010 PATH data at grid (28, 27)



14.3.2.3 Air Sensitive Receivers

The existing and planned representative Air Sensitive Receivers (ASRs) that could be effected by the underpass road Project within 500 m from its site boundary have been identified and are summarised in **Table 14.3.3**. The final use of each of the parcels may change in the future; therefore, ASRs have been assessed at a variety of intervals up to the proposed maximum height of the buildings that are currently planned. Receptors are located every four metres from 4 m to 20 m and every 10 metres from 20 m to the maximum height of the proposed building. A bias is generated towards the lower levels as this is where the maximum pollutant concentrations are expected to occur.

A field study of the selected existing ASRs external to the underpass road boundary was undertaken and the fresh air intake and residential levels were estimated based on a visual survey. Fresh air intakes for low level commercial property were assumed to be at podium level or where ventilation ducts were identified. Residential receptors were assessed every four metres from the lowest residential level up to 20 metres and then every 10 metres above that.

All the ASRs as listed in **Table 14.3.3** are subject to air quality impact during the operation phase of the underpass road. Construction of the underpass road forms part of the WKCD Project. The underpass road is scheduled to be constructed between 2013 and 2017. The planned ASRs representing facilities/buildings within the WKCD site that will be completed at the early stage of the Project will be subject to air quality impact due to construction of the facilities/buildings at a later stage. Hence, the years in which the planned ASRs will be subject to the construction phase air quality impacts are detailed in **Table 14.3.3** and shown in **Figures 3.1a** and **3.1b**. Shaded cells are indicative of residential ASRs.

Table 14.3.3: Representative ASRs Identified for the Assessment

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
1	SRT-1	Sorrento – Tower 1 Residential (Existing ASR)	404	24	19	65	2013 – 2017	4m above podium
2	SRT-2			28	23			8m above podium
3	SRT-3			32	27			12m above podium
4	SRT-4			36	31			16m above podium
5	SRT-5			40	35			20m above podium
6	SRT-6			50	45			30 m above podium
7	SRT-7			60	55			40 m above podium
8	SRT-8			70	65			50 m above podium
9	SRT-9			80	75			60 m above podium
10	SRT-10			90	85			70 m above podium
11	SRT-11			100	95			80 m above podium
12	SRT-12			110	105			90 m above podium
13	SRT-13			120	115			100 m above podium
14	SRT-14			130	125			110 m above podium
15	SRT-15			140	135			120 m above podium
16	SRT-16			150	145			130 m above podium
17	SRT-17			160	155			140 m above podium
18	SRT-18			170	165			150 m above podium
19	SRT-19			180	175			160 m above podium
20	SRT-20			190	185			170 m above podium
21	SRT-21			200	195			180 m above podium
22	SRT-22			210	205			190 m above podium
23	SRT-23			220	215			200 m above podium
24	SRT-24			230	225			210 m above podium
25	SRT-25			240	235			220 m above podium
26	SRT-26			250	245			230 m above podium

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
27	SRT-27			260	255			240 m above podium
28	CLS-1	The Cullinan – Lunar Sky	194	59.8	54.8	33	2013 – 2017	lowest possible fresh air intake (1st floor above podium)
29	CLS-2	Serviced Apartment (Existing ASR)		62.6	57.6			2nd lowest possible fresh air intake (2nd floor above podium)
30	CLS-3			127.0	122			24th floor inlet
31	CLS-4			129.8	124.8			25th floor inlet
32	CLS-5			163.4	158.4			37th floor inlet
33	CLS-6			166.2	161.2			38th floor inlet
34	WF3-1	The Waterfront – Tower 3 Residential (Existing ASR)	158	36.2	31.2		2013 – 2017	4m above podium
35	WF3-2			40.2	35.2			8m above podium
36	WF3-3			44.2	39.2			12m above podium
37	WF3-4			48.2	43.2			16m above podium
38	WF3-5			58.2	53.2			20m above podium
39	WF3-6			68.2	63.2			30 m above podium
40	WF3-7			78.2	73.2			40 m above podium
41	WF3-8			88.2	83.2			50 m above podium
42	WF3-9			98.2	93.2			60 m above podium
43	WF3-10			108.2	103.2			70 m above podium
44	WF3-11			118.2	113.2			80 m above podium
45	WF3-12			128.2	123.2			90 m above podium
46	WF3-13			138.2	133.2			100 m above podium
47	WF6-1	The Waterfront – Tower 6 Residential (Existing ASR)	309	36.1	31.1		2013 – 2017	4m above podium
48	WF6-2			40.1	35.1			8m above podium
49	WF6-3			44.1	39.1			12m above podium
50	WF6-4			48.1	43.1			16m above podium
51	WF6-5			58.1	53.1			20m above podium
52	WF6-6			68.1	63.1			30 m above podium
53	WF6-7			78.1	73.1			40 m above podium
54	WF6-8			88.1	83.1			50 m above podium
55	WF6-9			98.1	93.1			60 m above podium
56	WF6-10			108.1	103.1			70 m above podium
57	WF6-11			118.1	113.1			80 m above podium
58	WF6-12			128.1	123.1			90 m above podium
59	WF6-13			138.1	133.1			100 m above podium
60	ICC-1	International Commerce Centre(i) Office	142	61.3	56.3	>100	2013 – 2017	5th floor inlet
61	ICC-2			64.1	59.1			6th floor inlet
62	ICC-3			66.9	61.9			7th floor inlet
63	ICC-4			69.7	64.7			8th floor inlet

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
64	ICC-5	(Existing ASR)		72.5	67.5			9th floor inlet
65	ICC-6			75.3	70.3			10th floor inlet
66	ICC-7			145.3	140.3			35th floor inlet
67	ICC-8			148.1	143.1			36th floor inlet
68	ICC-9			150.9	145.9			37th floor inlet
69	ICC-10			153.7	148.7			38th floor inlet
70	ICC-11			156.5	151.5			39th floor inlet
71	ICC-12			159.3	154.3			40th floor inlet
72	ICC-13			220.9	215.9			62nd floor inlet
73	ICC-14			223.7	218.7			63rd floor inlet
74	ICC-15			226.5	221.5			64th floor inlet
75	ICC-16			229.3	224.3			65th floor inlet
76	ICC-17			285.3	280.3			85th floor inlet
77	ICC-18			288.1	283.1			86th floor inlet
78	ICC-19			290.9	285.9			87th floor inlet
79	ICC-20			293.7	288.7			88th floor inlet
80	ICC-21			302.1	297.1			91st floor inlet
81	ICC-22			335.7	330.7			103rd floor inlet
82	HT2-1	The HarbourSide – Tower 2 Residential (Existing ASR)	47	30.8	25.8	63	2013 – 2017	4m above podium
83	HT2-2			34.8	29.8			8m above podium
84	HT2-3			38.8	33.8			12m above podium
85	HT2-4			42.8	37.8			16m above podium
86	HT2-5			46.8	41.8			20m above podium
87	HT2-6			56.8	51.8			30 m above podium
88	HT2-7			66.8	61.8			40 m above podium
89	HT2-8			76.8	71.8			50 m above podium
90	HT2-9			86.8	81.8			60 m above podium
91	HT2-10			96.8	91.8			70 m above podium
92	HT2-11			106.8	101.8			80 m above podium
93	HT2-12			116.8	111.8			90 m above podium
94	HT2-13			126.8	121.8			100 m above podium
95	HT2-14			136.8	131.8			110 m above podium
96	HT2-15			146.8	141.8			120 m above podium
97	HT2-16			156.8	151.8			130 m above podium
98	HT2-17			166.8	161.8			140 m above podium
99	HT2-18			176.8	171.8			150 m above podium
100	HT2-19			186.8	181.8			160 m above podium
101	HT2-20			196.8	191.8			170 m above podium
102	HT2-21			206.8	201.8			180 m above podium
103	HT2-22			216.8	211.8			190 m above podium

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
104	HT2-23			226.8	221.8			200 m above podium
105	HT2-24			236.8	231.8			210 m above podium
106	HT2-25			246.8	241.8			220 m above podium
107	HT2-26			256.8	251.8			230 m above podium
108	HT2-27			266.8	261.8			240 m above podium
109	WKTA1-1	Topside Developments at West Kowloon Terminus Site A(ii) (iii) Commercial (Planned ASR from 2015 onwards)	31	28.0	23	15	2015 – 2017	4m above podium
110	WKTA1-2			32.0	27			8m above podium
111	WKTA1-3			36.0	31			12m above podium
112	WKTA1-4			40.0	35			16m above podium
113	WKTA1-5			44.0	39			20m above podium
114	WKTA1-6			54.0	49			30 m above podium
115	WKTA1-7			64.0	59			40 m above podium
116	WKTA1-8			74.0	69			50 m above podium
117	WKTA1-9			84.0	79			60 m above podium
118	WKTA2-1	Topside Developments at West Kowloon Terminus Site A(ii) (iii) Commercial (Planned ASR from 2015 onwards)	198	28.0	23	21	2015 – 2017	4m above podium
119	WKTA2-2			32.0	27			8m above podium
120	WKTA2-3			36.0	31			12m above podium
121	WKTA2-4			40.0	35			16m above podium
122	WKTA2-5			44.0	39			20m above podium
123	WKTA2-6			54.0	49			30 m above podium
124	WKTA2-7			64.0	59			40 m above podium
125	WKTA2-8			74.0	69			50 m above podium
126	WKTA2-9			84.0	79			60 m above podium
127	WKTA2-10			94.0	89			70 m above podium
128	WKTA2-11			104.0	99			80 m above podium
129	WKTA3-1	Topside Developments at West Kowloon Terminus Site A(ii) (iii) Commercial (Planned ASR from 2015 onwards)	404	28.0	23	15	2015 – 2017	4m above podium
130	WKTA3-2			32.0	27			8m above podium
131	WKTA3-3			36.0	31			12m above podium
132	WKTA3-4			40.0	35			16m above podium
133	WKTA3-5			44.0	39			20m above podium
134	WKTA3-6			54.0	49			30 m above podium
135	WKTA3-7			64.0	59			40 m above podium
136	WKTA3-8			74.0	69			50 m above podium
137	WKTA3-9			84.0	79			60 m above podium
138	WKTA4-1	Topside Developments at West Kowloon Terminus Site A(ii) (iii) Commercial	182	28.0	23	25	2015 – 2017	4m above podium
139	WKTA4-2			32.0	27			8m above podium
140	WKTA4-3			36.0	31			12m above podium
141	WKTA4-4			40.0	35			16m above podium
142	WKTA4-5			44.0	39			20m above podium
143	WKTA4-6			54.0	49			30 m above podium

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
144	WKTA4-7	(Planned ASR from 2015 onwards)		64.0	59			40 m above podium
145	WKTA4-8			74.0	69			50 m above podium
146	WKTA4-9			84.0	79			60 m above podium
147	WKTA4-10			94.0	89			70 m above podium
148	WKTA4-11			104.0	99			80 m above podium
149	WKTA4-12			114.0	109			90 m above podium
150	WKTA4-13			124.0	119			100 m above podium
151	AMT-1	The Arch – Moon Tower Residential (Existing ASR)	95	42.0	37	52	2013 – 2017	4m above podium
152	AMT-2			46.0	41			8m above podium
153	AMT-3			50.0	45			12m above podium
154	AMT-4			54.0	49			16m above podium
155	AMT-5			58.0	53			20m above podium
156	AMT-6			68.0	63			30 m above podium
157	AMT-7			78.0	73			40 m above podium
158	AMT-8			88.0	83			50 m above podium
159	AMT-9			98.0	93			60 m above podium
160	AMT-10			108.0	103			70 m above podium
161	AMT-11			118.0	113			80 m above podium
162	AMT-12			128.0	123			90 m above podium
163	AMT-13			138.0	133			100 m above podium
164	AMT-14			148.0	143			110 m above podium
165	AMT-15			158.0	153			120 m above podium
166	AMT-16			168.0	163			130 m above podium
167	AMT-17			178.0	173			140 m above podium
168	AMT-18			188.0	183			150 m above podium
169	AMT-19			198.0	193			160 m above podium
170	AMT-20			208.0	203			170 m above podium
171	AMT-21			218.0	213			180 m above podium
172	AMT-22			228.0	223			190 m above podium
173	PB1-1	Residential Developments at Austin Station(iii) Residential (Planned ASR from 2015 onwards)	326	15.8	10.8	23	2015 – 2017	4m above podium
174	PB1-2			30.1	25.1			8m above podium
175	PB1-3			34.1	29.1			12m above podium
176	PB1-4			38.1	33.1			16m above podium
177	PB1-5			42.1	37.1			20m above podium
178	PB1-6			46.1	41.1			30 m above podium
179	PB1-7			56.1	51.1			40 m above podium
180	PB1-8			66.1	61.1			50 m above podium
181	PB1-9			76.1	71.1			60 m above podium
182	PB1-10			86.1	81.1			70 m above podium
183	PB1-11			96.1	91.1			80 m above podium

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
184	PB2-1	Residential Developments at Austin Station(iii) Residential (Planned ASR from 2015 onwards)	222	15.8	10.8	21	2015 – 2017	4m above podium
185	PB2-2			30.1	25.1			8m above podium
186	PB2-3			34.1	29.1			12m above podium
187	PB2-4			38.1	33.1			16m above podium
188	PB2-5			42.1	37.1			20m above podium
189	PB2-6			46.1	41.1			30 m above podium
190	PB2-7			56.1	51.1			40 m above podium
191	PB2-8			66.1	61.1			50 m above podium
192	PB2-9			76.1	71.1			60 m above podium
193	PB2-10			86.1	81.1			70 m above podium
194	PB3-1	Residential Developments at Austin Station(iii) Residential (Planned ASR from 2015 onwards)	182	30.6	25.6	26	2015 – 2017	4m above podium
195	PB3-2			34.6	29.6			8m above podium
196	PB3-3			38.6	33.6			12m above podium
197	PB3-4			42.6	37.6			16m above podium
198	PB3-5			46.6	41.6			20m above podium
199	PB3-6			56.6	51.6			30 m above podium
200	PB3-7			66.6	61.6			40 m above podium
201	PB3-8			76.6	71.6			50 m above podium
202	PB3-9			86.6	81.6			60 m above podium
203	PB3-10			96.6	91.6			70 m above podium
204	PB4-1	Residential Developments at Austin Station(iii) Residential (Planned ASR from 2015 onwards)	39	49.5	44.5	20	2015 – 2017	4m above podium
205	PB4-2			53.5	48.5			8m above podium
206	PB4-3			57.5	52.5			12m above podium
207	PB4-4			61.5	56.5			16m above podium
208	PB4-5			65.5	60.5			20m above podium
209	PB4-6			75.5	70.5			30 m above podium
210	PB4-7			85.5	80.5			40 m above podium
211	PB4-8			95.5	90.5			50 m above podium
212	PB4-9			105.5	100.5			60 m above podium
213	PB4-10			115.5	110.5			70 m above podium
214	WOB-1	Wai On Building – Block A Residential (Existing ASR)	47	11.8	6.8	16	2013 – 2017	4m above podium
215	WOB-2			15.8	10.8			8m above podium
216	WOB-3			19.8	14.8			12m above podium
217	WOB-4			23.8	18.8			16m above podium
218	WOB-5			27.8	22.8			20m above podium
219	WOB-6			37.8	32.8			30 m above podium
220	WOB-7			47.8	42.8			40 m above podium
221	WOB-8			57.8	52.8			50 m above podium
222	VT1-1	The Victoria Towers –	31	49.3	44.3	52	2013 – 2017	4m above podium
223	VT1-2			53.3	48.3			8m above podium

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
224	VT1-3	Tower 1		57.3	52.3			12m above podium
225	VT1-4	Residential		61.3	56.3			16m above podium
226	VT1-5	(Existing ASR)		65.3	60.3			20m above podium
227	VT1-6			75.3	70.3			30 m above podium
228	VT1-7			85.3	80.3			40 m above podium
229	VT1-8			95.3	90.3			50 m above podium
230	VT1-9			105.3	100.3			60 m above podium
231	VT1-10			115.3	110.3			70 m above podium
232	VT1-11			125.3	120.3			80 m above podium
233	VT1-12			135.3	130.3			90 m above podium
234	VT1-13			145.3	140.3			100 m above podium
235	VT1-14			155.3	150.3			110 m above podium
236	VT1-15			165.3	160.3			120 m above podium
237	VT1-16			175.3	170.3			130 m above podium
238	VT1-17			185.3	180.3			140 m above podium
239	VT1-18			195.3	190.3			150 m above podium
240	VT1-19			205.3	200.3			160 m above podium
241	VT1-20			215.3	210.3			170 m above podium
242	VT1-21			225.3	220.3			180 m above podium
243	VT1-22			235.3	230.3			190 m above podium
244	VT1-23			13.0	8			Fresh Air Intake
245	LCS-1	Lai Chak Middle School	31	11.2	6.2	7	2013 – 2017	4m above podium
246	LCS-2	Educational (Existing ASR)		15.2	10.2			8m above podium
247	CHC1-1	China HK City – Tower 3(i)	15	23.1	18.1	11	2013 – 2017	4m above podium
248	CHC1-2			27.1	22.1			8m above podium
249	CHC1-3	Commercial		31.1	26.1			12m above podium
250	CHC1-4	(Existing ASR)		35.1	30.1			16m above podium
251	CHC1-5			39.1	34.1			20m above podium
252	CHC1-6			49.1	44.1			30 m above podium
253	CHC2-1	China HK City – Tower 5(i)	7	23.1	18.1	11	2013 – 2017	4m above podium
254	CHC2-2			27.1	22.1			8m above podium
255	CHC2-3	Commercial		31.1	26.1			12m above podium
256	CHC2-4	(Existing ASR)		35.1	30.1			16m above podium
257	CHC2-5			39.1	34.1			20m above podium
258	CHC2-6			49.1	44.1			30 m above podium
259	RPH-1	The Royal Pacific Hotel(i)	119	23.1	18.1	15	2013 – 2017	4m above podium
260	RPH-2			27.1	22.1			8m above podium
261	RPH-3			31.1	26.1			12m above podium

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
262	RPH-4	Hotel (Existing ASR)		35.1	30.1			16m above podium
263	RPH-5			39.1	34.1			20m above podium
264	RPH-6			49.1	44.1			30 m above podium
265	PCK-1	Pacific Club Kowloon Recreational (Existing ASR)	317	24.0	19	4	2013 – 2017	4m above podium
266	P01a-1	Parcel 01	N/A	13.4	4.0	7	2015 – 2017	See Note (vi)
267	P01a-2	Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2015 onwards)		17.4	8.0			
268	P01a-3			21.4	12.0			
269	P01a-4			25.4	16.0			
270	P01a-5			29.4	20.0			
271	P01a-6			39.4	30.0			
272	P01a-7			49.4	40.0			
273	P01b-1	Parcel 01	N/A	13.4	4.0	7	2015 – 2017	See Note (vi)
274	P01b-2	Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2015 onwards)		17.4	8.0			
275	P01b-3			21.4	12.0			
276	P01b-4			25.4	16.0			
277	P01b-5			29.4	20.0			
278	P01b-6			39.4	30.0			
279	P01b-7			49.4	40.0			
280	P01c-1	Parcel 01		13.4	4.0	7	2015 – 2017	See Note (vi)
281	P01c-2	Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2015 onwards)		17.4	8.0			
282	P01c-3			21.4	12.0			
283	P01c-4			25.4	16.0			
284	P01c-5			29.4	20.0			
285	P01c-6			39.4	30.0			
286	P01c-7			49.4	40.0			
287	P01d-1	Parcel 01		13.4	4.0	7	2015 – 2017	See Note (vi)
288	P01d-2	Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2015 onwards)		17.4	8.0			
289	P01d-3			21.4	12.0			
290	P01d-4			25.4	16.0			
291	P01d-5			29.4	20.0			
292	P01d-6			39.4	30.0			
293	P01d-7			49.4	40.0			
294	P01e-1	Parcel 01 Planned Performance		49.4	40.0	7	2015 – 2017	

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
		Art Venues within WKCD (iv) (Planned ASR from 2015 onwards)						
295	P02-1	Parcel 02 Retail/ Dining/ Entertainment /Residential (Planned ASR from 2030 onwards)	N/A	13.4	4.0	15	none	
296	P02-2			17.4	8.0			
297	P02-3			21.4	12.0			Lowest residential floor
298	P02-4			25.4	16.0			
299	P02-5			29.4	20.0			
300	P02-6			39.4	30.0			
301	P02-7			49.4	40.0			
302	P02-8			59.4	50.0			
303	P03-1	Parcel 03 Retail/ Dining/ Entertainment /Residential (Planned ASR from 2030 onwards)	N/A	11.2	4.0	8	none	
304	P03-2			15.2	8.0			
305	P03-3			19.2	12.0			Lowest residential floor
306	P03-4			23.2	16.0			
307	P03-5			27.2	20.0			
308	P04-1	Parcel 04 Retail/ Dining/ Entertainment (Planned ASR from 2030 onwards)	N/A	9.0	4.0	5	none	See Note (vi)
309	P04-2			13.0	8.0			
310	P04-3			17.0	12.0			
311	P04-4			21.0	16.0			
312	P04-5			25.0	20.0			
313	P04-6			35.0	30.0			
314	P05-1	Parcel 05 Office/ Residential (Planned ASR from 2017 onwards)	N/A	13.4	4.0	15	2017	See Note (vi)
315	P05-2			17.4	8.0			
316	P05-3			21.4	12.0			
317	P05-4			25.4	16.0			
318	P05-5			29.4	20.0			
319	P05-6			39.4	30.0			Lowest residential floor
320	P05-7			49.4	40.0			
321	P06-1	Parcel 06 Office(v) Residential (Planned ASR from 2017 onwards)	N/A	13.4	4.0	14	2017	See Note (vi)
322	P06-2			17.4	8.0			
323	P06-3			21.4	12.0			
324	P06-4			25.4	16.0			
325	P06-5			29.4	20.0			
326	P06-6			39.4	30.0			Lowest residential

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
								floor
327	P06-7			49.4	40.0			
328	P07-1	Parcel 07	N/A	13.4	4.0	14	2017	See Note (vi)
329	P07-2	Office(v)		17.4	8.0			
330	P07-3	Residential		21.4	12.0			
331	P07-4	(Planned ASR from 2017 onwards)		25.4	16.0			
332	P07-5			29.4	20.0			
333	P07-6			39.4	30.0			Lowest residential floor
334	P07-7			49.4	40.0			
335	P08-1	Parcel 08	N/A	13.4	4.0	5	none	See Note (vi)
336	P08-2	Planned Performance Art Venues within WKCD (iv)		17.4	8.0			
337	P08-3			21.4	12.0			
338	P08-4			25.4	16.0			
339	P08-5	(Planned ASR from 2018 onwards)		29.4	20.0			
340	P09-1	Parcel 09	N/A	13.4	4.0	15	2017	See Note (vi)
341	P09-2	Office(v)/ Residential (vi)		17.4	8.0			
342	P09-3			21.4	12.0			
343	P09-4	(Planned ASR from 2017 onwards)		25.4	16.0			
344	P09-5			29.4	20.0			
345	P09-6			39.4	30.0			Lowest residential floor
346	P09-7			49.4	40.0			
347	P10-1	Parcel 10	N/A	13.4	4.0	15	2017	See Note (vi)
348	P10-2	Office+ Retail/ Dining/ Entertainment (v)		17.4	8.0			
349	P10-3			21.4	12.0			
350	P10-4			25.4	16.0			
351	P10-5	Residential		29.4	20.0			
352	P10-6	(Planned ASR from 2017 onwards)		39.4	30.0			Lowest residential floor
353	P10-7			49.4	40.0			
354	P10-8			59.4	50.0			
355	P11-1	Parcel 11	N/A	13.4	4.0	15	2017	
356	P11-2	Retail/ Dining/ Entertainment (v)		17.4	8.0			
357	P11-3			21.4	12.0			Lowest residential floor
358	P11-4	Residential		25.4	16.0			
359	P11-5	(Planned ASR from 2017		29.4	20.0			
360	P11-6			39.4	30.0			

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
361	P11-7	onwards)		49.4	40.0			
362	P11-8			59.4	50.0			
363	P12-1	Parcel 12	N/A	13.4	4.0	15	None	See Note (vi)
364	P12-2			17.4	8.0			
365	P12-3	Planned Performance Art Venues within WKCD (iv)		21.4	12.0			
366	P12-4			25.4	16.0			
367	P12-5	(Planned ASR from beyond 2020)		29.4	20.0			
368	P13-1	Parcel 13	N/A	13.4	4.0	15	2017	See Note (vi)
369	P13-2			17.4	8.0			
370	P13-3	Office+ Retail/ Dining/ Entertainment (v)		21.4	12.0			
371	P13-4			25.4	16.0			
372	P13-5	Residential		29.4	20.0			
373	P13-6	(Planned ASR from 2017 onwards)		39.4	30.0			Lowest residential floor
374	P13-7			49.4	40.0			
375	P13-8			59.4	50.0			
376	P14-1	Parcel 14	N/A	13.4	4.0	12	2017	See Note (vi)
377	P14-2			17.4	8.0			
378	P14-3	Planned Performance Art Venues within WKCD (iv)		21.4	12.0			
379	P14-4			25.4	16.0			
380	P14-5			29.4	20.0			
381	P14-6	(Planned ASR from 2017 onwards)		39.4	30.0			
382	P14-7			49.4	40.0			
383	P15-1	Parcel 15	N/A	13.4	4.0	12	2017	See Note (vi)
384	P15-2			17.4	8.0			
385	P15-3	Planned Performance Art Venues within WKCD + Retail/ Dining/ Entertainment (iv) Office(iv)		21.4	12.0			
386	P15-4			25.4	16.0			
387	P15-5			29.4	20.0			
388	P15-6			39.4	30.0			
389	P15-7	(Planned ASR from 2017 onwards)		49.4	40.0			
390	P16-1	Parcel 16	N/A	13.4	4.0	8	none	See Note (vi)
391	P16-2			17.4	8.0			
392	P16-3	Retail/ Dining/ Entertainment (v)		21.4	12.0			
393	P16-4			25.4	16.0			
394	P16-5			29.4	20.0			

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
395	P16-6	Residential (Planned ASR from 2018 onwards)		39.4	30.0			Lowest residential floor
396	P16-7			49.4	40.0			
397	P16-8			59.4	50.0			
398	P17-1	Parcel 17 Retail/ Dining/ Entertainment + Residential (Planned ASR from 2018 onwards)	N/A	13.4	4.0	15	none	See Note (vi)
399	P17-2			17.4	8.0			
400	P17-3			21.4	12.0			
401	P17-4			25.4	16.0			
402	P17-5			29.4	20.0			
403	P17-6			39.4	30.0			Lowest residential floor
404	P17-7			49.4	40.0			
405	P18a-1	Parcel 18 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2020 onwards)	N/A	13.4	4.0	8	none	See Note (vi)
406	P18a-2			17.4	8.0			
407	P18a-3			21.4	12.0			
408	P18a-4			25.4	16.0			
409	P18a-5			29.4	20.0			
410	P18a-6			39.4	30.0			
411	P18a-7			49.4	40.0			
412	P18b-1	Parcel 18 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2020 onwards)	N/A	13.4	4.0	8	none	See Note (vi)
413	P18b-2			17.4	8.0			
414	P18b-3			21.4	12.0			
415	P18b-4			25.4	16.0			
416	P18b-5			29.4	20.0			
417	P18b-6			39.4	30.0			
418	P18b-7			49.4	40.0			
419	P18c-1	Parcel 18 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2020 onwards)	N/A	13.4	4.0	8	none	See Note (vi)
420	P18c-2			17.4	8.0			
421	P18c-3			21.4	12.0			
422	P18c-4			25.4	16.0			
423	P18c-5			29.4	20.0			
424	P18c-6			39.4	30.0			
425	P18c-7			49.4	40.0			
426	P18d-1	Parcel 18 Planned Performance Art Venues	N/A	13.4	4.0	8	none	See Note (vi)
427	P18d-2			17.4	8.0			
428	P18d-3			21.4	12.0			
429	P18d-4			25.4	16.0			

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
430	P18d-5	within WKCD (iv) (Planned ASR from 2020 onwards)		29.4	20.0			
431	P18d-6			39.4	30.0			
432	P18d-7			49.4	40.0			
433	P18e	Parcel 18 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2030 onwards)	N/A	49.4	40.0	8	none	
434	P19-1	Parcel 19 Hotel + Retail/ Dining/ Entertainment (v) Residential (Planned ASR from 2018 onwards)	N/A	13.4	4.0	14	none	See Note (vi)
435	P19-2			17.4	8.0			
436	P19-3			21.4	12.0			
437	P19-4			25.4	16.0			
438	P19-5			29.4	20.0			
439	P19-6			39.4	30.0			Lowest residential floor
440	P19-7			49.4	40.0			
441	P19-8			59.4	50.0			
442	P20-1	Parcel 20 Planned Performance Art Venues within WKCD + Retail/ Dining/ Entertainment (iv) (Planned ASR from 2017 onwards)	N/A	13.4	4.0	13	2017	See Note (vi)
443	P20-2			17.4	8.0			
444	P20-3			21.4	12.0			
445	P20-4			25.4	16.0			
446	P20-5			29.4	20.0			
447	P20-6			39.4	30.0			
448	P20-7			49.4	40.0			
449	P20-8			59.4	50.0			
450	P21-1	Parcel 21 Office + Retail/ Dining/ Entertainment (v) Residential (Planned ASR from 2017 onwards)	N/A	13.4	4.0	13	2017	See Note (vi)
451	P21-2			17.4	8.0			
452	P21-3			21.4	12.0			
453	P21-4			25.4	16.0			
454	P21-5			29.4	20.0			
455	P21-6			39.4	30.0			Lowest residential floor
456	P21-7			49.4	40.0			
457	P22-1	Parcel 22	N/A	13.4	4.0	13	none	See Note (vi)

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
458	P22-2	GIC + Retail/ Dining/ Entertainment (v) Residential (Planned ASR from 2018 onwards)		17.4	8.0			
459	P22-3			21.4	12.0			
460	P22-4			25.4	16.0			
461	P22-5			29.4	20.0			Lowest residential floor
462	P22-6			39.4	30.0			
463	P22-7			49.4	40.0			
464	P22-8			59.4	50.0			
465	P23a-1	Parcel 23 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2020 onwards)	N/A	13.4	4.0	8	none	See Note (vi)
466	P23a-2			17.4	8.0			
467	P23a-3			21.4	12.0			
468	P23a-4			25.4	16.0			
469	P23a-5			29.4	20.0			
470	P23a-6			39.4	30.0			
471	P23a-7			49.4	40.0			
472	P23b-1	Parcel 23 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2020 onwards)		13.4	4.0	8	none	See Note (vi)
473	P23b-2			17.4	8.0			
474	P23b-3			21.4	12.0			
475	P23b-4			25.4	16.0			
476	P23b-5			29.4	20.0			
477	P23b-6			39.4	30.0			
478	P23b-7			49.4	40.0			
479	P23c-1	Parcel 23 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2020 onwards)		13.4	4.0	8	none	See Note (vi)
480	P23c-2			17.4	8.0			
481	P23c-3			21.4	12.0			
482	P23c-4			25.4	16.0			
483	P23c-5			29.4	20.0			
484	P23c-6			39.4	30.0			
485	P23c-7			49.4	40.0			
486	P23d-1	Parcel 23 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2020 onwards)		13.4	4.0	8	none	See Note (vi)
487	P23d-2			17.4	8.0			
488	P23d-3			21.4	12.0			
489	P23d-4			25.4	16.0			
490	P23d-5			29.4	20.0			
491	P23d-6			39.4	30.0			
492	P23d-7			49.4	40.0			
493	P23e	Parcel 23 Planned		49.4	40.0	8	none	

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
		Performance Art Venues within WKCD (iv) (Planned ASR from 2020 onwards)						
494	P24-1	Parcel 24 Office + Retail/ Dining/ Entertainment (v) Residential (Planned ASR from 2018 onwards)	N/A	13.4	4.0	14	none	See Note (vi)
495	P24-2			17.4	8.0			
496	P24-3			21.4	12.0			
497	P24-4			25.4	16.0			
498	P24-5			29.4	20.0			
499	P24-6			39.4	30.0			Lowest residential floor
500	P24-7			49.4	40.0			
501	P24-8			59.4	50.0			
502	P25-1	Parcel 25 Pavilion (iv) (Planned ASR from 2017 onwards)	N/A	13.4	4.0	1	2017	See Note (vi)
503	P25-2			17.4	8.0			
504	P25-3			21.4	12.0			
505	P25-4			25.4	16.0			
506	P25-5			29.4	20.0			
507	P26-1	Parcel 26 Office + Retail/ Dining/ Entertainment (v) Residential (Planned ASR from 2018 onwards)	N/A	13.4	4.0	15	none	See Note (vi)
508	P26-2			17.4	8.0			
509	P26-3			21.4	12.0			
510	P26-4			25.4	16.0			
511	P26-5			29.4	20.0			
512	P26-6			39.4	30.0			Lowest residential floor
513	P26-7			49.4	40.0			
514	P26-8			59.4	50.0			
515	P27-1	Parcel 27 Office + Retail/ Dining/ Entertainment (v) Residential (Planned ASR from 2018 onwards)	N/A	13.4	4.0	15	none	See Note (vi)
516	P27-2			17.4	8.0			
517	P27-3			21.4	12.0			
518	P27-4			25.4	16.0			
519	P27-5			29.4	20.0			
520	P27-6			39.4	30.0			
521	P27-7			49.4	40.0			Lowest residential floor
522	P27-8			59.4	50.0			
523	P28-1	Parcel 28 Office	N/A	13.4	4.0	21	none	See Note (vi)
524	P28-2			17.4	8.0			
525	P28-3			21.4	12.0			

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
526	P28-4	+ Retail/ Dining/ Entertainment (v) Residential (Planned ASR from 2018 onwards)		25.4	16.0			
527	P28-5			29.4	20.0			
528	P28-6			39.4	30.0			Lowest residential floor
529	P28-7			49.4	40.0			
530	P28-8			59.4	50.0			
531	P28-9			69.4	60.0			
532	P28-10			79.4	70.0			
533	P29-1	Parcel 29 Office + Retail/ Dining/ Entertainment (v) Residential (Planned ASR from 2018 onwards)	N/A	13.4	4.0	23	none	See Note (vi)
534	P29-2			17.4	8.0			
535	P29-3			21.4	12.0			
536	P29-4			25.4	16.0			
537	P29-5			29.4	20.0			
538	P29-6			39.4	30.0			Lowest residential floor
539	P29-7			49.4	40.0			
540	P29-8			59.4	50.0			
541	P29-9			69.4	60.0			
542	P29-10			79.4	70.0			
543	P30a-1	Parcel 30 Planned Performance Art Venues within WKCD (iv) (Planned ASR from beyond 2020)	N/A	13.4	4.0	6	none	See Note (vi)
544	P30a-2			17.4	8.0			
545	P30a-3			21.4	12.0			
546	P30a-4			25.4	16.0			
547	P30a-5			29.4	20.0			
548	P30b-1	Parcel 30 Planned Performance Art Venues within WKCD (iv) (Planned ASR from beyond 2020)		13.4	4.0	6	none	See Note (vi)
549	P30b-2			17.4	8.0			
550	P30b-3			21.4	12.0			
551	P30b-4			25.4	16.0			
552	P30b-5			29.4	20.0			
553	P30c-1	Parcel 30 Planned Performance Art Venues within WKCD (iv) (Planned ASR from beyond		13.4	4.0	6	none	See Note (vi)
554	P30c-2			17.4	8.0			
555	P30c-3			21.4	12.0			
556	P30c-4			25.4	16.0			
557	P30c-5			29.4	20.0			

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
		2020)						
558	P30d-1	Parcel 30		13.4	4.0	6	none	See Note (vi)
559	P30d-2	Planned Performance Art Venues within WKCD (iv) (Planned ASR from beyond 2020)		17.4	8.0			
560	P30d-3			21.4	12.0			
561	P30d-4			25.4	16.0			
562	P30d-5			29.4	20.0			
563	P30e	Parcel 30 Planned Performance Art Venues within WKCD (iv) (Planned ASR from beyond 2020)		29.4	20.0	6	none	
564	P31-1	Parcel 31	N/A	13.4	4.0	22	none	See Note (vi)
565	P31-2	Retail/ Dining/ Entertainment (iv) Office(iv) (Planned ASR from 2018 onwards)		17.4	8.0			
566	P31-3			21.4	12.0			
567	P31-4			25.4	16.0			
568	P31-5			29.4	20.0			
569	P31-6			39.4	30.0			
570	P31-7			49.4	40.0			
571	P31-8			59.4	50.0			
572	P31-9			69.4	60.0			
573	P31-10			79.4	70.0			
574	P31-11			89.4	80.0			
575	P32-1	Parcel 32	N/A	13.4	4.0	15	none	
576	P32-2	Retail/ Dining/ Entertainment + Residential (Planned ASR from 2018 onwards)		17.4	8.0			
577	P32-3			21.4	12.0			Lowest residential floor
578	P32-4			25.4	16.0			
579	P32-5			29.4	20.0			
580	P32-6			39.4	30.0			
581	P32-7			49.4	40.0			
582	P34-1	Parcel 34	N/A	13.4	4.0	21	none	See Note (vi)
583	P34-2	Office + Planned Performance		17.4	8.0			
584	P34-3			21.4	12.0			
585	P34-4			25.4	16.0			
586	P34-5			29.4	20.0			

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
587	P34-6	Art Venues within WKCD (iv) (Planned ASR from 2018 onwards)		39.4	30.0			
588	P34-7			49.4	40.0			
589	P34-8			59.4	50.0			
590	P34-9			69.4	60.0			
591	P34-10			79.4	70.0			
592	P35a-1	Parcel 35 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2017 onwards)	N/A	13.4	4.0	7	2017	See Note (vi)
593	P35a-2			17.4	8.0			
594	P35a-3			21.4	12.0			
595	P35a-4			25.4	16.0			
596	P35a-5			29.4	20.0			
597	P35b-1	Parcel 35 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2017 onwards)		13.4	4.0	7	2017	See Note (vi)
598	P35b-2			17.4	8.0			
599	P35b-3			21.4	12.0			
600	P35b-4			25.4	16.0			
601	P35b-5			29.4	20.0			
602	P35c-1	Parcel 35 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2017 onwards)		13.4	4.0	7	2017	See Note (vi)
603	P35c-2			17.4	8.0			
604	P35c-3			21.4	12.0			
605	P35c-4			25.4	16.0			
606	P35c-5			29.4	20.0			
607	P35d-1	Parcel 35 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2017 onwards)		13.4	4.0	7	2017	See Note (vi)
608	P35d-2			17.4	8.0			
609	P35d-3			21.4	12.0			
610	P35d-4			25.4	16.0			
611	P35d-5			29.4	20.0			
612	P35e-1	Parcel 35 Planned Performance Art Venues within WKCD (iv)		29.4	20.0	7	2017	

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
		(Planned ASR from 2017 onwards)						
613	P36-1	Parcel 36	N/A	11.4	4.0	15	none	See Note (vi)
614	P36-2	Retail/ Dining/ Entertainment (iv) (Planned ASR from 2018 onwards)		15.4	8.0			
615	P36-3			19.4	12.0			
616	P36-4			23.4	16.0			
617	P36-5			27.4	20.0			
618	P36-6			37.4	30.0			
619	P36-7			47.4	40.0			
620	P36-8			57.4	50.0			
621	P36-9			67.4	60.0			
622	P36-10			77.4	70.0			
623	P37-1	Parcel 37	N/A	11.4	4.0	15	2017	See Note (vi)
624	P37-2	Retail/ Dining/ Entertainment (iv) (Planned ASR from 2017 onwards)		15.4	8.0			
625	P37-3			19.4	12.0			
626	P37-4			23.4	16.0			
627	P37-5			27.4	20.0			
628	P37-6			37.4	30.0			
629	P37-7			47.4	40.0			
630	P37-8			57.4	50.0			
631	P37-9			67.4	60.0			
632	P37-10			77.4	70.0			
633	P38-1	Parcel 38	N/A	13.4	4.0	21	2017	See Note (vi)
634	P38-2	Office + Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2017 onwards)		17.4	8.0			
635	P38-3			21.4	12.0			
636	P38-4			25.4	16.0			
637	P38-5			29.4	20.0			
638	P38-6			39.4	30.0			
639	P38-7			49.4	40.0			
640	P38-8			59.4	50.0			
641	P38-9			69.4	60.0			
642	P38-10			79.4	70.0			
643	P39-1	Parcel 39	N/A	13.4	4.0	11	none	See Note (vi)
644	P39-2	Office + Planned Performance Art Venues within WKCD (iv) (Planned ASR		17.4	8.0			
645	P39-3			21.4	12.0			
646	P39-4			25.4	16.0			
647	P39-5			29.4	20.0			
648	P39-6			39.4	30.0			
649	P39-7			49.4	40.0			

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
650	P39-8	from 2020 onwards)		59.4	50.0			
651	P39-9			69.4	60.0			
652	P39-10			79.4	70.0			
653	P40a-1	Parcel 40	N/A	13.4	4.0	6	none	See Note (vi)
654	P40a-2	Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2018 onwards)		17.4	8.0			
655	P40a-3			21.4	12.0			
656	P40a-4			25.4	16.0			
657	P40a-5			29.4	20.0			
658	P40a-6			39.4	30.0			
659	P40a-7			49.4	40.0			
660	P40b-1	Parcel 40		13.4	4.0	6	none	See Note (vi)
661	P40b-2	Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2018 onwards)		17.4	8.0			
662	P40b-3			21.4	12.0			
663	P40b-4			25.4	16.0			
664	P40b-5			29.4	20.0			
665	P40b-6			39.4	30.0			
666	P40b-7			49.4	40.0			
667	P40c-1	Parcel 40		13.4	4.0	6	none	See Note (vi)
668	P40c-2	Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2018 onwards)		17.4	8.0			
669	P40c-3			21.4	12.0			
670	P40c-4			25.4	16.0			
671	P40c-5			29.4	20.0			
672	P40c-6			39.4	30.0			
673	P40c-7			49.4	40.0			
674	P40d-1	Parcel 40		13.4	4.0	6	none	See Note (vi)
675	P40d-2	Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2018 onwards)		17.4	8.0			
676	P40d-3			21.4	12.0			
677	P40d-4			25.4	16.0			
678	P40d-5			29.4	20.0			
679	P40d-6			39.4	30.0			
680	P40d-7			49.4	40.0			
681	P40e	Parcel 40 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2018 onwards)		49.4	40.0	6	none	

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
682	P41-1	Parcel 41	N/A	13.4	4.0	1	none	See Note (vi)
683	P41-2	Pavilion (iv) (Planned ASR from 2030 onwards)		17.4	8.0			
684	P41-3			21.4	12.0			
685	P41-4			25.4	16.0			
686	P41-5			29.4	20.0			
687	P43a-1	Parcel 43	N/A	16.5	4.0	13	none	See Note (vi)
688	P43a-2	Hotel + Retail/ Dining/ Entertainment (iv) (Planned ASR from 2020 onwards)		20.5	8.0			
689	P43a-3			24.5	12.0			
690	P43a-4			28.5	16.0			
691	P43b-1	Parcel 43		16.5	4.0	13	none	See Note (vi)
692	P43b-2	Hotel + Retail/ Dining/ Entertainment (iv) (Planned ASR from 2020 onwards)		20.5	8.0			
693	P43b-3			24.5	12.0			
694	P43b-4			28.5	16.0			
695	P43b-5			32.5	20.0			
696	P43c-1	Parcel 43		16.5	4.0	13	none	See Note (vi)
697	P43c-2	Hotel + Retail/ Dining/ Entertainment (iv) (Planned ASR from 2020 onwards)		20.5	8.0			
698	P43c-3			24.5	12.0			
699	P43c-4			28.5	16.0			
700	P43c-5			32.5	20.0			
701	P43d-1	Parcel 43		16.5	4.0	13	none	See Note (vi)
702	P43d-2	Hotel + Retail/ Dining/ Entertainment (iv) (Planned ASR from 2020 onwards)		20.5	8.0			
703	P43d-3			24.5	12.0			
704	P43d-4			28.5	16.0			
705	P43d-5			32.5	20.0			
706	P43d-6			42.5	30.0			
707	P43d-7			52.5	40.0			
708	P43e-1	Parcel 43		16.5	4.0	13	none	See Note (vi)
709	P43e-2	Hotel + Retail/ Dining/ Entertainment (iv) (Planned ASR from 2020 onwards)		20.5	8.0			
710	P43e-3			24.5	12.0			
711	P43e-4			28.5	16.0			
712	P43e-5			32.5	20.0			
713	P43e-6			42.5	30.0			
714	P43e-7			52.5	40.0			

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
715	P43e-8			62.5	50.0			
716	P43f-1	Parcel 43		16.5	4.0	13	none	See Note (vi)
717	P43f-2	Hotel + Retail/ Dining/ Entertainment (iv) (Planned ASR from 2020 onwards)		20.5	8.0			
718	P43f-3			24.5	12.0			
719	P43f-4			28.5	16.0			
720	P43f-5			32.5	20.0			
721	P43f-6			42.5	30.0			
722	P43f-7			52.5	40.0			
723	P43f-8			62.5	50.0			
724	P43g-1	Parcel 43		16.5	4.0	13	none	See Note (vi)
725	P43g-2	Hotel + Retail/ Dining/ Entertainment (iv) (Planned ASR from 2020 onwards)		20.5	8.0			
726	P43g-3			24.5	12.0			
727	P43g-4			28.5	16.0			
728	P43g-5			32.5	20.0			
729	P43g-6			42.5	30.0			
730	P43g-7			52.5	40.0			
731	P43h-1	Parcel 43		16.5	4.0	13	none	See Note (vi)
732	P43h-2	Hotel + Retail/ Dining/ Entertainment (iv) (Planned ASR from 2020 onwards)		20.5	8.0			
733	P43h-3			24.5	12.0			
734	P43h-4			28.5	16.0			
735	P43h-5			32.5	20.0			
736	P43h-6			42.5	30.0			
737	P43h-7			52.5	40.0			
738	P43i-1	Parcel 43		16.5	4.0	13	none	See Note (vi)
739	P43i-2	Hotel + Retail/ Dining/ Entertainment (iv) (Planned ASR from 2020 onwards)		20.5	8.0			
740	P43i-3			24.5	12.0			
741	P43i-4			28.5	16.0			
742	P43i-5			32.5	20.0			
743	P43i-6			42.5	30.0			
744	P43j-1	Parcel 43		16.5	4.0	13	none	See Note (vi)
745	P43j-2	Hotel + Retail/ Dining/ Entertainment (iv) (Planned ASR from 2020 onwards)		20.5	8.0			
746	P43j-3			24.5	12.0			
747	P43j-4			28.5	16.0			
748	P43j-5			32.5	20.0			
749	P43k-1	Parcel 43		16.5	4.0	13	none	See Note (vi)
750	P43k-2	Hotel + Retail/		20.5	8.0			
751	P43k-3	Dining/		24.5	12.0			

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
752	P43k-4	Entertainment (iv) (Planned ASR from 2020 onwards)		28.5	16.0			
753	P46a-1	Parcel 46 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2020 onwards)	N/A	16.4	4.0	5	none	See Note (vi)
754	P46a-2			20.4	8.0			
755	P46a-3			24.4	12.0			
755	P46a-4			28.4	16.0			
756	P46a-5			32.4	20.0			
757	P46a-6			42.4	30.0			
758	P46b-1	Parcel 46 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2020 onwards)		16.4	4.0	5	none	See Note (vi)
759	P46b-2			20.4	8.0			
760	P46b-3			24.4	12.0			
761	P46b-4			28.4	16.0			
762	P46b-5			32.4	20.0			
763	P46b-6			42.4	30.0			
764	P46c-1	Parcel 46 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2020 onwards)		16.4	4.0	5	none	See Note (vi)
765	P46c-2			20.4	8.0			
766	P46c-3			24.4	12.0			
767	P46c-4			28.4	16.0			
768	P46c-5			32.4	20.0			
769	P46c-6			42.4	30.0			
770	P46d-1	Parcel 46 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2020 onwards)		16.4	4.0	5	none	See Note (vi)
771	P46d-2			20.4	8.0			
772	P46d-3			24.4	12.0			
773	P46d-4			28.4	16.0			
774	P46d-5			32.4	20.0			
775	P46d-6			42.4	30.0			
776	P46e-1	Parcel 46 Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2020		42.4	30.0	5	none	

No.	ASR	Description	Horizontal distance from WKCD site boundary (m)	Height (mPD)	Height above ground (m)	No. of storeys	Year subject to construction phase impact	Notes
		onwards)						
777	P50-1	Parcel 50	N/A	9.0	4.0	NA	none	See Note (vi)
778	P50-2	Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2020 onwards)		13.0	8.0			
779	P50-3			17.0	12.0			
780	P50-4			21.0	16.0			
781	P50-5			25.0	20.0			
782	P51-1	Parcel 51	N/A	9.0	4.0	NA	2016 – 2017	See Note (vi)
783	P51-2	Freespace (Planned ASR from 2016 onwards)		13.0	8.0			
784	P51-3			17.0	12.0			
785	P51-4			21.0	16.0			
786	P51-5			25.0	20.0			
787	P52-1	Parcel 52	N/A	9.0	4.0	2	2016 – 2017	See Note (vi)
788	P52-2	Pavilion (iv) (Planned ASR from 2016 onwards)		13.0	8.0			
789	P52-3			17.0	12.0			
790	P52-4			21.0	16.0			
791	P52-5			25.0	20.0			
792	P53-1	Parcel 53	N/A	9.0	4.0	2	2014 – 2017	See Note (vi)
793	P53-2	Pavilion (iv) (Planned ASR from 2014 onwards)		13.0	8.0			
794	P53-3			17.0	12.0			
795	P53-4			21.0	16.0			
796	P53-5			25.0	20.0			
797	P54-1	Parcel 54	N/A	9.0	4.0	1	2017	See Note (vi)
798	P54-2	Planned Performance Art Venues within WKCD (iv) (Planned ASR from 2017 onwards)		13.0	8.0			
799	P54-3			17.0	12.0			
800	P54-4			21.0	16.0			
801	P54-5			25.0	20.0			
802	OP	Open space (Planned ASR from 2017 onwards)	N/A	6.5	1.5	0	2017	

Notes
(i) Estimated locations of the fresh air takes of these developments are taken as the ASRs.
(ii) The locations and no. of storeys of the planned ASRs representing the topside development at West Kowloon Terminus (WKT) Site A are based on the approved EIA for Hong Kong Section of the Guangzhou – Shenzhen – Hong Kong Express Rail Link (XRL).
(iii) According to the approved EIA for Road Works at West Kowloon, these planned ASRs will be occupied upon completion of construction of the Road Works at West Kowloon project in 2014.
(iv) The planned ASRs represent the indicative fresh air intake locations of these planned developments.

(v) Selected assessment height is the indicative location of fresh air intake at podium level.
(vi) The planned ASRs at 4m above ground level are assessment points for reference only, but are not fresh air intake or openable window locations.

14.3.3 Identification of Pollution Sources

14.3.3.1 Background Air Quality

The underpass road is located on the Kowloon Peninsula and is surrounded by the sea on two of its four sides. In accordance with the *Guidelines in Assessing the 'TOTAL' Air Quality Impacts*, the WKCD area is categorised as an urban area. Since there is no EPD general air quality monitoring station located in this area, the recent five years (2007 –2011) annual average monitoring data recorded at five of EPD's general air quality monitoring stations in urban areas should therefore be used to estimate the background TSP concentration. Using this average allows for the harbour setting of the site to be considered and provides more representative estimation of the background concentrations than by using any one station only.

With reference to EPD's *Air Quality Annual Report*, the EPD's general air quality monitoring stations in urban areas that can be considered as an indication of the background concentration include Central/Western, Kwun Tong, Sham Shui Po, Tsuen Wan and Kwai Chung. The average TSP concentration of all these five monitoring stations is detailed in **Table.14.3.4.**

Table.14.3.4 Average Background TSP Air Pollutant Concentrations (Year 2007-2011)

Urban Stations	Annual Average TSP Concentration (µg/m^3)					TSP Background Concentration (µg/m^3)
	2007	2008	2009	2010	2011	
Tsuen Wan	79	67	63	63	69	68.2
Kwai Chung	**85**	79	70	71	71	75.2
Sham Shui Po	79	**81**	77	76	79	78.4
Kwun Tong	**82**	72	70	67	74	73.0
Central/Western	77	78	73	76	78	76.4
					Average	74.2

Note: Monitoring results that exceeded AQO are shown in bold characters.

Dust monitoring has been undertaken in the vicinity of the proposed West Kowloon Terminus (WKT) from March 2010 to December 2012 inclusive as part of the environmental monitoring and audit (EM&A) works for XRL project. The air monitoring stations considered to be most relevant to WKCD area are AM16 and AM17, as both stations are in close proximity to the WKCD site (see **Figure 3.2**). The annual average TSP concentration during that construction period of WKT has been calculated, as shown in **Table 14.3.5** (see **Appendix 3.27** for details).

Table 14.3.5: Air Quality Monitoring Results for Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link relevant to WKCD (March 2010 – December 2012)

Monitoring Station	Location	Annual Average TSP Concentration (µg/m^3)			3-year Average Concentration (µg/m^3)
		2010(1)	2011	2012	
AM16	Tower 3, The Waterfront	74.2	73.4	54.3	67.1
AM17	The Victoria Towers	74.7	79.3	55.5	69.7
				Average	68.4

Note: (1) Monitoring results from March 2010 to December 2010.

As the air quality monitoring stations AM16 and AM17 border the XRL site boundary, it is reasonable to assume that the average TSP concentration of these two stations can represent XRL generated dust concentrations plus prevailing background dust concentrations at the WKCD area. While the 5-year average TSP concentration in urban areas as obtained from EPD's urban air quality monitoring stations (74.2 µg/m^3 from **Table.14.3.4**) is comparable to that from the XRL data (68.4 µg/m^3 from **Table 14.3.5**), it is considered that using the XRL monitoring data is a more reasonable estimate for the WKCD area TSP assessment. This is because there is a sufficient amount of XRL data (about 3 years' data) and the XRL monitoring stations are in close proximity to the WKCD site whereas the EPD's monitoring stations are at much larger distances (1.91 km to 8.65 km) from the site.

Operational air quality contaminants of significance to the Project area include: SO_2, from marine; NO_2, from vehicles and marine; RSP, from vehicles and marine. The 5-year average concentrations for these pollutants are detailed in **Table 14.3.6**.

Table 14.3.6: Average Background Air Pollutant Concentrations from EPD's Urban Air Monitoring Stations (Year 2007-2011)

Pollutant	Urban Stations and 5-year Average Concentration (µg/m^3)					AQO criteria (µg/m^3)	5-year Average Concentration (µg/m^3)
	Tsuen Wan	Kwai Chung	Sham Shui Po	Kwun Tong	Central/ Western		
Sulfur Dioxide (SO_2)	19.8	24.4	17.4	13.8	17.6	80	18.6
Nitrogen Dioxide (NO_2)	63.2	64.6	68.4	60.4	52.8	80	61.9
Respirable Suspended Particulate (RSP/PM_{10})	51.2	50.4	51.2	48.8	49.6	55	50.2

In addition to the urban air quality monitoring stations, EPD had operated a local air quality monitoring station at the WKCD site to record background air pollutant concentrations from September 2011 to August 2012. Although the monitoring data is only for a single year, the recorded information is useful as a direct indication of the onsite air quality. **Table 14.3.7** shows the background air quality data for the WKCD site for 2011-2012 (see details in **Appendix 3.20)**.

Table 14.3.7: Average Background Air Pollutant Concentrations from EPD's Local Monitoring Station at WKCD Site (September 2011 – August 2012)

Pollutant	Annual Average Concentration (µg/m^3)	AQO criteria (µg/m^3)
Sulfur Dioxide (SO_2)	11.4	80
Nitrogen Dioxide (NO_2)	46.7	80
Respirable Suspended Particulate (RSP/PM_{10})	45.0	55

By comparing the EPD's onsite monitoring results at WKCD with the 5-year average from the urban monitoring stations, it can be seen that the onsite monitoring results are significantly lower – approximately 39% lower for SO_2, 25% lower for NO_2, and 10% lower for RSP.

The future background air pollutant concentrations to be used for predicting the total air quality impact due to operational phase for NO_2 RSP and SO_2 are as extracted from the PATH model (for year 2015) released by EPD in December 2012.

14.3.3.2 Construction Phase

Construction of the WKCD basement will be carried out in zones, with construction of Zone 1 aimed at commencement in 2013 for completion of Zones 1 to 3 in 2017 (see **Appendix 2.4** for the assumed construction programme). During construction, the major activities that would generate construction dust emissions include the following:

- Excavation activities;
- Foundation works;
- Concrete batching plant and barging points (assumed to be handed over from the XRL project to WKCD);
- Site Formation, and;
- Movement of mobile plant and vehicles on haul roads.

Based on a review of the construction methods adopted for the WKCD Project, construction dust will be potentially generated from the aforementioned land-based construction activities and is therefore identified as the representative pollutants. Therefore, it is considered appropriate to adopt total suspended particulate (TSP) as the key pollutant during the construction phase. According to the "2011 Hong Kong Emission Inventory Report" published by EPD in March 2013, which is the latest available information at the time of preparing this Report, the top 3 major sources of RSP include navigation, road transport and public electricity generation, which collectively accounted for about 72% of the total RSP emission in 2011 whereas non-combustion sources only constituted about 15% of the total emission. Since construction dust is only one of the various non-combustion sources, it is considered that RSP would not be a representative pollutant of construction dust.

Due to construction of concurrent projects in the vicinity, cumulative impacts are expected. **Table 14.3.8** summarises the concurrent projects that may contribute to cumulative construction dust impacts.

Table 14.3.8: Summary of concurrent projects during construction phase

Project	Construction Period	Possible Cumulative Impact	Included in Cumulative Impact Assessment
Hong Kong Section of the Guangzhou – Shenzhen – Hong Kong Express Rail Link (XRL)	Jan 2010 – 2015	Dust emissions from construction of the West Kowloon Terminus and operation of the concrete batching plant and barging points	Yes
Road Works at West Kowloon	2011 – 2014	According to the EIA, major dusty construction activities and excavation works are to be completed by March 2012. Minor dust emissions may arise from the remaining road works and movement of mobile plant and vehicles	No

Project	Construction Period	Possible Cumulative Impact	Included in Cumulative Impact Assessment
Road Improvement Works in West Kowloon Reclamation Development – Phase I	Late 2013 / early 2014 – end 2015	Dust emissions from the roadworks construction and movement of mobile plant and vehicles	Yes
Central Kowloon Route	2015 – end 2020	Dust emissions from construction works	Yes

As an updated schedule of construction works for the WKT of the XRL project is not available for 2013-2015, it is not possible to incorporate realistic dust emission sources of WKT into the FDM model for assessment of cumulative impacts. As such, relevant EM&A monitoring data of the XRL project is used to assess the potential cumulative impacts as described below.

With reference to the dust monitoring results from the two air quality monitoring stations (AM16 and AM17) in the vicinity of the WKCD site from March 2010 to December 2012 inclusive, the average TSP concentration during that construction period of WKT has been calculated, as shown in **Appendix 3.27**. . It is reasonable to assume that the average TSP concentration from these two dust monitoring stations can represent XRL generated dust concentrations plus prevailing background dust concentrations at the WKCD area. The background concentration used for the TSP assessment for the underpass road is therefore taken as 68.4 µg/m^3 (**Table 14.3.5**).

For the Central Kowloon Route (CKR) project, its construction dust impact assessment area overlaps part of the corresponding assessment area for the underpass road. Therefore, the relevant TSP modelling results from the published EIA of CKR project have been added to those of the underpass road for ASRs that are within the overlapped portion of both assessment areas in order to assess the cumulative effects.

14.3.3.3 Operation Phase – Vehicular Emissions

During the operation phase, there will be cumulative air quality impacts on the ASRs due to vehicular emissions from:

- Existing and proposed open roads outside the underpass road area but within the 500 m assessment area;
- Proposed underpasses/landscape decks along the Austin Road West and Lin Cheung Road and the associated top openings under the Road Works at West Kowloon project, which is within the 500 m assessment area; and
- Portal of the existing Western Harbour Crossing (WHC) which is in the vicinity of the underpass road site.
- Ventilation exhausts and portals serving the planned underground roads within the WKCD area.

It should be noted that all of the above vehicular emission sources, except the planned underground roads within WKCD, are due to the current and planned road networks serving the West Kowloon area. Therefore, it is anticipated that the underpass road itself would only have a relatively small contribution to total vehicular emissions in the area. On the contrary, the WKCD development would be subject to potential air quality impacts that are largely generated by the existing/planned road traffic in the area.

The air quality inside the WKCD basement where the underground vehicle roads are located should meet the air pollutant standards as recommended by the EPD's *Practice Note on Control of Air Pollution in*

Vehicle Tunnels (see **Table 14.3.2**). Therefore, the basement ventilation system should be properly designed by WKCDA's consultant/engineer to adequately remove or dilute vehicle emissions and the basement air quality should be monitored to ensure compliance with the relevant air quality standards.

14.3.3.4 Operation Phase – Marine Traffic Emissions

There are existing marine activities within the 500 m assessment area that will contribute to the background emissions, which include:

- Fast ferry traffic movements, based on scheduled sailings, of up to 170 daily movements (ferry going to is one movement, ferry leaving is a second movement) at the China Ferry Terminal;
- Tugs associated with Derrick lighter barge movements in the NYMTTS;
- Derrick lighter barges operating at the New Yau Ma Tei Public Cargo Working Area (NYPCWA), and;
- Ocean Cruise Ship berthing at the Ocean Terminal.

Although emissions from all the above current marine activities are not attributable to the underpass road development, the WKCD development would be subject to potential air quality impacts caused by such marine emissions.

Under the current development of marine traffic planning at the WKCD site, it is intended that marine services at WKCD will primarily be provided for visitor or leisure activities. In terms of traffic volume, the support on the need of the possible piers has been a key outcome from the public consultation in view of general public's opinions and needs. No precedence case or similar scale of development as the WKCD has been developed in the Victoria Harbour and therefore no realistic marine traffic forecast can be developed at this stage of the Project. However, as the possible piers would only be used by visitors or for leisure purposes without any planning for routine uses, it is anticipated that the marine traffic to be generated at the two possible piers would be insignificant when compared to the aforementioned existing marine activities. No vessel landing will be included at the optional viewing platform and for the proposed landing steps of WKCD, and therefore they are being designed as features of the development and will not serve any marine traffic.

14.3.3.5 Operation Phase – Industrial Emissions

Chimney survey and desktop study have been conducted to identify any existing or planned chimneys of industrial operations within the 500m assessment area. Based on the survey and desktop study findings, no existing or planned chimneys were identified within the assessment area.

14.3.3.6 Operation Phase – Identification of Key Air Pollutants of Concern

As presented in **Section 14.3.1.2**, under the APCO, AQOs are stipulated for seven criteria air pollutants, namely, nitrogen dioxide (NO_2), sulphur dioxide (SO_2), total suspended particulates (TSP), respirable suspended particulates (RSP), carbon monoxide (CO), ozone and lead. As identified in **Sections 14.3.3.3** and **14.3.3.4**, during the operation phase, the existing/planned ASRs within the 500m assessment area would be subject to potential air quality impacts due to emissions from the underpass road and the nearby road traffic as well as the surrounding marine traffic/vessels. Each of the seven criteria pollutants has been reviewed for its relevance to such major air pollution sources of the Project as follows.

Nitrogen Dioxide (NO_2)

According to the "*2011 Hong Kong Emission Inventory Report"* published by EPD in March 2013, navigation and road transport are the top two major sources of nitrogen oxides (NO_x) generated in Hong Kong, constituting respectively about 33% and 29% of the total NO_x emission in 2011. NO_x would be transformed to NO_2 in the presence of O_3 under sunlight. As summarised in **Table 14.3.6**, the latest 5-year average of the annual NO_2 concentration in the urban areas (i.e., Tsuen Wan, Kwai Chung, Sham Shui Po, Kwun Tung and Central/Western) is about 77% of the corresponding AQO. Therefore, NO_2 has been identified as a key air pollutant of the emissions from both road traffic and marine traffic/vessels, and has been assessed against the relevant AQOs for this Project.

Respirable Suspended Particulates (RSP)

According to the latest statistics of *"2011 Hong Kong Emission Inventory Report"*, navigation and road transport are the top two major sources of RSP in Hong Kong, accounting for respectively about 37% and 19% of the total RSP emissions in 2011. As summarised in **Table 14.3.6**, the latest 5-year average of the annual RSP concentration in the urban area is about 91% of the corresponding AQO. Therefore, RSP has been identified as a key air pollutant of the emissions from both road traffic and marine traffic/ vessels, and has been assessed against the relevant AQOs for this Project.

Sulphur Dioxide (SO_2)

According to the latest statistics of *"2011 Hong Kong Emission Inventory Report"*, 54% of total SO_2 emission in Hong Kong is attributed to navigation whereas only below 1% of the total emission is due to road transport. The introduction of ultra low sulphur diesel for vehicle fleet in 2000 has also helped reducing the SO_2 emission from road transport in Hong Kong. As summarised in **Table 14.3.6**, the latest 5-year average of the annual SO_2 concentration in the urban area is about 23% of the corresponding AQO. While the 5-year average SO_2 level appears to be well below the relevant AQO with a large margin, a number of the future ASRs within WKCD (such as those at Parcels 02, 03, 10, 11, 13, 15, etc.) are close to the potential marine traffic emission sources from the ferry/cruise ship terminals. Therefore, SO_2 has been identified as a key air pollutant of the emissions from marine traffic/vessels (but not from road transport), and has been assessed against the relevant AQOs for this Project.

Ozone

According to the *"Air Quality in Hong Kong 2011"* published by EPD, ozone is a major constituent of photochemical smog. It is not a pollutant directly emitted from man-made sources but formed by photochemical reactions of primary pollutants such as NO_x and volatile organic compounds (VOCs) under sunlight. As it takes several hours for these photochemical reactions to take place, ozone recorded in one place could be attributed to VOC and NOx emissions from places afar. Hence, ozone is a regional air pollution problem. In other words, unlike such air pollutants as NO_x,RSP and SO_2, ozone is not a pollutant directly attributable to emissions from nearby marine or road traffic. As a result, ozone is not identified as a key air pollutant for air quality impact assessment for this Project, though it is one of the criteria pollutants under the AQO.

Carbon Monoxide (CO)

According to the latest statistics of *"2011 Hong Kong Emission Inventory Report"*, road transport and navigation are the top two major sources of CO emissions in Hong Kong, contributing to respectively about 67% and 18% of the total CO emission in 2011. However, based on the *"Air Quality in Hong Kong 2012 Preliminary Report"* published by EPD, the highest 1-hour CO level and the highest 8-hour CO concentration in Mong Kok are respectively 3,590 $\mu g/m^3$ and 2,755 $\mu g/m^3$, which are only 12% and 28% of

the corresponding AQO respectively. Given that the ambient CO levels are well below the relevant AQO with large margins as opposed to the other pollutants such as RSP and NO_2, it is considered appropriate to select RSP and NO_2, but not CO, as the key pollutants for air quality impact assessment against the AQO for this Project.

Lead

Since leaded petrol was banned in Hong Kong on 1 April 1999, it is no longer considered as a primary source in Hong Kong. According to the *"Air Quality in Hong Kong 2011"* published by EPD, the ambient lead concentrations continued to linger at very low levels during 2011 as in previous years, and the overall 3-month averages, ranging from 0.02 $\mu g/m^3$ (in Kwun Tong and Tung Chung) to 0.104 $\mu g/m^3$ (in Yuen Long), were well below the AQO limit of 1.5 $\mu g/m^3$. Therefore, it is not considered as a key air pollutant for the operation phase air quality impact assessment.

Identified Key Air Pollutants

Based on the above review results, the following key air pollutants of concerns are identified for the purpose of air quality impact assessment during the operation phase:

- For road traffic emissions – NO_2 and RSP; and
- For marine traffic/vessel emissions – SO_2, NO_2 and RSP.

14.3.4 Assessment Methodology

14.3.4.1 Construction Phase

Introduction

To assess the construction phase through air quality modelling, use of the air quality model Fugitive Dust Model (FDM) was required. In accordance with the EPD's *Guidelines on Choice of Models and Model Parameters*, FDM was used to predict the air pollutant concentrations due to fugitive and open dust source impacts, which are shown in **Figures 3.3a-k** and **3.4a-f**. Details of the emission rates from the activities are given in **Appendices 3.1** to **3.3**.

Model Description – FDM

FDM is a computerised air quality model specifically designed for computing the concentration and deposition impacts from fugitive dust sources. The model is generally based on the well-known Gaussian Plume formulation for computing concentrations, but the model has been specifically adapted to incorporate an improved gradient transfer deposition algorithm. FDM is one of the air quality models listed as commonly used for EIA studies by EPD in *Guidelines on Choice of Models and Model Parameters.*

It should be noted that FDM and all Gaussian based dispersion models have limited ability to predict dispersion in the following situations:[1]

- Causality effects

  Gaussian plume models assume pollutant material is transported in a straight line instantly (like a beam of light) to receptors that may be several hours or more in transport time away from the source. The model takes no account for the fact that the wind may only be blowing at 1 m/s and will have only travelled 3.6 km in the first hour. This means that Gaussian models cannot account for causality effects, where the plume may meander across the terrain as the wind speed or direction changes. This effect is not considered to be significant for the WKCD site as the site is small.

- Low wind speeds

  Gaussian-plume models 'break down' during low wind speed or calm conditions due to the inverse speed dependence of the steady state plume equation. These models usually set a minimum wind speed of 0.5 m/s or 1.0 m/s and ignore or overwrite data below this limit.

- Straight-line trajectories

  Gaussian models will typically overestimate terrain impingement effects during stable conditions because they do not account for turning or rising wind caused by the terrain itself. This effect is not considered to be important for WKCD as the site and surrounding terrain is flat.

- Spatially uniform meteorological conditions

  Gaussian models assume that the atmosphere is uniform across the entire modelling domain, and that transport and dispersion conditions exist unchanged long enough for the material to reach the receptor

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46

[1] *Good Practice Guide for Atmospheric Dispersion Modelling.* Ministry for the Environment, New Zealand (June 2004)

even if this is several kilometres away. In the atmosphere, truly uniform conditions rarely occur. As the WKCD site and surrounding assessment area is sufficiently small with no significant terrain features, uniform meteorological conditions are considered appropriate.

- No memory of previous hour's emissions

  In calculating each hour's ground-level concentrations, Gaussian models have no memory of the contaminants released during the previous hours. This limitation is especially important for the proper simulation of morning inversion break-up, fumigation and diurnal recycling of pollutants.

Assumptions and Inputs – FDM

During the construction stage, the study area will not have many tall buildings. As such, the *"Guideline on Air Quality model (revised), EPA - 450/2-78-027R, July 1986"* is used to calculate the roughness length for use in FDM.

The EPD guideline on *"Choice of Models and Model Parameters"* states: the selection of rural or urban dispersion coefficients in a specific application should follow a land use classification procedure. If the land use types including industrial, commercial and residential uses account for 50% or more of an area within a 3 km radius from the source, the site is classified as urban; otherwise it is classified as rural. The surface roughness height is closely related to the land use characteristics of a study area and associated with the roughness element height. As a first approximation, the surface roughness can be estimated as 3 to 10 percent of the average height of physical structures. Typical values used for urban and new development areas are 370 cm and 100 cm, respectively.

Within a three kilometre radius of the site 55% is classified as urban and the remaining 45% is sea. As the sea roughness is typically given a value of 0.01 cm and urban is assumed to be 370 cm, an area averaged roughness height of 205 cm is used. This is to take account of the low turbulence over the sea water, and also the very large turbulence generated due to nearby large structures.

Hourly meteorological data for a full year as extracted from PATH model released by EPD in December 2012 (metrological data year 2010, grid 28, 27) has been adopted for use in FDM and is considered to be the most up to date data available. PATH data has been observed to have a lower mixing height for some hours, when compared to the measured mixing height. The minimum mixing height recorded by HKO in 2010 is 121.3 m, whereas the PATH minimum mixing height is 40 m. The HKO minimum mixing height of 121.3 m is used to replace any PATH mixing height below this value. This approach is considered appropriate as it will minimise over-estimation due to lower mixing heights and also will minimise under-estimation due to high stacks being excluded in the mixing volume. The PATH data with the above modification is considered to be representative of the site wind data at the underpass road site.

Prediction of dust emissions is based on emissions factors from the *Compilation of Air Pollution Emission Factors (AP-42), 5th Edition* published by the US Environmental Protection Agency (USEPA). The emission factor for a typical heavy construction activity is 2.69 megagrams (Mg)/hectare/month according to *Section 13.2.3.3* of *AP-42*. The number of working days for a month and number of working hours per day of the project are anticipated to be 26 days and 12 hours respectively. No construction work is anticipated to be carried out on Sundays. Based on *Table 11.9-4* of *AP-42*, the emission factor of wind erosion is 0.85 megagrams (Mg)/hectare/year. The locations of assumed dust sources are given in **Figures 3.3a** to **3.3k**. The key dust emission factors adopted in FDM are summarised in **Table 14.3.9**.

For the mitigated scenario, the active construction areas have ground watering applied once per hour or 12 times per day. This gives rise to dust suppression of 91.7%, as estimated in **Appendix 3.8**. The unmitigated scenario does not employ any watering for dust suppression.

For the concrete batching plant, it is assumed that the plant will be handed over from the XRL project to the WKCD (including underpass road) Project, and therefore the emissions from the plant will be the same as those given in the approved EIA for XRL. All assumptions and calculations are extracted from the Specified Process (SP) License issued to the XRL for the concrete batching plant. The concrete batching plant and haul roads within the site are modelled as having operation hours of 12 hours per day, that is, from 7:00 am to 7:00 pm.

No stockpile is modelled as excavated material is anticipated to be transported out of the site immediately after generation. Barging points are assumed to be handed over from the XRL project to the WKCD Project, and therefore the emissions from the plant will be the same as those given in the approved EIA for XRL.

The emission inventory and calculation of emission factors for the construction activities are detailed in **Appendices 3.1 to 3.3.**

Table 14.3.9: Key Dust Emission Factors Adopted in the Assessment

Activities	Emission Factors	Reference
Heavy construction activities including all above ground and open construction works, excavation and slope cutting works	2.69 Mg/hectare/month	Section 13.2.3.3 AP-42, 5th Edition
Wind erosion from heavy construction	0.85 Mg/hectare/year	Table 11.9-4 AP-42, 5th Edition
Paved haul road within concrete batching plant	Emission Factor = $k \times (sL)^{0.91} \times (W)^{1.02}$ g/VKT where k is particle size multiplier * sL is road surface silt loading W is average truck weight	Section 13.2.1 AP-42, 5th Edition (Jan 2011 edition)

* The particle size distribution was made reference to Section 13.2.1(Table 13.2.1-1) of the USEPA Compilation of Air Pollution Emission Factors (AP-42), 5th Edition (Jan 2011 edition).

With addition of the average background TSP concentration of two monitoring stations as described in **Section 14.3.3.1**, i.e., 68.4 µg/m ^{3}, the hourly, daily and annual TSP concentrations at the identified ASRs have been predicted and compared with the hourly, daily and annual average TSP criteria of 500 µg/m^3, 260 µg/m^3 and 80 µg/m^3 respectively.

Methodology – FDM

Construction of the underpass road is to be completed in stages; as such the FDM assessment has been completed for each construction year from 2013 to 2017, when the majority of the site works are expected to be completed.

For hourly and daily TSP, a tiered modelling approach has been adopted. Tier 1 assumes 100% active area for a given year is emitting TSP. This Tier 1 scenario (i.e. assuming 100% active area for the Project and the concurrent project) is hypothetical and for screening purposes to identify which ASRs may be subject to TSP concentrations above the relevant standards. For the purpose of the Tier 1 screening, the

dust mitigation measures, including frequent water spraying, are taken into account when estimating the dust emission rates from the construction activities. Details of the Tier 1 dust sources including their coordinates, dimensions and estimated emission rates are detailed in **Appendix 3.4**. Locations of the assumed dust sources for Tier 1 assessment are shown in **Figure 3.3a** to **3.3k**. The Tier 1 hourly and daily TSP levels at all the ASRs are then predicted for both scenarios of with and without the dust mitigation measures in place.

The ASRs identified with hourly or daily TSP non-compliance under Tier 1 screening, where mitigation measures are in place, are selected for the subsequent Tier 2 assessment.

The entire works area is broken into a number of zones for construction timetabling purposes. Based on the assumed construction plant inventory of individual zones and planned construction activities for each year, the percentage active areas for different zones are calculated, as summarised in **Table 14.3.10**. The maximum percentage active area for each year is taken from all zones and applied to the entire site.

It is assumed in the Tier 2 assessment that the maximum percentage active area of the underpass road excavation site for each zone and the corresponding active areas of the relevant concurrent project would be located closest to the ASR being assessed. The Tier 2 hourly or daily TSP levels at each of these ASRs are then predicted with the dust mitigation measures in place.

Under normal circumstances, construction activities for the proposed Project and the concurrent projects would likely spread over the whole work sites and zones. As such, the maximum percentage active area calculated from all zones, applied to the entire WKCD site, and the corresponding active areas of the relevant concurrent project to be located closest to a particular ASR at any one time during the Tier 2 assessment is a conservative approach. Details of the Tier 2 dust sources including their coordinates, dimensions and estimated emission rates are given in **Appendix 3.5**. Locations of the assumed dust sources for Tier 2 assessment are shown in **Figures 3.4a** to **3.4f**.

For the assessment of annual TSP concentrations, the active work area over the entire year would be less than that for a typical working hour or a typical working day. The percentage active area averaged over each construction year has been estimated for each zone as summarised in **Table 14.3.10**. The annual TSP assessment is based on the percentage active areas for individual zones. The annual TSP levels are predicted at all the ASRs for both scenarios of with and without the dust mitigation measures in place. Details of the dust sources for annual TSP assessment including their coordinates, dimensions and estimated emission rates are given in **Appendix 3.6**. Locations of assumed dust sources for annual assessment are shown in **Figure 3.3a** to **3.3k**.

Based on project-specific information, the percentages active work areas for heavy construction activities for hourly, daily and annual TSP assessment have been estimated and are summarised in **Table 14.3.10**. Detailed estimation of the percentages active work areas are provided in **Appendix 3.7**.

Table 14.3.10: Summary of tentative active area calculations for Tier 2 and Annual TSP assessment

Construction Year	Zone	Percentage Active Area		
		Hourly	Daily	Annually
2013	1	47.1%	47.1%	18.4%
	2a	0.0%	0.0%	0.0%
	2b	17.8%	17.8%	6.1%
	3	21.1%	21.1%	3.5%

Construction Year	Zone	Percentage Active Area		
		Hourly	Daily	Annually
	4	0.0%	0.0%	0.0%
	5	0.0%	0.0%	0.0%
	The Park (A, B, C)	1.4%	1.4%	0.8%
	Maximum	**47.1%**	**47.1%**	**18.4%**
2014	1	3.7%	3.7%	1.3%
	2a	66.1%	66.1%	44.6%
	2b	13.4%	13.4%	9.0%
	3	16.1%	16.1%	9.6%
	4	0.0%	0.0%	0.0%
	5	0.0%	0.0%	0.0%
	The Park (A, B, C)	9.9%	9.9%	9.9%
	Maximum	**66.1%**	**66.1%**	**44.6%**
2015	1	0.9%	0.9%	0.8%
	2a	6.5%	6.5%	5.7%
	2b	4.5%	4.5%	3.9%
	3	5.1%	5.1%	2.2%
	4	0.0%	0.0%	0.0%
	5	0.0%	0.0%	0.0%
	The Park (A, B, C)	0.3%	0.3%	0.3%
	Maximum	**6.5%**	**6.5%**	**5.7%**
2016	1	0.6%	0.6%	0.6%
	2a	1.3%	1.3%	0.7%
	2b	0.6%	0.6%	0.3%
	3	0.2%	0.2%	0.2%
	4	22.9%	22.9%	16.7%
	5	0.0%	0.0%	0.0%
	The Park (A, B, C)	0.5%	0.5%	0.5%
	Maximum	**22.9%**	**22.9%**	**16.7%**
2017	1	0.0%	0.0%	0.0%
	2a	3.2%	3.2%	3.2%
	2b	0.7%	0.7%	0.7%
	3	0.2%	0.2%	0.2%
	4	13.0%	13.0%	3.7%
	5	3.1%	3.1%	1.8%
	The Park (A, B, C)	2.4%	2.4%	1.6%
	Maximum	**13.0%**	**13.0%**	**3.7%**

Note: (a) The Tier 2 assessment for hourly and daily TSP uses the maximum percentage active area for all zones.
(b) The assessment of annual TSP uses zone specific percentage active area.

14.3.4.2 Operation Phase – Vehicular Emissions

Introduction

To assess the operational air quality, a variety of models were required. In accordance with the EPD's *Guidelines on Choice of Models and Model Parameters*, the following air dispersion models have been employed to predict the cumulative NO_2 and RSP levels at the identified ASRs:

- EMFAC-HK V2.5.1 (I and M) model has been used to determine the fleet average emission factors, for all the planned and existing roads within the 500 m assessment area, including planned underpass roads within WKCD site, and the proposed Central Kowloon Route (CKR). The model has included the effect of Inspection and Maintenance (I/M) program and is applicable for calendar years between 2013 and 2040.
- CALINE4 has been used to predict the air pollutant concentrations due to vehicular emissions from all open road links within the 500 m assessment area, which are as shown in **Figures 3.5.1a** to **3.5.1y**.
- ISCST3 has been used to predict the air pollutant concentrations due to vehicular emissions from the Western Harbour Crossing (WHC) portal (modelled as volume sources); the proposed underpasses/landscape deck portals (modelled as volume sources) and the associated top openings (modelled as area source) under the Road Works at West Kowloon project; as well as from the assumed ventilation serving the planned underground roads within the WKCD site (modelled as volume or point sources). The locations of all such pollution sources are as shown in **Figure 3.6**.
- Pollutants in the Atmosphere and the Transport over Hong Kong (PATH) has been used to predict the current background air pollution due to sources outside the project boundary. Sources include, but are not limited to, the Pearl River Deltas Economic Zone (PRDEZ), the Hong Kong International Airport, power plants in HKSAR. roads beyond the WKCD and, marine emissions. Background data predicted by PATH for year 2015 represents the worst case year relevant to the assessment of the Project.

The localised impacts due to the vehicle emissions within the 500 m assessment area of underpass road have been separately modelled by the near-field models (CALINE4 and ISCST3) in which the vehicular emission factors have been calculated from the EMFAC-HKV2.5.1 model.

The cumulative hourly maximum NO_x and RSP concentrations are predicted by the above models by using the corresponding MM5 hourly meteorological data in 2010 as extracted from the PATH model released by EPD in December 2012.

Model Description – EMFAC-HK – EMFAC-HKV2.5.1

EMFAC-HKV2.5.1 is an emissions inventory model that calculates emissions inventories for motor vehicles operating on roads in Hong Kong. The model is used for estimating vehicular tailpipe emissions including RSP and NO_x. The model can take into account both vehicle technologies and driving conditions. The model follows that of the California Air Resources Boards' EMFAC model but with modifications to cater for local factors, including the substantial reduction of the smoky vehicle problem in recent years.

Assumptions and Inputs – EMFAC-HK

For all the planned and existing roads within the 500 m assessment area including those planned underpass roads within WKCD site and the proposed CKR, the EMFAC-HK V2.5.1 model (I and M). which is the latest version at the time of preparing this report, has been used to determine the fleet average emission factors.

The Burden mode, used for calculating area-specific emission factors, has been selected in the model. Under this mode, the total emissions of pollutants such as RSP and NO_x were computed for each type of vehicle class based on temperature, relative humidity, speed corrected emission factors and vehicle activity. Hourly output was selected.

The assumptions and input parameters on modelling of vehicle emission factors are presented in the following sections. The traffic data used for the assessment includes the hourly traffic flows of 16 vehicle classes at various road links and the speed fractions of various vehicle classes in four model years. The model years are: 2015 (the year when operation of the Project was originally planned to commence); intermediate years 2020 and 2025, and 2030 (15 years after commencement of operation of the Project). According to the recently updated Project programme (see **Appendix 2.4**), the planned commencement of operation of the Project has been changed to 2017. Despite the change, the EMFAC results as presented in **Graph 14.2** show that year 2015 represents the worst case scenario where the total traffic emission is the highest among all model years of 2015, 2020, 2025 and 2030. In other words, the total traffic emission in year 2017 when the Project is planned to commence operation is anticipated to be lower than that in year 2015. Therefore, use of the emission estimates in 2015 for air quality impact assessment is a conservative approach.

Traffic data is provided by the Traffic Consultant, and are presented in the following sections. The traffic forecast data has been submitted to the Transport Department (TD) for review. TD has no objection in principle to the traffic data. The correspondence from TD is provided in **Appendix 3.9** for reference. The 24-hour traffic patterns are given in **Appendix 3.10**.

Vehicle Emission Standards

The emission standards, according to the latest implementation programme (as of November 2012) have been adopted in EMFAC-HK V2.5.1 model for vehicles registered in Hong Kong. In this model, the latest European Union (EU) emission standard, Euro VI, for all vehicle classes can be applied, with the exception of motorcycles which do not have applicable new EU emission standards.

Road Grouping

The road links for assessment have been grouped into five types. Emission factors for the following five road types have been calculated:

- Road Type 1 - Expressway (Design speed limit: 100kph);
- Road Type 2 - Trunk Road (Design speed limit: 80kph);
- Road Type 3 - Trunk Road (Design speed limit: 50kph);
- Road Type 4 - Local Roads (Design speed limit: 50kph), and;
- Road Type 5 - Trunk Road (Design speed limit: 70kph).

The five road types are characterised by continuous and interrupted flow with different design speed limits. It is assumed that there is continuous traffic flow in Expressway and Trunk Roads (Road Types 1, 2, 3 & 5), whereas there is interrupted flow in Local Roads (Road Type 4). The road type classification of individual road links in the assessment area are as shown in **Figures 3.5.1a** to **3.5.1y.** Road Type 5 is associated with the CKR and will not be present in 2015 or 2020, but will be present in 2025 and 2030, as CKR is anticipated to be in operation in 2021.

Vehicle Classes

Vehicles operating on open roads have been categorised into 16 vehicle classes according to the *Guideline on Modelling Vehicle Emission – Appendix I* for EMFAC-HK V2.5.1, and is presented in **Table 14.3.11**.

Table 14.3.11: Vehicle Classification in the EMFAC-HK Model

Index	Description	Notation in EMFAC-HK Model	Fuel Type	Gross Vehicle Weight
1	Private Cars (PC)	PC	ALL	ALL
3	Taxi	taxi	ALL	ALL
4	Light Goods Vehicles (<=2.5t)	LGV3	ALL	<=2.5ton
5	Light Goods Vehicles (2.5-3.5t)	LGV4	ALL	>2.5-3.5ton
6	Light Goods Vehicles (3.5-5.5t)	LGV6	ALL	>3.5ton
7	Medium & Heavy Goods Vehicles (5.5-15t)	HGV7	ALL	>5.5ton-15ton
8	Medium & Heavy Goods Vehicles (>=15t)	HGV8	ALL	>15ton
11	Public Light Buses	PLB	ALL	ALL
12	Private Light Buses (<=3.5t)	PV4	ALL	<=3.5ton
13	Private Light Buses (>3.5t)	PV5	ALL	>3.5ton
14	Non-franchised Buses (<6.4t)	NFB6	ALL	<=6.4ton
15	Non-franchised Buses (6.4-15t)	NFB7	ALL	>6.4ton – 15ton
16	Non-franchised Buses (>15t)	NFB8	ALL	<=15ton
17	Single Deck Franchised Buses	FBSD	ALL	ALL
18	Double Deck Franchised Buses	FBDD	ALL	ALL
19	Motor Cycles	MC	ALL	ALL

Exhaust / Evaporation Technology Fraction

Vehicle classes are grouped with different exhaust technology indexes and technology fractions. Each technology group represent a distinct emission control technologies. The EMFAC-HK V2.5.1 model has a set of default exhaust technology fractions which best represents the scheduled implementation of new vehicle emission standards as of November 2012. As there is no update to the planned emission control measures since the release of the guideline in November 2012, the default exhaust technology fractions are considered to be applicable in this assessment.

Vehicle Population

According to the *Guideline on Modelling Vehicle Emissions,* the vehicle population forecast function in EMFAC-HKV2.5.1 used 2010 as the base year. Natural replacement of vehicles and a set of annual growth rates and survival rates for different vehicles are assumed for 2011 to 2040. In particular, vehicles including private cars, motorcycles, and goods vehicles are assumed to grow by a varying percentage (from 0% - 2.5% annual) during the period whereas the number of franchised buses, public light buses and taxis are assumed to have no growth.

There have been some minor policy changes from April 2012 to November 2012. The changes include moving two diesel taxis (TAXI) to the private car (PC) category and moving 4 LPG Private light buses (PV4)

to the PV5 category. These changes, however, are considered to be insignificant and therefore have been excluded from the assessment. The default populations from the April 2012 population information have been adopted for the model years (2015, 2020, 2025, and 2030). The vehicle age distributions, in the base year 2010, are presented in **Appendix 3.11** for reference.

The use of electric vehicles (EVs), which do not have tailpipe emissions, has been promoted by the government in the recent years. By April 2012, there were more than 310 EVs in Hong Kong. The introduction of EVs will have an impact on the future vehicle fleet composition, although the effect is still unknown. Impacts will vary with policy in the future and the successful application of EVs as an alternative to the traditional vehicles. As a conservative approach, this assessment does not take into account the presence of EVs and any programme on the promotion of EVs.

Accrual Rate

Default values and compositions have been adopted with reference to in the EMFAC-HKV2.5.1 Guideline.

Diurnal Variation of Daily Vehicle Kilometres Travelled (VKT)

For each vehicle class, the Vehicle Kilometres Travelled (VKT) of individual hours is calculated by multiplying the hourly number of vehicles with the length of the corresponding road link (in kilometres). Diurnal (24-hour) traffic pattern has been provided by Traffic Consultant. The lengths of individual road links of the connecting road are given in **Appendix 3.12**. The 24-hour VKT values for all vehicle classes in each of the model years 2015, 2020, 2025 and 2030 together with a graphical plot, are provided in **Appendix 3.13**.

Daily Trips

The daily trips were used to estimate the cold start emissions of the petrol and LPG vehicles only, as is prescribed by the model. Therefore, trips for vehicles other than petrol or LPG type vehicles would be assumed to be zero. Different road types have different number of trips as follows.

Expressway and Trunk Road (Road Types 1, 2 & 3)

Zero trips are assumed in Expressway and Trunk Roads since there will be no cold start under normal circumstances.

Local Road (Road Type 4)

For Local Roads, the number of trips in the assessment area, $Trip_{within\ assessment\ area}$, has been estimated as:

$$Trip_{within\ assessment\ area} = (Trip_{within\ HK}/VKT_{within\ HK}) \times VKT_{within\ assessment\ area}$$

$Trip_{within\ HK}$ is the default data of EMFAC-HKV2.5.1 model. $VKT_{within\ HK}$ is the VKT of local roads in Hong Kong, which is estimated based on the default VKT data of EMFAC-HKV2.5.1 model and the relevant data as published in the *Annual Traffic Census 2010* by TD. Details of the trip estimation are as shown in **Appendix 3.14**. According to the Mobile Source Group of EPD, the default VKT and trips in the model are based on EPD's estimated data for Hong Kong. $VKT_{within\ assessment\ area}$ is calculated as mentioned above. The trips in each year are provided in **Appendix 3.13**.

While the number of trips is dependent on vehicle population, no project-specific vehicle population data can be identified for the assessment area according to the Traffic Consultants. However, project-specific VKT has been estimated based on the traffic forecast in the assessment area. Moreover, it can be argued that VKT is related to vehicle population in such a way that a higher vehicle population would generally result in a higher VKT. As a result, it has been proposed to estimate the number of trips in the assessment area on the basis of the project-specific VKT and the assumption that the number of trips per VKT in the assessment area would be similar to the number of trips per VKT in Hong Kong. It is considered that this proposed approach is based on best available data and reasonable assumption. This approach for estimating the number of trips together with the results of estimation has been submitted to TD for review. TD has no objection in principle to the method and the correspondence from TD is provided in **Appendix 3.9** for reference.

Hourly Temperature and Relative Humidity Profile

Annual and monthly hourly average ambient temperature and relative humidity obtained from the meteorological data as extracted from the 2010 HKO's King's Park meteorology station (with at least 90% valid data) have been adopted. The 24-hour variations of the annual averages of temperature and relative humidity are presented graphically in **Appendix 3.15**.

Speed Fractions

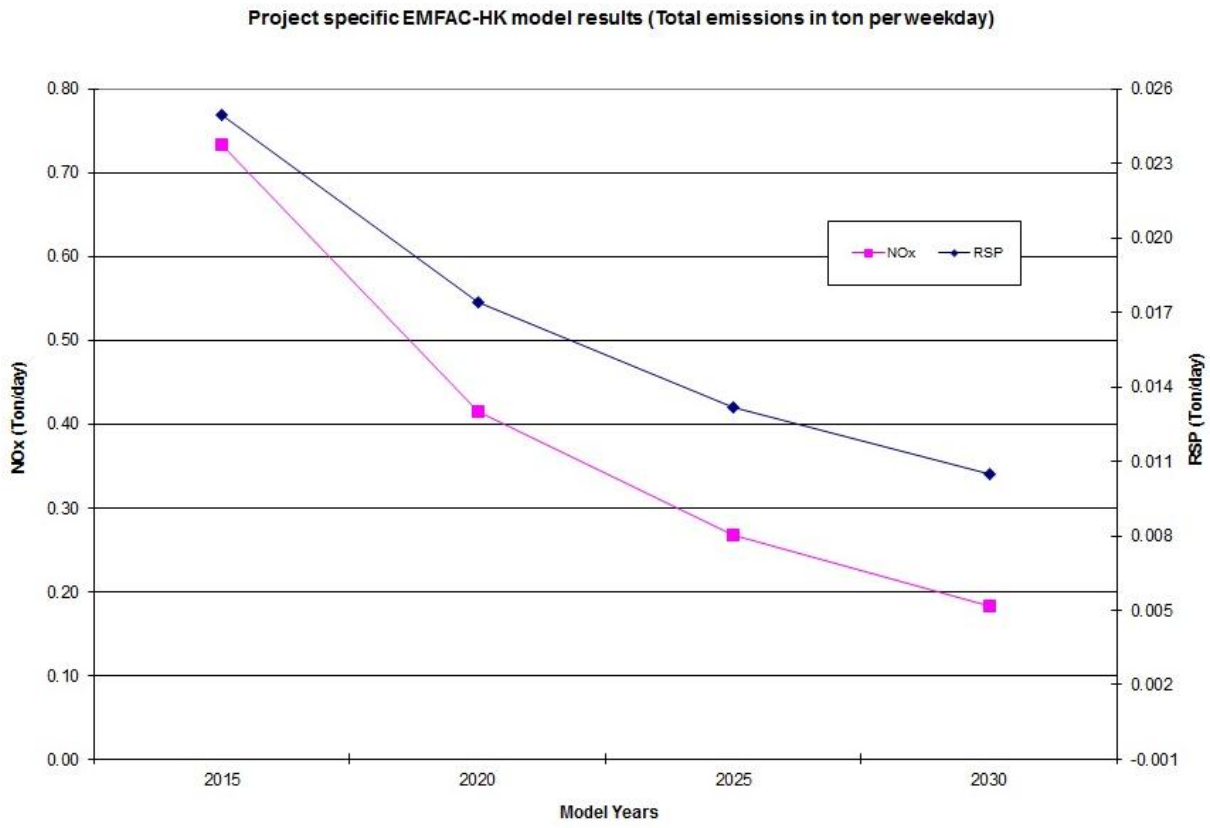
The 24-hour speed fractions for different road types and individual vehicle classes are provided by the Traffic Consultant, and are calculated based on the 24-hour traffic flow in each model year and the volume/capacity ratio of different road types. For each vehicle class, the VKT of each road link was grouped into sub-groups with speed bins of 8 km/h (0 - 8 km/h, 8 - 16 km/h, 16 - 24 km/h, etc.). The speed fraction of each sub-group was derived by the summation of the total VKT of road link within this sub-group divided by the total VKT of all road links. The estimated speed fractions provided by the Traffic Consultant are given in **Appendix 3.16**.

Predicted Emission Factors by EMFAC-HKV2.5.1 model

To determine the emissions with 15 years after commencement of the Project, emission rates were modelled for years 2015, 2020, 2025 and 2030. Upon modelling with EMFAC-HKV2.5.1, the emissions for each vehicle class at different hours are then divided by the corresponding VKT to obtain 24-hr emission factors in grams/vehicle-kilometre (g/veh-km). The calculations of emission factors for each model year are shown in **Appendix 3.17**. By comparing the total emissions in different model years as shown in **Graph 14.2**, year 2015 represents the worst case scenario where the total emission is the highest among all model years. Even with addition of the traffic due to the CKR project after 2020, the worst-case year is still predicted to be 2015. This is because despite the increased traffic volume, the total emissions are expected to decrease as a result of the retirement of older and more polluting vehicles in the fleet, which would be replaced with newer vehicles with lower emissions. Therefore, it is proposed to use the emission factors of this worst case year 2015 for the prediction of air quality impacts due to vehicular emissions in order to arrive at conservative impact assessment results.

Although the planned commencement year of operation of the Project has been updated from 2015 to 2017, use of the emission factors in 2015 represents conservative emissions for the assessment. This is because the total traffic emission in year 2017 is anticipated to be lower than that in year 2015 as illustrated in **Graph 14.2**.

Graph 14.2: Comparison of RSP and NOx EMFAC results for 2015, 2020, 2025 and 2030



Model Description – ISCST3

The Industrial Source Complex – Short Term version 3 (ISCST3) dispersion model was used to model the air pollutant concentrations due to vehicular emissions from the Western Harbour Crossing (WHC) portal (modelled as volume sources); the proposed underpasses/landscape deck portals (modelled as volume sources) and the associated top openings (modelled as area source) under the Road Works at West Kowloon project; as well as from the assumed ventilation serving the planned underground roads within the WKCD site (modelled as point or volume sources).

ISCST3 is a steady state Gaussian plume model which can be used to assess pollutant concentrations from sources associated with an industrial source complex. ISCST3 is one of the models prescribed by the EPD *Guidelines on Choice of Models and Model Parameters*. ISCST3 is considered an appropriate model to use for this situation as meteorological conditions will not vary greatly over the site, as the site is relatively flat and small and no significant effects are expected due to terrain variations.

It should be noted that ISCST3 and all Gaussian based dispersion models have limited ability to predict dispersion in the situations as described in **Section 14.3.4.1.**

Assumptions and Inputs – ISCST3

The operational sources for ISCST3 modelling (shown in **Figure 3.6**) include:

- Proposed underpasses/landscape decks along the Austin Road West and Lin Cheung Road and the associated top openings under the Road Works at West Kowloon project, which is within the 500 m assessment area;
- Portal of the existing WHC which is in the vicinity of the WKCD site; and
- Ventilation exhausts and portals serving the planned underground roads within the WKCD area.

EMFAC-HKV2.5.1 and the traffic modelling data from the Traffic Consultants were used to generate the inputs for use in ISCST3.

Hourly meteorological data for a full year as extracted from the PATH model released by EPD in December 2012 (meteorological data year 2010, grid 28, 27) has been adopted for use in ISCST3. The data is considered to be the most up to date data available, PATH data has been observed to have a lower mixing height for some hours, when compared to the measured mixing height. The minimum mixing height recorded by HKO in 2010 is 121.3 m, whereas the PATH minimum mixing height is 40 m. The HKO minimum mixing height of 121.3 m is used to replace any PATH mixing height below this value. This approach is considered appropriate as it will minimise over-estimation due to lower mixing heights and also will minimise under-estimation due to high stacks being excluded in the mixing volume. The PATH data with the above modification is considered to be representative of the site wind data at WKCD.

Ventilation Exhausts/Portals Serving WKCD Basement

The basement will be ventilated through stacks; however the proportion released through stacks and through the portals cannot be determined until a comprehensive ventilation study is carried out during the detailed design phase. Two scenarios were therefore considered for the ventilation of the WKCD basement:

Scenario I – 100% of the vehicle emissions generated within the basement is ventilated through a series of stack exhausts and 0% through the basement entry and exit points

Under this Scenario, the exhausts are assumed to be attached to buildings within the WKCD and were modelled as 6 m tall point sources with an exit air velocity of 2.0 m/s. The stack diameter was dependant on the ventilation area. The basement is broken into three areas, namely B1 Road, B1 Loading and B2 Carpark, for the purpose of the ventilation calculations. The areas are shown in **Figures 3.5.1n**, **3.5.1r**, **3.5.1s** and **3.5.1t**;

Standard practice is to model ventilation shafts as point sources. As the final dimensions of the exhaust louvres are yet to be known at this stage, it is considered appropriate to model the basement ventilation louvres as stacks. A single stack is used at approximately the horizontal centre of the proposed louvre area to allow the greatest flexibility in the final stack location.

The Practice Note ADM-2 recommends MTR ventilation exhausts shall be located not closer than 5 m to any opening such as an openable or fixed window, doorway, building ventilation system intake or exhaust and the like in any building irrespective of whether such vent shaft is freestanding or is accommodated in a building. Although there is no such practice note for underground roads and tunnels, this basis has been used to adopt a minimum stack height of 6 m. This is considered to give worst case results at the ground level and allows for flexibility of the final design and the ventilation to be located at this level.

There are several ventilation exhausts for the XRL/WKT basement carpark, however this basement does not include an underground road and therefore does not need to be considered as a concurrent source.

Scenario II – 100% of the vehicle emissions generated within the basement is ventilated through the basement entry and exit points and 0% through a series of stack exhausts

Under this Scenario, the basement emissions were considered as a total of the three roads (basements roads A, B and C) as shown in **Figures 3.5.1n**, **3.5.1r**, **3.5.1s** and **3.5.1t**. The detailed design of the basement and its ventilation system is not yet complete; therefore it has been broadly assumed that the emissions would be evenly distributed among the three entry/exit points to approximate the scenario. Therefore, one third of the total basement emissions were assumed to be emitted from the western portal near the western tunnel, one third through the eastern portal onto Austin Road West and one third through the northern portal onto Austin Road West.

The basement entry and exit point are not treated as a standard portal as the traffic does not exit directly from the portal, that is the vehicles come to a T-intersection at the entry and exit point for Location A and C as shown in **Figure 3.6**. The entry and exit points are modelled as volume sources based on the dimensions of the opening.

Underpasses/landscape decks along the Austin Road West and Lin Cheung Road and the associated top openings

The portal emissions are the worst case emissions from portals and other openings of Austin Road West and Lin Cheung Road. EPD's *Guidelines on Choice of Models and Model Parameters* recommends portals and similar openings are modelled as volume sources according to the Permanent International of Road Congresses (PIARC) *XIXth World Road Congress Report*. To obtain worst case emissions from each top opening and portal, using the recommended guideline the following situations were considered:

- Scenario 1 - 10% of tunnel emissions released through short top openings, the remainder released through the tunnel portal;
- Scenario 2 - 20% of tunnel emissions released through short top openings, the remainder released through the tunnel portal;
- Scenario 3 - 30% of tunnel emissions released through short top openings, the remainder released through the tunnel portal, and;
- Scenario 4 - Maximum emissions according to PIARC recommendations (which are dependent on top opening lengths – 66% of emissions through top opening if he length is 50m and 100% through top opening if the length is 100m), the remainder or emissions which are not released through the top opening are released through the tunnel portal.

By adopting the traffic forecast in the worst case year of 2015, the emission rates for Scenarios 1 to 4, with 100% of the WKCD basement emission through its portals (Scenario II) are given in **Appendix 3.18a – Appendix 3.18d** whereas the emission rates for Scenarios 1 to 4, with 100% of the WKCD basement emissions through its stack exhausts (Scenario I) are given in **Appendix 3.18a – Appendix 3.18h**. All scenarios were modelled to determine the worst case effects.

By adopting the traffic forecast in 2020, the emission rates for the combination of Scenario I and Scenario 1 are also estimated, as presented in **Appendix 3.19**. Based on the comparison of the modeling results for all eight combinations of Scenarios I & II with Scenarios 1-4 for the worst case year of 2015, the results for different combinations differ by a small amount (less than 2%) and yet the combination of Scenario I with Scenario 1 tends to give relatively more conservative results. Therefore, this combination has been used to estimate the emission rates for year 2020, which are then used to refine the NO_2 modelling results for those planned ASRs that will be in operation from 2020 onwards (see **Section 14.3.5.2**).

EMFAC-HKV2.5.1 model results and the traffic modelling data from the Traffic Consultants were used to generate the inputs for use in ISCST3.

Existing WHC Portal

The portal emissions are modelled according to EPD's *Guidelines on Choice of Models and Model Parameters*, which recommends portals and similar openings are modelled as volume sources according to the PIARC *XIXth World Road Congress Report*. Details of the assumptions are in **Appendix 3.18a – Appendix 3.18h** and **Appendix 3.19**.

Model Description – CALINE4

CALINE4 is a line source air quality model developed by the California Department of Transportation and is one of the models prescribed by the EPD *Guidelines on Choice of Models and Model Parameters*. It is based on the Gaussian diffusion equation and employs a mixing zone concept to characterise pollutant dispersion over the roadway.

The purpose of the model is to assess air quality impacts near transportation facilities. Given source strength, meteorology and site geometry, CALINE4 can predict pollutant concentrations for receptors located within 500 m of a given roadway. As with all Gaussian models, CALINE4 has some limitations, as described in **Section 14.3.4.1.**

Assumptions and Inputs – CALINE4

The predicted traffic flows have taken into account the development of the four concurrent projects, namely: Road Works at West Kowloon; Road Improvement Works in West Kowloon Reclamation; the Hong Kong Section of the XRL, and; Central Kowloon Route (CKR). **Appendix 3.10** presents details of the 24-hour traffic forecast for different vehicles and individual road links within the 500 m assessment area (see **Figures 3.5.1a** to **3.5.1y**) as provided by the Traffic Consultants.

Hourly meteorological data for a full year as extracted from the PATH model released by EPD in December 2012 (meteorological data year 2010, grid 28, 27) has been adopted for use in CALINE4. The data is considered to be the most up to date data available. PATH data has been observed to have a lower mixing height for some hours, when compared to the measured mixing height. The minimum mixing height recorded by HKO in 2010 is 121.3 m, whereas the PATH minimum mixing height is 40 m. The HKO minimum mixing height of 121.3 m is used to replace any PATH mixing height below this value. This approach is considered appropriate as it will minimise over-estimation due to lower mixing heights and also will minimise under-estimation due to high stacks being excluded in the mixing volume. The PATH data with the above modification is considered to be representative of the site wind data at the underpass road site.. A roughness coefficient of 370cm is used, as the area is considered to be urban.

Based on the worst case emission factors and the 24-hour traffic flow in 2015, the composite fleet emission factors have been calculated for the road links, as detailed in **Appendix 3.23**.

By adopting the traffic forecast in 2020, the composite fleet emission factors have also been calculated for the road links, as detailed in **Appendix 3.24**. These emission factors have been used to refine the NO_2 modelling results for those planned ASRs that will be in operation from 2020 onwards (see **Section 14.3.5.2**).

14.3.4.3 Operation Phase – Marine Emissions

Introduction

To assess the operational air quality from marine sources ISCST3 was used to predict the cumulative NO_x, RSP and SO_2 levels at the identified ASRs in accordance with the EPD's *Guidelines on Choice of Models and Model Parameters*,

Marine emissions considered to be important for the assessment are: fast ferry traffic movements, based on scheduled sailings at the China Ferry Terminal; cargo-handling vessel traffic movements along the Yau Ma Tei Fairway at the western edge waterfront of the WKCD site; derrick lighter barges operating at the New Yau Ma Tei Public Cargo Working Area (NYPCWA), and; ocean cruise ship emissions at berth at the Ocean Terminal. As the marine emissions are all from existing marine activities within the surrounding waters and the WKCD development itself does not contribute to any marine traffic emissions, the cumulative SO_2 levels due to the various surrounding sources are assessed for the proposed ASRs within the WKCD site only. ISCST3 has been used to predict the air pollutant concentrations due to marine sources. The locations of all such pollution sources are as shown in **Figure 3.7**. Details of the emissions rates for individual sources are given in **Appendix 3.25**.

PATH was used to predict the current background air pollution for year 2015 due to sources outside the project boundary. Sources include, but are not limited to, the Pearl River Deltas Economic Zone (PRDEZ), the Hong Kong International Airport, power plants in HKSAR and roads beyond the WKCD, and long range marine emissions.

The cumulative hourly maximum NO_x, RSP and SO_2 concentrations are predicted by the above models by using the corresponding MM5 hourly meteorological data in 2010 as extracted from the PATH model released by EPD in December 2012.

Model Description – ISCST3

Gaussian model ISCST3 has been used for modelling potential impacts from the above-mentioned nearby marine emission sources. Refer to **Section 14.3.4.2.**

Assumptions and Inputs

The operational sources for the ISCST3 modelling (shown in **Figure 3.7**) include:

- Fast ferry traffic movements, based on scheduled sailings, of up to 170 daily movements (ferry going to is one movement, ferry leaving is a second movement) at the China Ferry Terminal;
- Tugs associated with derrick lighter barge movements in the NYMTTS;
- Derrick lighter barges operating at the New Yau Ma Tei Public Cargo Working Area (NYPCWA), and;
- Ocean Cruise Ship movements at the Ocean Terminal.

Hourly meteorological data for a full year as extracted from the PATH model released by EPD in December 2012 (meteorological data year 2010, grid 28, 27) has been adopted for use in CALINE4. The data is considered to be the most up to date data available. PATH data has been observed to have a lower mixing height for some hours, when compared to the measured mixing height. The minimum mixing height recorded by HKO in 2010 is 121.3 m, whereas the PATH minimum mixing height is 40 m. The HKO

minimum mixing height of 121.3 m is used to replace any PATH mixing height below this value. This approach is considered appropriate as it will minimise over-estimation due to lower mixing heights and also will minimise under-estimation due to high stacks being excluded in the mixing volume. The PATH data with the above modification is considered to be representative of the site wind data at underpass site.

New Yau Ma Tei Public Cargo Working Area (NYPCWA)

The NYPCWA is located on the north-south shoreline of the NYMTTS to the north of WKCD. The area is mainly used for loading and unloading cargo from derrick lighter barges. The shoreline is approximately 1,250 metres long. According to the *Merchant Shipping (Local Vessels) (Typhoon Shelters) Regulation – Chapter 548E* the maximum permitted length for local vessels in the typhoon shelter is 50 metres. For manoeuvring purposes it was assumed that each vessel would need 5 metres at bow and stern. The maximum number of vessels operating at any one time was therefore assumed to be the shoreline length divided by vessel and manoeuvring length, which gives 20 vessels. Although this does not take into account a larger possible vessel density should smaller barges being used, it is still considered realistic estimate, as a visual survey identified a similar number of vessels along the shore front.

The emission rates were estimated with reference to the *USEPA Non-Road Diesel Standards* and *USEPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories (April 2009)*, hereafter referred to as "*USEPA Methodology*". The barges were assumed to have an engine size of 314.6 kW, which is based on average engine size information from 250 ton cranes. Based on the maximum theoretical loading factor of 43% for gantry cranes (Starcrest Consulting Group, LLC, 2009. *Rubber Tired Gantry (RTG) Crane Load Factor Study*), a loading factor of 50%, which is considered to be conservative, is assumed for the barges. A visual survey showed the derrick lighters operate approximately 5 minutes out of every 20 minutes, with an on-off sequence of: rigging – 10 minutes; crane operation – 5 minutes; unrigging – 5 minutes. Therefore all engines are assumed to be operating at 50% load and for 25% of the operation hours.

Marine diesel engines are assumed to have an average operating lifetime of 10,000 hours. Derrick lighter barges are assumed to operate during the same period as the NYPCWA, i.e., 7:00 am to 9:00 pm daily or 14 hours per day (Monday to Saturday), with a time-in mode of 25%. Based on these assumptions, it can be estimated that the average life span of the marine engine on a derrick lighter barge is approximately 10 years, which is used to determine the emission rate for the engines by making reference to the emission standards for non-road diesel engines. This estimated engine life span is considered to give a conservative emission rate as the average age of engines is likely to be less than 10 years. Based on a visual survey, the exhaust height of the derrick lighter engine is assumed to be 8.7m (approximately the height of three shipping containers). Details of estimating the engine emission can be found in **Appendix 3.25**.

Information provided by the marine sub-consultant estimates 130 small craft movements per day in the NYMTTS (both entering and leaving). It is assumed that all the vessels are tugs and are restricted to the same operation period as the NYPCWA, that is 7:00 am to 9:00 pm daily.

The NO_x emission rates for tugs were estimated by actual engine data sourced from maritime sales information. RSP emission rates are based on Harbour Craft Emission Factors as published in the "*USEPA Methodology"*. SO_2 emission rates were estimated from the *Starcrest Consulting Group, LLC Puget Sound Maritime Air Emission Inventory (April 2007).* The tugs were assumed to have two 696 kW engines (average engine size from maritime sales information). The RSP emission rates were adjusted according to the *Starcrest Consulting Group, LLC Puget Sound Maritime Air Emission Inventory (April 2007)* whereas the SO_2 emission rates were adjusted based on the fuel sulfur content as given in the reference material,

and the actual fuel sulfur content as used in Hong Kong marine vessels. Detailed information can be found in **Appendix 3.25**.

Engine loading factor for tugs was assumed to be 31% as described in the *"USEPA Methodology"*. The movements were divided evenly among the operating hours and so for modelling purposes there are nine tug movements per operating hour of NYPCWA.

As the tugs are moving, the emissions are modelled as a series of area sources. To allow for variation in the actual vessel route, a width of 30 m is applied. The average hourly area emission rate was calculated by the instantaneous emission rate (g/s) multiplied by the time that it takes for the vessel to move over the length of the route (based on the reported average speed), and then divided by the total route area and 3600 seconds (one hour).

The estimated emission rates are summarised in **Table 14.3.12** and details of the estimation are given in **Appendix 3.25**.

Table 14.3.12: Estimated Emission Rates of Barges at NYPCWA

Pollutant	Vessel type	Estimated Emission Rates
NOx	Barge	0.0799 g/s for each barge
	Tug	2.30×10^{-6} g/m^2.s for each tug
RSP	Barge	0.0022 g/s for each barge
	Tug	8.81×10^{-8} g/m^2.s for each tug
SO_2	Barge	0.0136 g/s for each barge
	Tug	6.07×10^{-7} g/m^2.s for each tug

China Ferry Terminal

The China Ferry Terminal is located to the south-east of WKCD. Three main companies operate at the Terminal, which are: CotaiJet, TurboJet and Chu Kong Passenger Transport Limited. Sailing timetables were reviewed for each of the companies and total vessel unloading/loading to the terminal calculated. The total unloading/loading was from one to 14 vessels per hour, between the hours of 7:00am and 11:00pm. Outside of these hours there are no scheduled ferry services and therefore no emissions modelled.

The emission rates were calculated based on the "*Institute for the Environment, The Hong Kong University of Science & Technology: Study on Marine Vessels Emission Inventory*", hereafter referred to as the *"HK Inventory"*. During berthing it is assumed that only auxiliary engines are operational. An overall average emission rate for all ferries was calculated for berthing based on the average auxiliary engine information available. The auxiliary engines are assumed to have a loading factor of 45% during cruise and berthing, as stated in the *"HK Inventory"*.. It is also assumed that each unloading/loading takes 30 minutes to complete, including manoeuvring and berthing.

From information available from ferry operators, the exhausts were assumed to emit at water level, as no stack was visible for the majority of the ferries surveyed, and stacks for fast ferries are horizontal. To account for this exhaust position, the stacks were modelled with an efflux velocity of 0.001 m/s and an equivalent stack diameter. This approach is as described in Section 6.1 of the *USEPA AERMOD Implementation Guide, 2009* and is considered conservative.

Emissions for the movement of fast ferries to and from the terminal were also modelled. Separate emission factors were calculated for Macau ferries (i.e., fast ferries travelling to/from Macau) and China ferries (i.e., fast ferries travelling to/from cities in Mainland China). Emissions are estimated based on the *"HK Inventory".* Slow cruise is defined as 8 – 12 knots, but the marine speed limit within the Victoria Harbour is 10 knots. Therefore, all fast ferries are assumed to travel at 10 knots within the study area for the purpose of estimating the engine emission rates.

For Macau ferries, the largest engine power as stated in the "*HK Inventory"* is 9,280kW and the maximum design cruise speed is 45 knots. For China ferries, the largest engine power as stated in the "*HK Inventory"* is 5,490kW and the maximum design cruise speed is 32 knots. In order to estimate the ferry engine power at the cruise speed of 10 knots, it is assumed that the engine power, which can be estimated as hydrodynamic drag force multiplied by cruise speed, is directly proportional to the cruise speed. In other words, the hydrodynamic drag force is assumed to be at a constant level that equals to the highest hydrodynamic drag force at maximum engine power. This is a conservative assumption for estimating the engine power at reduced cruise speed conditions where the hydrodynamic drag force would be lower. With such a conservative assumption, it can be estimated that the engine power levels for Macau ferries and China ferries travelling at 10 knots are respectively 0.22 (i.e., 10knots / 45knots) x 9,280kW and 0.31 (i.e., 10knots / 32knots) x 5,490kW. Each scheduled travel of a fast ferry is considered to have two vessel trips along the ferry route (one to and one from). The estimated emission rates are summarised in **Table 14.3.13** and details of the estimation are given in **Appendix 3.25**.

As the marine traffic emissions are included as part of the emission inventory of the PATH model, there is a certain amount of double counting. The modelling results for the fast ferries are therefore considered to be conservative.

Table 14.3.13: Estimated Emission Rates of Fast Ferries at China Ferry Terminal

Pollutant	Mode	Estimated Emission Rates
NOx	Berth	0.12 g/s for each ferry*
	China Ferry - Transit	8.84×10^{-6} g/m^2.s for each ferry
	Macau Ferry - Transit	1.01×10^{-5} g/m^2.s for each ferry
RSP	Berth	0.004 g/s for each ferry*
	China Ferry - Transit	2.79×10^{-7} g/m^2.s for each ferry
	Macau Ferry - Transit	3.21×10^{-7} g/m^2.s for each ferry
SO_2	Berth	0.026 g/s for each ferry*
	China Ferry - Transit	1.88×10^{-6} g/m^2.s for each ferry
	Macau Ferry - Transit	2.15×10^{-6} g/m^2.s for each ferry

*Assumed to last for 30 minutes during each hour of operation

Ocean Terminal

The Ocean Terminal is located to the south-east of WKCD. A 40,000-ton ship is berthed at the Ocean Terminal during day-time but leaves for the sea during the night-time. This 40,000-ship is hereafter referred to as the day-time ship. Other cruise ships are also periodically berthed at the Ocean Terminal. There are totally two berths available at the Ocean Terminal. Therefore, it is assumed for the worst-case scenario that both the day-time ship and another 70,000-ton ship are berthed at the Terminal simultaneously with the 70,000-ton ship berthing for 24 hours of a day (hereafter referred to as the 24-hour ship). The day-time ship is generally berthed between about 8:00am and 8:00pm and has been modelled as such. The 24-hour ship is assumed to be berthed for 24 hours at the Terminal, as when visiting it can be berthed at the Terminal

for more than a day. This modelling approach is considered to have captured the worst-case scenario when both cruise ships are at the berths.

Emission rates of the ships berthing at the Ocean Terminal were estimated by using the "*USEPA Methodology*", MARPOL regulations, as stated in *Merchant Shipping (Prevention of Air Pollution) Regulation – Chapter 413M, Section 27 (3) (b)* and engine information for the auxiliary engines. No information was available as to whether the ship is to cold iron during berth, so it is assumed all auxiliary engines are running for the entire time the cruise ships are berthed at the Ocean Terminal. During berthing the cruise ships would also be running auxiliary boilers to provide hot water, heating and other services. These services would be provided by exhaust heat exchangers on the main and auxiliary engines during cruising, however during berth the main engines are off and therefore auxiliary boilers are needed Boiler emissions were estimated based on the "*HK Inventory*". The fuel used during berthing is assumed to be residual oil, with a sulfur content of 2.8%. This is conservative as some ocean going vessels use distillate fuel, which has a lower sulfur content and leads to lower RSP and SO_2 emissions. The future projected average fuel sulfur content is 1.98% for auxiliary engines and 2.07% for auxiliary boilers, both of which are lower than the assumed 2.8% sulfur content. Moreover, the MARPOL regulations will reduce the sulfur content to 0.5% from 2020 onwards.

To prevent over-estimation of the SO_2 emissions from the ships berthing at the Ocean Terminal, a calibration exercise was performed with reference to the on-site SO_2 data recorded at the EPD's WKCD monitoring station (see **Section 14.3.3.1**). Historic berthing timetable at the Ocean Terminal during the monitoring period of the WKCD monitoring station (i.e., from Sep 2011 to Aug 2012) was identified. As there are many day-time marine traffic emission sources (e.g., Star Ferries, China ferries, Macau ferries, recreational and cargo vessels) during day-time, the calibration exercise was carried out only for night-tme periods between 9pm and 8am when the 24-hour ship alone is berthed at the Ocean Terminal (the day-time ship is at cruise during night-time) and the emissions from fast ferries and other marine traffic are minimal. The calibration results were then used to adjust the SO_2 emission rate for the 24-hour ship to provide more realistic estimates of the maximum SO_2 concentrations at the ASRs. The SO_2 emission rate for the day-time ship, which is smaller in tonnage than the 24-hour ship, is conservatively assumed to be the same as the adjusted emission rate for the 24-hour ship. Details of the calibration results for estimation of SO_2 emission rates are given in **Appendix 3.25**.

Based on a visual survey and information on the day-time ship, the height of the stacks was assumed to be 50 metres. Based on engine information, there are four auxiliary engines for day-time ship, and it is therefore assumed there are four stacks. The estimated emission rates of the ships are summarised in **Table 14.3.14** and details of the estimation are given in **Appendix 3.25**. No emissions for vessels sailing to and from the terminal were estimated or modelled as this is considered to be adequately covered by the PATH model and is outside the 500 m assessment area.

Table 14.3.14: Estimated Emission Rates of Cruise Ships at Ocean Terminal

Pollutant	Vessel	Estimated Emission Rates (g/s)
NOx	Day-time ship	12.97
	24-hour ship	14.55
RSP	Day-time ship	1.88
	24-hour ship	1.97
SO_2	Day-time ship	7.62
	24-hour ship	7.62

14.3.4.4 Operation Phase – General Emissions

To assess the operational air quality, a variety of models were required. In accordance with the EPD's *Guidelines on Choice of Models and Model Parameters*.

Model Description - PATH

The PATH model is a numerical air quality modelling system developed specifically for use in Hong Kong. The model comprises of three modules: an emission model; a prognostic meteorological model and an Eulerian transport and chemistry model. These modules are interfaced together and set up on a series of nested domains to account for influences outside of Hong Kong.

Assumptions and Inputs – PATH

An updated version of PATH was released by the EPD for general use in December 2012. As there is no significant policy change or inventory update since the release of the latest PATH and the submission of this report, use of the 2012 PATH model in its current state is considered appropriate.

For EIA applications, PATH simulates wind field, pollutant emissions, transportation and chemical transformation and outputs pollutant concentrations over Hong Kong and the Pearl River Delta (PRD) region at a fine grid size of 1.5km.

During the 12th Hong Kong-Guangdong Joint Working Group Meeting on Sustainable Development and Environmental Protection (Nov 2012), the Hong Kong and Guangdong Governments jointly endorsed a Major Air Pollutant Emission Reduction Plan for the Pearl River Delta Region up to year 2020. A comprehensive emission inventory for Hong Kong and PRD was compiled for year 2010 based on current best estimates and projected to 2015 and 2020 in accordance with the emission reduction measures proposed in the plan. The emission inventory for year 2010 was used in PATH and produced reasonable agreement with air quality measurements. The projected emission inventories for years 2015 and 2020 were also used in PATH to predict air qualities for future years. The emission inventories include the total emissions from six key groups, namely, public electricity generation, road transport (emissions estimated based on VKT forecast provided by TD and EMFAC-HK model version 2.1), navigation, civil aviation (emissions estimated based on forecasted air traffic movements), other fuel combustion (covering emissions from such major facilities as HK & China Gas, Green Island Cement and Integrated Waste Management Facilities) and non-combustion. The Hong Kong emission inventories of the key air pollutants of concerns for the Project are summarized in **Table 14.3.15**.

Table 14.3.15: Summary of 2015 and 2020 Hong Kong Emission Inventory for the PATH Model

Pollutant	Total Emission in 2015 (ton/year)	Total Emission in 2020 (ton/year)
SO_2	26,625	23,075
NO_x	98,100	87,200
RSP	5,706	5,389

PATH model was used to quantify the background air quality during the operational phase of the Project. Emission sources including roads, marine, airports, power plants and industries within the Pearl River Delta Economic Zone and Hong Kong were considered in the PATH model. Details of the PATH Model and related emission inventory can be found in EPD's web site.

The hourly SO_2, NO_x and RSP concentrations as extracted from the PATH for year 2015 are adopted as the background air pollutant concentrations in the estimation of cumulative impact for the Project during the

worst case year of 2015. The hourly pollutant concentrations as extracted from the PATH for year 2020 have also been used to refine the NO_2 modelling results for those planned ASRs that will be in operation from 2020 onwards (see **Section 14.3.5.2**).

Since the vehicular and marine traffic emissions at local scale (i.e. within the 500m assessment area) have been modeled by near-field dispersion models, namely, CALINE4 and ISCST (see **Sections 14.3.4.2** and **14.3.4.3**), adding the PATH background concentrations to the near-field modeling results would lead to certain amount of double counting, and hence conservative cumulative modeling results.

Other Assumptions

According to *Entec UK Limited: Defra UK Ship Emissions Inventory, 2010* the NO_x:NO_2 ratio can vary between 0.05 and 0.10. The NO_x formed during combustion comprise predominantly of NO, with a small percentage of primary NO_2. In the atmosphere the NO oxidises to NO_2 which is considered as secondary NO_2. For conservative results a conversion factor of 0.10 has been used for NO_x to NO_2.

The Ozone Limiting Method (OLM) as described in *EPD's Guidelines on Choice of Models and Model Parameters* has been adopted to estimate the conversion of NO_x to NO_2 from both marine and vehicular emissions. The ozone concentrations are based on the future hourly background ozone concentrations, for year 2015 or 2020 which were extracted from grid (28, 27) of the most up to date PATH. Grid (28, 27) of the PATH model is used because the majority of the WKCD area falls within this grid (see **Figure 3.8**).

The NO_x/NO_2 conversion for vehicular and marine emissions is therefore estimated as follows:

$$[NO_2] = 0.075 \times [NO_x]_{vehicle} + \text{minimum of } \{0.925 \times [NO_x]_{vehicle} \text{ or } (46/48) \times [O_3]_{PATH}\} + 0.10 \times [NO_x]_{marine} + \text{minimum of } \{0.90 \times [NO_x]_{marine} \text{ or } (46/48) \times [O_3]_{PATH}\}$$

where

- $[NO_2]$ is the estimated hourly vehicular NO_2 concentration (predicted by CALINE4 and ISCST);
- $[NO_x]_{vehicle}$ vehicular is the hourly NO_x concentration as predicted by CALINE4 and ISCST3 for emissions at the receptor;
- $[O_3]_{PATH}$ is the hourly ozone concentrations as extracted from the aforementioned grid of the PATH model for year 2015 or 2020, and;
- $[NO_x]_{marine}$ is the hourly NO_x concentration as predicted by ISCST3 for marine emissions at the receptor;

To estimate the total hourly concentrations, the hourly pollutant concentrations as predicted by CALINE4 and ISCST3 (vehicular and marine) are added together with the future hourly background pollutant concentrations as extracted from the relevant grid of the PATH model. Therefore, the total hourly concentrations of NO_2 are calculated as follows:

$$[NO_2]_{total} = [NO_2] + [NO_2]_{PATH}$$

where

- $[NO_2]_{total}$ is the total hourly NO_2 concentration;

- $[NO_2]$ is the hourly vehicular and marine NO_2 concentration which is first predicted by CALINE4 and ISCST3 as NO_x and then converted to NO_2 by using OLM; and
- $[NO_2]_{PATH}$ is the hourly NO_2 concentrations as extracted from the aforementioned grid of the PATH model for year 2015 or 2020.

Similarly, the total hourly RSP (vehicular and marine) and SO_2 (marine emissions only) concentrations are also calculated by adding together the hourly results predicted by CALINE4, ISCST3 and PATH.

With the total hourly NO_2, RSP and SO_2 estimated, the daily results are obtained by taking the arithmetic mean of the 24 hourly results. Similarly, the annual concentrations are calculated as the arithmetic mean of the whole year of hourly results.

14.3.5 Evaluation and Assessment of the Air Quality Impacts

14.3.5.1 Construction Phase

Construction Phase Tier 1 Results

The Tier 1 screening results for mitigated and unmitigated scenarios including the background contribution are tabulated in **Appendix 3.28**. The unmitigated and mitigated results are summarised as follows.

Hourly

The Tier 1 hourly TSP results under both unmitigated and mitigated scenarios are summarized in **Table 14.3.16**. There would be exceedances of the hourly TSP limit of 500 µg/m^3 under the Tier 1 unmitigated scenario from 2014 to 2017. However, under the Tier 1 mitigated scenario, exceedances of the hourly TSP limit would only occur from 2015 to 2017, but no exceedances in 2014.

The locations of the dust sources are shown in **Figures 3.3a** to **3.3k**. **Figures 3.11a** to **3.11h** and **3.12a** to **3.12h** show the Tier 1 hourly TSP concentration contours for unmitigated and mitigated scenarios, respectively.

Table 14.3.16: Summary of Predicted Cumulative Hourly Average TSP Concentrations for All ASRs (Tier 1 Unmitigated & Mitigated)

Year	Tier 1 Unmitigated Scenario Range of Maximum Hourly TSP (µg/m^3) [Criterion - 500 µg/m^3]	Tier 1 Mitigated Scenario Range of Maximum Hourly TSP (µg/m^3) [Criterion - 500 µg/m^3]
2014	97 – 1992	75 – 420
2015	150 – 4731	79 – 580
2016	175 – 5296	79 – 623
2017	203 – 5108	81 – 543

Table 14.3.17 shows the receptors that would breach the hourly TSP limit of 500 µg/m^3 under the Tier 1 mitigated scenario for years 2015 to 2017. ASRs that were predicted to exceed the hourly TSP limit of 500 µg/m^3 for the Tier 1 mitigated scenario were modelled further under Tier 2 conditions, as described in **Section 14.3.4.1**.

Table 14.3.17: Predicted Cumulative Hourly Average TSP Concentrations for ASRs with Exceedance (Tier 1 Mitigated)

ASR	Height above ground (m)	Maximum Hourly TSP (µg/m^3) [Criterion - 500 µg/m^3]	Remark
2015			
P01d-1	4	580	Planned Performance Art Venues within WKCD. It is a possible fresh air intake. Exceedance subject to Tier 2 assessment.
P53-1	4	575	Planned Performance Art Venues within WKCD. It is a possible open area. Exceedance subject to Tier 2 assessment.
2016			
P01a-1	4	534	Planned Performance Art Venues within WKCD. It is a possible fresh air intake. Exceedance subject to Tier 2 assessment.
P01b-1	4	550	Planned Performance Art Venues within WKCD. It is a possible fresh air intake. Exceedance subject to Tier 2 assessment.
P01c-1	4	616	Planned Performance Art Venues within WKCD. It is a possible fresh air intake. Exceedance subject to Tier 2 assessment.
P53-1	4	623	Planned Performance Art Venues within WKCD. It is a possible open area. Exceedance subject to Tier 2 assessment.
2017			
P52-1	4	543	Planned Performance Art Venues within WKCD. It is a possible open area. Exceedance subject to Tier 2 assessment

Daily

The daily TSP results for Tier 1 unmitigated and mitigated scenario including the background contribution are tabulated in **Appendix 3.28. Table 14.3.18** summarises the Tier 1 results for daily TSP under both unmitigated and mitigated scenarios. There would be exceedances of the daily TSP limit of 260 µg/m^3 under the Tier 1 unmitigated scenario from 2014 to 2017. However, under the Tier 1 mitigated scenario, no ASRs are predicted to exceed the daily TSP limit for any of the assessment years.

The locations of the dust sources are shown in **Figures 3.3a** to **3.3k**. **Figures 3.13a** to **3.13h** and **Figures 3.14a** to **3.14h** show the daily TSP concentration contours for unmitigated and mitigated scenarios, respectively.

Table 14.3.18: Summary of Predicted Cumulative Daily Average TSP Concentrations for All ASRs (Tier 1 Unmitigated & Mitigated)

Year	Tier 1 Unmitigated Scenario Range of Maximum Daily TSP (µg/m^3) [Criterion - 260 µg/m^3]	Tier 1 Mitigated Scenario Range of Maximum Daily TSP (µg/m^3) [Criterion - 260 µg/m^3]
2014	74 – 433	69 –132
2015	80 – 1110	70 – 223
2016	86 –1844	70 – 257
2017	84 –1278	70 – 204

Construction Phase Tier 2 Results

The Tier 2 results including the background contribution, as described in **Section 14.3.4.1,** are tabulated in **Appendix 3.29**, and are discussed below.

Hourly

Tier 2 scenario was performed for those ASR subject to exceedance of the hourly TSP limit under the Tier 1 mitigated scenario. Under the Tier 2 mitigated scenario no ASRs were subject to exceedance of the hourly TSP limit of 500 µg/m³, as summarised in **Table 14.3.19**. Detailed results can be found in **Appendix 3.29**. The locations of the dust sources are shown in **Figures 3.3a** to **3.3k**. **Figures 3.15a** to **3.15e** show the hourly TSP concentration contours under the Tier 2 mitigated scenario.

Table 14.3.19: Summary of Predicted Cumulative Hourly Average TSP Concentrations (Tier 2 Mitigated)

ASR	Height above ground (m)	Maximum Hourly TSP (µg/m^3) [Criterion - 500 µg/m^3]
2015		
P01d-1	4	406
P53-1	4	265
2016		
P01a-1	4	343
P01b-1	4	374
P01c-1	4	438
P53-1	4	413
2017		
P52-1	4	247

Daily

There are no ASRs that would be subject to exceedance of the daily TSP limit under the Tier 1 mitigated scenario. Therefore, it is not necessary to run the Tier 2 mitigated scenario for daily TSP.

Construction Phase Annual Results

The annual results for mitigated and unmitigated scenarios including the background contribution are tabulated in **Appendix 3.30** and are also summarised in **Table 14.3.20**. There would be exceedances of the annual TSP limit of 80 µg/m^3 under the unmitigated scenario for years 2014 and 2016 only. However, under the mitigated scenario, no ASRs would exceed the annual TSP limit for any of the assessment years.

The locations of the dust sources are shown in **Figures 3.3a** to **3.3k**. **Figures 3.17a** to **3.17h** and **Figures 3.18a** to **3.18h** show the annual TSP concentration contours for unmitigated and mitigated scenarios, respectively.

Table 14.3.20: Summary of Predicted Cumulative Annual Average TSP Concentrations for All ASRs (Unmitigated & Mitigated)

Year	Unmitigated Scenario Range of Maximum Annual TSP ($\mu g/m^3$) [Criterion - 80 $\mu g/m^3$]	Mitigated Scenario Range of Maximum Annual TSP ($\mu g/m^3$) [Criterion - 80 $\mu g/m^3$]
2014	69 - 81	68 - 75
2015	68 - 79	68 - 79
2016	69 - 84	68 - 78
2017	68 - 79	68 - 71

14.3.5.2 Operation Phase – Vehicular and Marine Emissions

The predicted air quality results have included the background pollutant levels as extracted from the PATH model for year 2015 based on the latest released model and the cumulative impacts of the following emissions:

- Existing and proposed open roads within the 500 m assessment area;
- Proposed underpasses/landscape decks along the Austin Road West and Lin Cheung Road and the associated top openings under the Road Works at West Kowloon project;
- Existing WHC portal in the vicinity of the WKCD site;
- Ventilation exhausts/portals serving the planned underground roads within the WKCD area;
- Emissions from stationary marine sources at NYPCWA, China Ferry Terminal and Ocean Terminal, and;
- Fast ferry and tug movements within the 500 m assessment area.

Comparison of the predicted cumulative NO_2, RSP and SO_2 concentrations and any exceedances for individual ASRs under all modelled scenarios during the worst case year of 2015 (see **Sections 14.3.4.2**) can be found in **Appendix 3.31**. For the planned ASRs that will only be in operation in or after 2020, however, the modelling results that are based on the worst case year of 2015 with the highest total road traffic emissions would be overly conservative because those planned ASRs are yet to exist in 2015. As a result, the relevant modelling works for road traffic emissions have been refined for such planned ASRs by adopting the traffic forecast in 2020 and the background concentrations as extracted from the PATH for year 2020 in order to obtain more realistic estimates of the predicted maximum cumulative NO_2 levels. Details of the modelling results using the traffic forecast and background concentrations in 2020 are given in **Appendix 3.32**. The contours for cumulative NO_2, SO_2 and RSP at 1.5m, 12m, 40m, 50m and 60m above ground are shown in **Figure 3.19** to **Figure 3.93**.

According to the modelling results as summarised in **Table 14.3.21**, all the ASRs would be in compliance with the corresponding AQOs for daily and annual RSP; for hourly, daily and annual SO_2; as well as for hourly, daily and annual NO_2. However, the predicted maximum hourly or daily NO_2 concentrations at some of the ASRs would exceed the corresponding AQO for up to once per year, which is within the allowable numbers of exceedance for hourly NO_2 (3 times per year) and for daily NO_2 (once per year). Details of such hourly and daily NO_2 exceedances, together with the breakdown of NO_2 contributions due to different sources, are summarised in **Table 14.3.22.**

Table 14.3.21: Summary of Predicted Cumulative RSP, SO_2 and NO_2 Concentrations for All ASRs

Air Pollutant	Averaging Time	AQO ($\mu g/m^3$)	Allowable Exceedances in a Year	Range of Maximum Concentrations ($\mu g/m^3$)	Maximum No. of Exceedance in a Year
RSP	24 hours	180	1	114.5 – 117.7	0
Note (1)	1 year	55	0	42.8 – 51.7	0
SO_2	1 hour	800	3	84.7 – 619.1	0
Note (1)	24 hours	350	1	31.5 – 89.0	0
	1 year	80	0	7.9 – 16.2	0
NO_2	1 hour	300	3	259.7 – 314.9	0 – 1
Note (2)	24 hours	150	1	108.0 – 150.3	0 – 1
	1 year	80	0	45.0 – 79.7	0

Notes:
(1) The predicted SO_2 and RSP concentrations for all existing and planned ASRs are based on the traffic forecast during the worst-case year of 2015 and the background concentrations as extracted from the PATH for year 2015.
(2) The predicted NO_2 concentrations for existing ASRs and planned ASRs that will be in operation before 2020 are based on the traffic forecast during the worst-case year of 2015 and the background concentrations as extracted from the PATH for year 2015 whereas the predicted NO_2 concentrations for planned ASRs that will be in operation in/after 2020 have been refined based on the traffic forecast in 2020 and the background concentrations as extracted from the PATH for year 2020.

From **Table 14.3.22**, four existing ASRs, namely, WOB-1, VT1-23, SRT-1 and SRT-2, would be subject to exceedance of the AQO for hourly NO_2 for once a year, which is, however, below the allowable number of exceedances (3 times per year). At two planned ASRs, namely, P09-1 and P37-1, the cumulative maximum daily NO_2 concentrations would marginally exceed the AQO for daily NO_2 by only 0.2 to 0.3 $\mu g/m^3$ (about 0.1% to 0.2% of the AQO for daily NO_2) for once per year, which is still within the allowable number of exceedance under the AQO for daily NO_2 (once per year). Therefore, these four existing ASRs and two planned ASRs would still be in compliance with the AQO for hourly NO_2 and daily NO_2 respectively. As noted in **Table 14.3.3**, ASRs P09-1 and P37-1 are at 4m above ground level, and are therefore assessment points for reference only but not fresh air intake or openable window locations.

It can also be seen from **Table 14.3.22** that majority (some 78%-81%) of the hourly/daily NO_2 concentrations would be from the background concentration and the remaining 19%-22% would be due to nearby marine traffic/vessel plus road traffic emissions. Of these 19%-22% contributions, the percentage contributions from nearby road traffic emissions for the four existing ASRs would be around 6%-12%, which are lower than the corresponding percentages (some 18%-19%) for the two planned ASRs. As the underpass road project would only contribute to some road traffic emissions, the underpass road project is not the key contributor to the exceedance of hourly or daily NO_2 limits (only once in a year) at the six ASRs.

Table 14.3.22: Breakdown of Predicted Cumulative NO_2 Concentrations by Sources for ASRs with Potential Exceedance

ASR	Height above ground (m)	Description	Maximum Cumulative Hourly/Daily NO_2 Concentrations ($\mu g/m^3$)*						
			Background Contribution		Marine Traffic Contribution		Road Traffic Contribution		Total Concentration#
Hourly NO_2 (AQO: 300 $\mu g/m^3$, not to be exceeded for more than 3 times per year)									
WOB-1	6.8	Wing On Building – Block A Residential (Existing ASR)	246.2	80.6%	39.6	13.0%	19.6	6.4%	305.4 [1]
VT1-23	8	The Victoria Towers – Tower 1	246.2	80.3%	41.6	13.6%	18.7	6.1%	306.5 [1]

ASR	Height above ground (m)	Description	Maximum Cumulative Hourly/Daily NO_2 Concentrations ($\mu g/m^3$)*						
			Background Contribution		Marine Traffic Contribution		Road Traffic Contribution		Total Concentration#
		Residential (Existing ASR)							
SRT-1	19	Sorrento – Tower 1	246.2	78.2%	30.0	9.5%	38.7	12.3%	314.9 [1]
SRT-2	23	Residential (Existing ASR)	246.2	81.1%	29.9	9.8%	27.6	9.1%	303.7 [1]
Daily NO_2 (AQO: 150 $\mu g/m^3$, not to be exceeded for more than once per year)									
P09-1	4	Office/ Residential (Planned from 2017 onwards)	118.9	79.1%	2.2	1.5%	29.2	19.4%	150.3 [1]
P37-1	4	Retail/ Dining/ Entertainment (Planned from 2017 onwards)	118.9	79.2%	3.7	2.5%	27.6	18.4%	150.2 [1]

*Percentages in shaded cells represent the percentage share of the total concentrations.
#Numbers in bracket refer to the numbers of exceedance per year.

As explained in **Sections 14.3.3.3** and **14.3.3.4**, majority of the vehicular emission sources and all marine emission sources are due to respectively the nearby current/planned road networks serving the West Kowloon area and the existing marine activities in the surrounding waters, but not due to the WKCD development itself. To illustrate this, breakdown of the predicted maximum hourly NO_2 contributions due to different sources has been identified at a number of selected ASRs during the worst case year of 2015, as presented in **Table 14.3.23**. These selected ASRs cover existing ASRs close to but outside the WKCD boundary and planned ASRs representing the various types of future developments (to be operated before 2020) scattering within the entire WKCD area. It can be seen from the Table that 88%-100% of NO_2 contributions would be due to the background concentration plus the surrounding marine traffic emissions, with 12% or less from the nearby road traffic emissions. As the underpass road project would only result in some road traffic emissions, the underpass road project itself would have very minor contribution to the predicted air quality impacts at the ASRs.

Table 14.3.23: Breakdown of Predicted Cumulative Hourly NO_2 Concentrations by Sources for Selected ASRs (for the Worst Case Year of 2015)

ASR	Height above ground (m)	Description	Maximum Cumulative Hourly NO_2 Concentrations ($\mu g/m^3$)* (AQO: 300 $\mu g/m^3$, not to be exceeded for more than 3 times per year)						
			Background Contribution		Marine Traffic Contribution		Road Traffic Contribution		Total Concentration#
WOB-1	6.8	Wing On Building – Block A Residential (Existing ASR)	246.2	80.6%	39.6	13.0%	19.6	6.4%	305.4 [1]
VT1-23	8	The Victoria Towers – Tower 1 Residential (Existing ASR)	246.2	80.3%	41.6	13.6%	18.7	6.1%	306.5 [1]
SRT-1	19	Sorrento – Tower 1	246.2	78.2%	30.0	9.5%	38.7	12.3%	314.9 [1]
SRT-2	23	Residential (Existing ASR)	246.2	81.1%	29.9	9.8%	27.6	9.1%	303.7 [1]

ASR	Height above ground (m)	Description	Maximum Cumulative Hourly NO_2 Concentrations ($\mu g/m^3$)* (AQO: 300 $\mu g/m^3$, not to be exceeded for more than 3 times per year)						
			Background Contribution		Marine Traffic Contribution		Road Traffic Contribution		Total Concentration#
P01a-1	4	Planned performance art venue (Planned ASR from 2015 onwards)	246.2	86.0%	40.0	14.0%	0.1	0.0%	286.3
P01a-3	12		246.2	86.1%	39.9	13.9%	0.0	0.0%	286.1
P01a-5	20		246.2	86.1%	39.7	13.9%	0.0	0.0%	285.9
P01a-7	40		246.2	87.5%	35.2	12.5%	0.0	0.0%	281.4
P09-1	4	Office/ Residential (Planned ASR from 2017 onwards)	246.2	87.3%	35.9	12.7%	0.0	0.0%	282.1
P09-3	12		246.2	87.5%	35.2	12.5%	0.0	0.0%	281.4
P09-5	20		246.2	87.9%	33.8	12.1%	0.0	0.0%	280.0
P09-7	40		277.2	99.2%	2.2	0.8%	0.0	0.0%	279.4
P10-1	4	Office + Retail/ Dining/ Entertainment Residential (Planned ASR from 2017 onwards)	246.2	85.8%	40.9	14.2%	0.0	0.0%	287.1
P10-3	12		246.2	85.8%	40.8	14.2%	0.0	0.0%	287.0
P10-5	20		246.2	85.9%	40.5	14.1%	0.0	0.0%	286.7
P10-8	50		246.2	88.1%	33.4	11.9%	0.0	0.0%	279.6
P16-1	4	Retail/ Dining/ Entertainment Residential (Planned ASR from 2018 onwards)	277.2	99.4%	1.8	0.6%	0.0	0.0%	279.0
P16-3	12		277.2	99.4%	1.7	0.6%	0.0	0.0%	278.9
P16-5	20		277.2	99.4%	1.7	0.6%	0.0	0.0%	278.9
P16-8	50		277.2	99.5%	1.3	0.5%	0.0	0.0%	278.5
P29-1	4	Office + Retail/ Dining/ Entertainment Residential (Planned ASR from 2018 onwards)	277.2	99.8%	0.5	0.2%	0.1	0.0%	277.8
P29-3	12		277.2	99.8%	0.5	0.2%	0.0	0.0%	277.7
P29-5	20		277.2	99.8%	0.5	0.2%	0.0	0.0%	277.7
P29-10	70		277.2	99.9%	0.4	0.1%	0.0	0.0%	277.6
P35c-1	4	Planned performance art venue (Planned ASR from 2017 onwards)	277.2	99.6%	1.1	0.4%	0.0	0.0%	278.3
P35c-3	12		277.2	99.6%	1.1	0.4%	0.0	0.0%	278.3
P35c-5	20		277.2	99.6%	1.1	0.4%	0.0	0.0%	278.3
P37-1	4	Retail/ Dining/ Entertainment (Planned ASR from 2017 onwards)	246.2	88.1%	6.7	2.4%	26.6	9.5%	279.5
P37-3	12		277.2	99.6%	0.1	0.0%	1.0	0.4%	278.3
P37-5	20		277.2	99.7%	0.1	0.0%	0.8	0.3%	278.1
P37-10	70		277.2	100.0%	0.0	0.0%	0.0	0.0%	277.2
P51-1	4	Freespace (Planned ASR from 2016 onwards)	277.2	99.9%	0.2	0.1%	0.0	0.0%	277.4
P51-3	12		277.2	99.9%	0.2	0.1%	0.0	0.0%	277.4
P51-5	20		277.2	99.9%	0.2	0.1%	0.0	0.0%	277.4
P52-1	4	Pavilion (Planned ASR from 2016 onwards)	277.2	100.0%	0.0	0.0%	0.0	0.0%	277.2
P52-3	12		277.2	100.0%	0.0	0.0%	0.0	0.0%	277.2
P52-5	20		277.2	100.0%	0.0	0.0%	0.0	0.0%	277.2
OP	1.5	Open Space (Planned ASR from 2017 onwards)	277.2	100.0%	0.0	0.0%	0.0	0.0%	277.2

*Percentages in shaded cells represent the percentage share of the total concentrations.
#Numbers in bracket refer to the numbers of exceedance per year.

To illustrate the predicted air quality impacts in 2020, breakdown of the predicted maximum hourly NO_2 contributions due to different sources has also been identified by adopting the traffic forecast and

background concentrations for the year of 2020 at selected ASRs, as presented in **Table 14.3.24**. The selected ASRs cover existing ASRs close to but outside the WKCD boundary and planned ASRs representing the future developments within WKCD, particularly those in the vicinity of the WHC portal. It can be seen from the Table that 73%-100% of NO_2 contributions would be due to the background concentration plus the surrounding marine traffic emissions, with 27% or less from the nearby road traffic emissions. The NO_2 contributions from nearby road traffic for P43d and P43e at not more than 12m above ground (21%-27%) are much higher than those for other ASRs (0.0%-8.9%), chiefly because of their proximity to the WHC portal. Another observation is that the cumulative maximum hourly NO_2 concentrations of the existing ASRs in 2020 would be considerably lower than those in 2015 (i.e., **Table 14.3.23**), indicating an appreciable extent of improvement in air quality from 2015 to 2020.

Table 14.3.24: Breakdown of Predicted Cumulative Hourly NO_2 Concentrations by Sources for Selected ASRs (for Year 2020)

ASR	Height above ground (m)	Description	Maximum Cumulative Hourly NO_2 Concentrations (μg/m^3)* (AQO: 300 μg/m^3, not to be exceeded for more than 3 times per year)						
			Background Contribution		Marine Traffic Contribution		Road Traffic Contribution		Total Concentration
WOB-1	6.8	Wing On Building – Block A Residential (Existing ASR)	259.7	97.1%	4.9	1.8%	2.9	1.1%	267.5
VT1-23	8	The Victoria Towers – Tower 1 Residential (Existing ASR)	214.5	74.5%	61.7	21.4%	11.7	4.1%	287.9
SRT-1	19	Sorrento – Tower 1 Residential (Existing ASR)	214.5	79.9%	30.0	11.2%	23.8	8.9%	268.3
SRT-2	23		259.7	98.8%	0.0	0.0%	3.1	1.2%	262.8
P37-1	4	Retail/ Dining/ Entertainment (Planned ASR from 2017 onwards)	259.7	98.8%	0.1	0.0%	3.0	1.1%	262.8
P37-3	12		259.7	98.9%	0.1	0.0%	2.7	1.0%	262.5
P37-5	20		259.7	99.0%	0.1	0.0%	2.4	0.9%	262.2
P37-10	70		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P39-1	4	Office + Planned performance art venues (Planned ASR from 2020 onwards)	259.7	99.0%	0.1	0.0%	2.6	1.0%	262.4
P39-3	12		259.7	99.4%	0.1	0.0%	1.5	0.6%	261.3
P39-5	20		259.7	99.7%	0.1	0.0%	0.7	0.3%	260.5
P39-10	70		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43a-1	4	Hotel + Retail/ Dining/ Entertainment (Planned ASR from 2020 onwards)	259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43a-3	12		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43a-4	16		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43b-1	4	Ditto	259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43b-3	12		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43b-5	20		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43c-1	4	Ditto	259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43c-3	12		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43c-5	20		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43d-1	4	Ditto	202.8	72.6%	2.7	1.0%	73.9	26.4%	279.4
P43d-3	12		202.8	77.3%	2.7	1.0%	56.7	21.6%	262.2

ASR	Height above ground (m)	Description	Maximum Cumulative Hourly NO_2 Concentrations (μg/m^3)* (AQO: 300 μg/m^3, not to be exceeded for more than 3 times per year)						
			Background Contribution		Marine Traffic Contribution		Road Traffic Contribution		Total Concentration
P43d-5	20		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43d-7	40		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43e-1	4	Ditto	202.8	72.2%	3.2	1.1%	74.9	26.7%	280.9
P43e-3	12		202.8	77.5%	3.2	1.2%	55.8	21.3%	261.8
P43e-5	20		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43e-8	50		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43f-1	4	Ditto	259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43f-3	12		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43f-5	20		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43f-8	50		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43g-1	4	Ditto	259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43g-3	12		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43g-5	20		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43g-7	40		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43h-1	4	Ditto	259.7	100.0%	0.0	0.0%	0.1	0.0%	259.8
P43h-3	12		259.7	100.0%	0.0	0.0%	0.1	0.0%	259.8
P43h-5	20		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43h-7	40		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43i-1	4	Ditto	259.7	99.9%	0.0	0.0%	0.2	0.1%	259.9
P43i-3	12		259.7	100.0%	0.0	0.0%	0.1	0.0%	259.8
P43i-5	20		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43i-6	30		259.7	100.0%	0.0	0.0%	0.0	0.0%	259.7
P43j-1	4	Ditto	259.7	99.9%	0.0	0.0%	0.3	0.1%	260.0
P43j-3	12		259.7	99.9%	0.0	0.0%	0.2	0.1%	259.9
P43j-5	20		259.7	100.0%	0.0	0.0%	0.1	0.0%	259.8
P43k-1	4	Ditto	259.7	99.9%	0.0	0.0%	0.3	0.1%	260.0
P43k-3	12		259.7	99.9%	0.0	0.0%	0.2	0.1%	259.9
P43k-4	16		259.7	100.0%	0.0	0.0%	0.1	0.0%	259.8

*Percentages in shaded cells represent the percentage share of the total concentrations.

14.3.6 Mitigation Measures

14.3.6.1 Construction Phase

General Dust Control Measures

To ensure compliance with the TSP criteria during the construction phase, the relevant requirements stipulated in the *Air Pollution Control (Construction Dust) Regulation* and EPD's *Guidance Note on the Best Practicable Means for Cement Works (Concrete Batching Plant) BPM 3/2(93)* as well as the good practices for dust control should be implemented to reduce the dust impact. The dust control measures are detailed

as follows:

Dust emissions could be suppressed by regular water spraying on site. In general, water spraying twice a day could reduce dust emission from active construction area by 50%. However, for this underpass road Project, more frequent water spraying, i.e., 12 times a day or once every one hour, is required for heavy construction activities at all active works area in order to achieve a higher dust suppression efficiency of 91.7% to reduce the dust impacts to acceptable levels. A watering intensity of 3.75 L/m^2, 12 times a day or once every hour, is predicted to achieve 91.7% dust suppression efficiency. Detailed calculations can be found in **Appendix 3.8**. Heavy construction activities include construction of roads, drilling, ground excavation, cut and fill operations (i.e., earth moving), etc.

Best Practices for Dust Control

In addition to implementing the recommended dust control measures mentioned above, it is recommended that the relevant best practices for dust control as stipulated in the *Air Pollution Control (Construction Dust) Regulation* should also be adopted to further reduce the construction dust impacts of the Project. These best practices include:

Good Site Management

- Good site management is important to help reducing potential air quality impact down to an acceptable level. As a general guide, the Contractor should maintain high standard of housekeeping to prevent emission of fugitive dust. Loading, unloading, handling and storage of raw materials, wastes or by-products should be carried out in a manner so as to minimise the release of visible dust emission. Any piles of materials accumulated on or around the work areas should be cleaned up regularly. Cleaning, repair and maintenance of all plant facilities within the work areas should be carried out in a manner minimising generation of fugitive dust emissions. The material should be handled properly to prevent fugitive dust emission before cleaning.

Disturbed Parts of the Roads

- Each and every main temporary access should be paved with concrete, bituminous hardcore materials or metal plates and kept clear of dusty materials; or
- Unpaved parts of the road should be sprayed with water or a dust suppression chemical so as to keep the entire road surface wet.

Exposed Earth

- Exposed earth should be properly treated by compaction, hydroseeding, vegetation planting or seating with latex, vinyl, bitumen within six months after the last construction activity on the site or part of the site where the exposed earth lies.

Loading, Unloading or Transfer of Dusty Materials

- All dusty materials should be sprayed with water immediately prior to any loading or transfer operation so as to keep the dusty material wet.

Debris Handling

- Any debris should be covered entirely by impervious sheeting or stored in a debris collection area sheltered on the top and the three sides.

- Before debris is dumped into a chute, water should be sprayed so that it remains wet when it is dumped.

Transport of Dusty Materials

- Vehicle used for transporting dusty materials/spoils should be covered with tarpaulin or similar material. The cover should extend over the edges of the sides and tailboards.

Wheel washing

- Vehicle wheel washing facilities should be provided at each construction site exit. Immediately before leaving the construction site, every vehicle should be washed to remove any dusty materials from its body and wheels.

Use of vehicles

- The speed of the trucks within the site should be controlled to about 10km/hour in order to reduce adverse dust impacts and secure the safe movement around the site.
- Immediately before leaving the construction site, every vehicle should be washed to remove any dusty materials from its body and wheels.
- Where a vehicle leaving the construction site is carrying a load of dusty materials, the load should be covered entirely by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle.

Site hoarding

- Where a site boundary adjoins a road, street, service lane or other area accessible to the public, hoarding of not less than 2.4m high from ground level should be provided along the entire length of that portion of the site boundary except for a site entrance or exit.

Best Practices for Concrete Batching Plant

It is recommended that the relevant best practices for dust control as stipulated in the *Guidance Note on the Best Practicable Means for Cement Works (Concrete Batching Plant) BPM 3/2* should also be adopted to further reduce the construction dust impacts of the Project. These include:

Exhaust from Dust Arrestment Plant

- Wherever possible the final discharge point from particulate matter arrestment plant, where is not necessary to achieve dispersion from residual pollutants, should be at low level to minimise the effect on the local community in the case of abnormal emissions and to facilitate maintenance and inspection.

Emission Limits

- All emissions to air, other than steam or water vapour, shall be colourless and free from persistent mist or smoke

Engineering Design/Technical Requirements

- As a general guidance, the loading, unloading, handling and storage of fuel, raw materials, products, wastes or by-products should be carried out in a manner so as to prevent the release of visible dust and/or other noxious or offensive emissions

Detailed mitigation methods and guidance can be found in the stand-alone EM&A Manual.

14.3.6.2 Operation Phase – Vehicular and Marine Emissions

Since it has been assessed that all the ASRs would be in compliance with all the relevant AQOs for SO_2, NO_2 and RSP, no mitigation measures for vehicular or marine traffic emissions are required during the operation phase.

14.3.7 Evaluation of Residual Impacts

14.3.7.1 Construction Phase

It has been assessed that there would neither be exceedance of the hourly TSP limit under the Tier 2 mitigated scenario nor exceedance of the AQO for daily TSP under the Tier 1 mitigated scenario at any of the ASRs throughout the entire construction period. Similarly, no exceedance of the AQO for annual TSP was predicted at any of the ASRs for the entire construction period under the mitigated scenario. Hence no residual impacts are anticipated during the construction phase.

14.3.7.2 Operation Phase – Vehicular and Marine Emissions

According to the modelling results, all the identified ASRs would be in compliance with the corresponding AQO for hourly, daily and annual SO_2; for hourly, daily and annual NO_2 as well as for daily and annual RSP. However, during the worst case year of 2015, four existing ASRs, namely, WOB-1, VT1-23, SRT-1 and SRT-2, would be subject to exceedance of the AQO for hourly NO_2 (i.e., 300 $\mu g/m^3$) by about 3.7-14.9 $\mu g/m^3$ (or about 1.2%-5.0% of the relevant AQO) for once a year, and two planned ASRs, namely, P09-1 and P37-1, would be subject to marginal exceedance of the AQO for daily NO_2 (i.e., 150 $\mu g/m^3$) by about 0.2-0.3 $\mu g/m^3$ (or about 0.1%-0.2% of the relevant AQO) for once a year. Since the numbers of such hourly and daily NO_2 exceedances are within the respective allowable numbers of exceedances (3 times per year for hourly NO_2 and once per year for daily NO_2), the AQO for hourly and daily NO_2 would still be complied with at the six ASRs. Hence, no residual impacts are anticipated during the operation phase due to vehicular and marine emissions.

14.3.8 Environmental Monitoring and Audit

14.3.8.1 Construction Phase

Regular dust monitoring is considered necessary during the construction phase of the Project and regular site audits are also required to ensure the dust control measures are properly implemented. Details of the environmental monitoring and audit (EM&A) programme will be presented in the stand-alone EM&A Manual.

14.3.8.2 Operation Phase

Since it has been assessed that all the ASRs would be in compliance with all the relevant AQOs for SO_2, NO_2 and RSP, no residual air quality impacts due to vehicular or marine traffic emissions are anticipated. Therefore, no monitoring is considered necessary for vehicular or marine traffic emissions.

14.3.9 Conclusion

Construction Phase

With implementation of the recommended mitigation measures as well as the relevant control requirements as stipulated in the *Air Pollution Control (Construction Dust) Regulation* and EPD's *Guidance Note on the Best Practicable Means for Cement Works (Concrete Batching Plant) BPM 3/2(93)*, it has been assessed that there would neither be exceedance of the hourly TSP limit under the Tier 2 mitigated scenario nor exceedance of the AQO for daily TSP under the Tier 1 mitigated scenario at any of the ASRs throughout the entire construction period. For annual TSP results, no exceedance of the corresponding AQO was predicted at any of the ASRs during the construction phase provided the recommended mitigation measures are in place.

Operation Phase

Majority of the vehicular emission sources and all marine emission sources are due to respectively the nearby current/planned road networks serving the West Kowloon area and the existing marine activities in the surrounding waters, but not due to the underpass road project itself. Therefore, the underpass road project alone would only have very minor contribution to the predicted air quality impacts at the ASRs.

According to the modelling results, all the identified ASRs would be in compliance with the corresponding AQO for hourly, daily and annual SO_2; for hourly, daily and annual NO_2 as well as for daily and annual RSP. However, during the worst case year of 2015, four existing ASRs, namely, WOB-1, VT1-23, SRT-1 and SRT-2, would be subject to exceedance of the AQO for hourly NO_2 (i.e., 300 $\mu g/m^3$) by about 3.7-14.9 $\mu g/m^3$ (or about 1.2%-5.0% of the relevant AQO) for once a year, and two planned ASRs, namely, P09-1 and P37-1, would be subject to marginal exceedance of the AQO for daily NO_2 (i.e., 150 $\mu g/m^3$) by about 0.2-0.3 $\mu g/m^3$ (or about 0.1%-0.2% of the relevant AQO) for once a year. Since the numbers of such hourly and daily NO_2 exceedances are within the respective allowable numbers of exceedances (3 times per year for hourly NO_2 and once per year for daily NO_2), the AQO for hourly and daily NO_2 would still be complied with at the six ASRs.

In conclusion, no adverse air quality impacts due to vehicular or marine traffic emissions are anticipated during the operation phase.

14.4 Noise Impact

This section presents the assessment of the potential noise impacts associated with the construction and operation phases of the proposed underpass roads within WKCD site. The total length of proposed underpass roads is approximately 1400m and the key layout plan is shown in **Appendix 4.2c**. The interim access point at Austin Road West has been included into the noise impact assessment as shown in **Appendix 4.2c**. Noise generated from various construction activities is the primary concern during the construction phase. Road traffic noise is not anticipated as the proposed underpass and permanent underpass from Canton Road are fully underground. Noise from the open sections of the access ramps connecting the underpass and the noise emission from the portals of the underpass road are identified as sources of road traffic noise impact. Fixed plant noise from ventilation shafts of the proposed underpass is major noise impact during the operation phase. Representative Noise Sensitive Receivers (NSRs) within 300m of the subject site have been identified and the worst case impacts on these receivers have been assessed. Suitable mitigation measures, where necessary, have been recommended accordingly to reduce the identified noise impacts to acceptable levels.

14.4.1 Noise Legislations, Standards and Guidelines

14.4.1.1 Construction Phase

Control over the generation of construction noise in Hong Kong is governed by the Noise Control Ordinance (NCO) and the Environmental Impact Assessment Ordinance (EIAO) and their subsidiary requirements. Various Technical Memoranda (TMs) have been issued under the NCO and the EIAO to stipulate control approaches and criteria. These TMs prescribe the maximum permitted noise levels for the use of Powered Mechanical Equipment (PME) and certain construction activities and processes, according to the type of equipment or activity, the perceived noise climate of the area, and the working hours of equipment operation and usage. The TMs applicable to the control of noise from construction activities of proposed construction works are:

- TM on Environmental Impact Assessment Process (EIAO-TM)
- TM on Noise from Construction Work other than Percussive Piling (GW-TM)
- TM on Noise from Construction Work in Designated Areas (DA-TM)

14.4.1.2 General Construction Activities during Non-Restricted Hours

Noise impacts arising from general construction activities other than percussive piling during the daytime period (07:00-19:00 hours of any day not being a Sunday or general holiday) are assessed against the noise standards tabulated in **Table 14.4.1** below.

Table 14.4.1: Noise Standards for Daytime Construction Activities

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

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

Note: The above noise standards apply to uses, which rely on opened windows for ventilation
The above standards shall be viewed as the maximum permissible noise levels assessed at 1m from the external facade
The above standards shall be met as far as possible. All practicable mitigation measures shall be exhausted and the residual impacts are minimised

14.4.1.3 General Construction Activities during Restricted Hours

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

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

The use of Specified PME (SPME) and/or the carrying out of Prescribed Construction Work (PCW) within a Designated Area (DA) under the NCO during the restricted hours are also prohibited without a CNP. The relevant technical details in Technical Memorandum on Noise from Construction Work in Designated Areas (DA-TM) under NCO can be referred.

Designated areas, in which the control of SPME and PCW shall apply, are established through the Noise Control (Construction Work Designated Areas) Notice made under Section 8A(1) of the NCO. According to the Designated Area defined under the NCO, all part of the works area of this Project will fall within these areas where construction works would be carried out.

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

According to the construction programme, the proposed construction works would be carried out during non-restricted hours. In case of any construction activities during restricted hours, it is the Contractor's responsibility to ensure compliance with the NCO and the relevant TMs. The Contractor will be required to submit CNP application to the Noise Control Authority and abide by any conditions stated in the CNP, should one be issued.

14.4.1.4 Ground-borne Construction Noise

Basement design is involved in the proposed Project. The underground construction works will be carried out by cut and cover method. No tunnelling works would be involved in the basement construction. Hence, potential ground-borne noise impact to existing NSRs is not anticipated. As all basement construction works will be completed in Phase 1 of the proposed Project, no underground works will be carried out after completion of the venues with noise sensitive use above the basement. In view of this situation, ground-borne noise impact arising from the construction works of the proposed Project to the planned NSRs is not

anticipated. Therefore, no ground-borne noise impact is expected during the construction phase of the Project.

14.4.1.5 Road Traffic Noise

The EIAO-TM published under Section 16(5) of the EIAO is the fundamental legislation of noise criteria for evaluating noise impact of designated projects. The summary of noise criteria is given in **Table 14.4.2**.

Table 14.4.2: Relevant Road Traffic Noise Standards for Planning Purposes

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

Notes: (i) The above standards apply to uses which rely on opened windows for ventilation
(ii) The above standards should be viewed as the maximum permissible noise levels assessed at 1m from the external facade

14.4.1.6 Operation Phase - Fixed Plant Noise

For the fixed plant noise assessment, the Acceptable Noise Levels (ANLs) for the NSRs are determined based on the Area Sensitivity Rating (ASR).

ASR is defined in the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM). The ASR depends on the type of area and the degree of impact that Influencing Factors (IFs) have on the NSRs and is determined from **Table 14.4.3** below. Industrial area, major road or the area within the boundary of Hong Kong International Airport shall be considered to be an IF.

Table 14.4.3: Area Sensitivity Rating

Type of Area Containing NSR	Degree to which NSR is affected by IF		
	Not Affected	Indirectly Affected	Directly Affected
(i) Rural area, including country parks or village type developments	A	B	B
(ii) Low density residential area consisting of low-rise or isolated high-rise developments	A	B	C
(iii) Urban area	B	C	C
(iv) Area other than those above	B	B	C

The ANLs laid down in the Table 2 of the IND-TM is shown in **Table 14.4.4** below.

Table 14.4.4: Acceptable Noise Level for Fixed Noise Source

Time Period	Area Sensitivity Rating		
	A	B	C
Day (0700 to 1900 hours)	60	65	70
Evening (1900 to 2300 hours)			

Night (2300 to 0700 hours)	50	55	60

As stipulated in Annex 5 of the EIAO-TM, the noise standard for planning purposes for fixed noise source are (a) 5 dB(A) below the appropriate ANL, or (b) the prevailing background noise levels (For quiet areas with level 5 dB(A) below the ANL).

The whole WKCD is located in urban area. According to **Table 14.4.3**, the ASR of the area in West Kowloon for most identified NSRs shall be "B", while the ASRs for NSR P3b, VT1, LCS and CRGPS are identified as "C" due to directly and indirectly affected by nearby major road, namely Canton Road which is considered as Influencing Factor according to the IND-TM. The noise criteria of the fixed plant noise at different locations of the Project are summarised in **Table 14.4.5** and **Table 14.4.6** below.

Table 14.4.5 Noise Criteria of Fixed Plant Noise

NSR ID.	Time Period	ASR[#]	ANL – 5, dB(A)	Background Noise Level, dB(A)*	Fixed Plant Noise Criteria, dB(A)
P3b, VT1, LCS and CRGPS	Daytime (0700 to 1900)	C	65	71	65
	Evening Time (1900 to 2300)		65	72	65
	Night-time (2300 to 0700)		55	69	55
P16a, P17c, P19, P27b, P29a&b and P32a-c	Daytime (0700 to 1900)	B	60	60	60
	Evening Time (1900 to 2300)		60	57	57
	Night-time (2300 to 0700)		50	51	50
P10, P11a&b, P13a-e	Daytime (0700 to 1900)	B	60	63	60
	Evening Time (1900 to 2300)		60	58	58
	Night-time (2300 to 0700)		50	51	50
P2, P3a, P5c, P6a&b, P7, P9b, P9c	Daytime (0700 to 1900)	B	60	65	60
	Evening Time (1900 to 2300)		60	60	60
	Night-time (2300 to 0700)		50	51	50
P5a, P5b and P9a	Daytime (0700 to 1900)	B	60	65	60
	Evening Time (1900 to 2300)		60	65	60
	Night-time (2300 to 0700)		50	67	50
P16b, P17a and P17b	Daytime (0700 to 1900)	B	60	68	60
	Evening Time (1900 to 2300)		60	67	60
	Night-time (2300 to 0700)		50	62	50
P24, P27a and P28	Daytime (0700 to 1900)	B	60	64	60
	Evening Time (1900 to 2300)		60	63	60
	Night-time (2300 to 0700)		50	61	50

Notes: ([#])Type of area containing NSR inside study area is classified as "Urban Area". The Influencing Factor (IF) inside study area is Canton Road which with an annual average daily traffic flow in excess of 30,000.

(*) Refer to **Appendix 4.1** for the background noise measurement results.

The proposed outdoor theatre in the WKCD would also be affected by fixed noise sources in proximity. As fixed noise criterion for outdoor theatre has not been specified in the EIAO-TM, reference has been made to the Community Noise Exposure Level as proposed in the State of California General Plan Guidelines

2003[2], in which a level greater than 65 dB(A) in terms of L_{dn} is defined as normally unacceptable for amphitheatre. In considering the Area Sensitive Rating at the proposed Outdoor Theatre shall be B and the corresponding ANL is 65 dB(A) during 0700 to 2300, it is proposed to adopt the noise criterion 5 dB(A) below the ANL or the prevailing background level which is lower for the proposed Outdoor Theatre.

For the Outdoor Theatre proposed in the WKCD site, the current background noise levels measured at the locations of the proposed Outdoor Theatre during daytime and evening are lower than the ANL by more than 5 dB(A). Hence, the current background noise levels are adopted for the establishment of the fixed source noise criteria for that Outdoor Theatre.

Table 14.4.6 Noise Criteria of Fixed Plant Noise for the Outdoor Theatre

NSR ID.	Time Period	ASR[#]	ANL – 5, dB(A)	Background Noise Level, dB(A)*	Fixed Plant Noise Criteria, dB(A)
P50**	Daytime (0700 to 1900)	B	60	59	59
Outdoor Theatre	Evening Time (1900 to 2300)		60	58	58

Notes: (#) Type of area containing NSR inside study area is classified as "Urban Area".
(*) Refer to **Appendix 4.1** for the background noise measurement results.
(**) No activity would be held at the venue during night time.

14.4.2 Baseline Conditions

14.4.2.1 Study Area

The Study Area is defined as within 300m of the site boundary of the Project for noise impact assessment. This study area is identified and shown in **Figure 4.1**.

14.4.2.2 Description of the Environment

Site visits were conducted in June, July and August 2011 to understand the existing environment in the vicinity of the Project site. This Project site is surrounded by the areas with residential, commercial and recreational uses. The existing noise environment is dominated by the road traffic noise from Austin Road West, Lin Cheung Road, Canton Road and the West Kowloon Highway.

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84

2 Figure 2 of Appendix C, State of California General Plan Guidelines 2003, published by the California Governor's Office of Planning and Research, US

14.4.2.3 Identification of Noise Sensitive Receivers

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

For the purpose of noise assessment, the first layer of residential premises located close to the site boundary have been selected as assessment points/ identified representative NSRs within the Assessment Area for prediction of noise impact levels.

According to the Outline Zoning Plans ("the Approved South West Kowloon OZP No. S/K20/28" gazetted on 8 January 2013 and "the Draft Tsim Sha Tsui OZP No. S/K1/27" gazetted on 11 January 2013), the assessment area mainly comprises zoning of Other Specified Uses and Comprehensive Development Area (CDA). Part of the assessment area is within Residential zoning adjacent to the Canton Road. Existing NSRs in the Residential and CDA zones located close to the site boundary have been identified and selected as representative NSRs.

Based on the approved EIA of Road Works at West Kowloon (AEIAR-141/2009), topside development at West Kowloon Terminus (Site A) is planned for commercial use and remains unchanged based on the latest information provided by MTRCL. Hence, no planned NSR is identified within Site A of West Kowloon Terminus. The topside developments of the Sites C and D were planned for residential use. Based on the latest information provided by the MTRCL, the tentative population intake of the planned NSR at Site D will be in June 2015 and hence it is also included in the assessment. The development layout of Site D and building heights are based on the latest layout approved and provided by the Planning Department.

As this Project includes residential development, planned NSRs are also identified within the Project site area for assessment of the potential traffic noise impact from the proposed underpass. The boundary of all residential parcels have set back distance from land use zone as shown in **Figure 4.1** to avoid potential noise impact. The minimum setback distance from site boundary at Austin Road West and Canton Road site are 26m and 49m respectively.

Central air conditioning will be proposed for all CACFs except Outdoor Theatre within the WKCD, and therefore, will not rely on open windows for ventilation. Hence, no assessment point is proposed for the CACFs except Outdoor Theatre under the airborne noise impact assessment.

Descriptions of selected representative NSRs are tabulated in **Table 14.4.7**. The representative NSRs for construction noise impact assessment are shown in **Figures 4.2a to 4.2e**. The representative NSRs for fixed plant noise impact assessment are shown in the **Figures 4.4a and 4.4b**. Photos of existing noise sensitive receivers are shown in **Figure 4.5**.

Table 14.4.7: Representative Noise Sensitive Receivers

No.	NSR ID	Description	Use	Existing/ Planned	No. of Storeys (Sensitive use only)	1st Assessment Level (mPD)	Area Sensitivity Rating	Noise Impact Assessment		
								Construction	Fixed Source	Road Traffic
1	HT1	The Harbourside Tower 1	Residential	Existing	65	40	N/A	√		
2	HT3	The Harbourside Tower 3	Residential	Existing	65	40	N/A	√		
3	AST	The Arch - Sun Tower	Residential	Existing	52	40	N/A	√		
4	RD	Development next to Austin Station	Residential	Planned	20	47	N/A	√		
5	WOB	Wai On Buiding	Residential	Existing	15	7	N/A	√		
6	VT1	The Victoria Towers - Tower 1	Residential	Existing	52	47	C	√	√	√
7	VT2	The Victoria Towers - Tower 2	Residential	Existing	52	47	N/A	√		
8	LCS	Lai Chack Middle School	Educational	Existing	5	8	C	√	√	√
9	CRGPS	Canton Road Government Primary School	Educational	Existing	6	7	C	√	√	
10	FQ	Fire Services Department Staff Quarter	Residential	Existing	7	24	N/A	√		
11	CUL	The Cullinan I	Residential	Existing	33	40	N/A	√		
12	P2	Parcel 2 in WKCD	Residential	Planned	13	22	B		√	
13	P3	Parcel 3 in WKCD	Residential	Planned	6	19	C		√	√
14	P5	Parcel 5 in WKCD	Residential	Planned	9	33	B		√	√
15	P6	Parcel 6 in WKCD	Residential	Planned	8	33	B		√	
16	P7	Parcel 7 in WKCD	Residential	Planned	8	33	B	√	√	
17	P9	Parcel 9 in WKCD	Residential	Planned	9	33	B		√	√
18	P10	Parcel 10 in WKCD	Residential	Planned	10	33	B		√	
19	P11	Parcel 11 in WKCD	Residential	Planned	13	22	B		√	
20	P13	Parcel 13 in WKCD	Residential	Planned	9	37	B		√	
21	P16	Parcel 16 in WKCD	Residential	Planned	10	33	B		√	
22	P17	Parcel 17 in WKCD	Residential	Planned	11	22	B		√	

No.	NSR ID	Description	Use	Existing/ Planned	No. of Storeys (Sensitive use only)	1st Assessment Level (mPD)	Area Sensitivity Rating	Noise Impact Assessment		
								Construction	Fixed Source	Road Traffic
23	P19	Parcel 19 in WKCD	Residential	Planned	10	33	B		√	
24	P22	Parcel 22 in WKCD	Residential	Planned	12	29	N/A			
25	P24	Parcel 24 in WKCD	Residential	Planned	11	33	B		√	
26	P27	Parcel 27 in WKCD	Residential	Planned	9	42	B		√	
27	P28	Parcel 28 in WKCD	Residential	Planned	14	40	B		√	
28	P29	Parcel 29 in WKCD	Residential	Planned	16	37	B		√	
29	P32	Parcel 32 in WKCD	Residential	Planned	10	22	B		√	
30	P50#	Outdoor Theatre in WKCD	Performing Arts	Planned	N/A	6	B		√	

Note: (N/A) Not Applicable

All residential floors inside WKCD will be mixed with retail, dining and entertainment (RDE) and / or office at lower floor below 1st assessment level to minimize the noise impacts.

(#) The operation of Outdoor Theatre will be after the construction work of Parks, Hotel and M+ Phase 1. No major construction works within 300m will be overlap the operation phase of this NSR so that it is not included in construction noise impact assessment.

14.4.3 Background Noise Condition

Noise surveys were carried out in June, July and August 2011 to investigate the background noise condition of the surrounding environment and the Project site. The baseline noise measurement locations are shown in **Figure 4.6**.

Nine noise surveys were carried out in the Project site. The noise surveys were undertaken using Type 1 sound level meters, namely Rion NL-18 and Rion NL-31. During each survey, the sound level meter was checked using an acoustic calibrator generating a sound pressure level of 94.0 dB(A) at 1kHz immediately before and after the noise measurement. The measurements were accepted as valid only if the calibration levels before and after the noise measurement were agreed to be within 1.0 dB(A). The sound level meters and acoustic calibrators are calibrated in accredited laboratories yearly to ensure reliable performance. The measurement results are shown in **Appendix 4.1**.

14.4.4 Identification of Pollution Sources

14.4.4.1 Construction Noise

The major construction activities involved in the Project is site formation and construction of underpass in the WKCD site. The major part of the underpass including the interim access road near Austin Road West will be constructed between year 2014 and 2017. The remaining part of the underpass (permanent access road near Canton Road) will be constructed after the demolition of the existing TST Fire Station after 2022 and it is expected to be completed for operation by 2030. The construction noise impact associated with the underpass will be assessed in both assessment scenarios of year between 2014 and 2017 and year between 2022 and 2030.

As mentioned in **Section 14.2.8**, the construction programme of this WKCD Project would overlap with other several construction projects including the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL), the Road Works at West Kowloon (RWWK) and the Proposed Road Improvement Works in West Kowloon Reclamation Development Phase 1. Construction noise from these projects was also identified as key noise sources to the identified NSRs under this Project.

14.4.4.2 Road Traffic Noise Sources

During the operational phase, road traffic noise is anticipated to be minimal as a large portion of the proposed underpass is fully underground. Noise from the open sections of the access ramps connecting the grade roads and the proposed underpass, and the noise emission from the portals of the underpass road are identified as sources of road traffic noise impact. There are two accesses to the underpass are designed with open road sections. One is the interim access at Austin Road West with an open road section about 30m in length. The other one is the permanent access at Canton Road which has an open road section about 15m in length. The locations of these two open road sections are shown in **Figure 14.1.1**.

14.4.4.3 Fixed Noise Sources

Operation of planned fixed plant such as air intake/exhaust openings for ventilation of underpass section and basement facilities located above ground within WKCD would likely generate noise impacts. Some

other facilities are proposed within the WKCD development including a district cooling system, sewage pump sumps, electricity substation and wind turbines, mentioned in **Section 2.2**, are also considered as fixed noise sources within the WKCD. The district cooling system and sewage pump sumps will be located at basement level served by the basement ventilation system with above-ground ventilation openings, which are taken into account in the fixed plant noise impact assessment.

Other existing and planned fixed plant noise sources which could impact on the noise sensitive uses in WKCD as well as all existing nearby NSRs are also identified. Those sources include openings of ventilation shafts serving the Kowloon Station, Austin Station, Airport Railway, Western Harbour Crossing Tunnel, China Harbour City and the XRL West Kowloon Terminus (under construction). The operation of the existing China Harbour Ferry Terminal in the vicinity of the east of the Project site is also considered as fixed noise source. Measurements of these fixed noise sources have been conducted in order to identify their sound power levels for the fixed plant noise impact assessment. The methodology for identification of the sound power levels is presented in **Appendix 4.1a**. Details of the identified sound power levels and locations of the noise measurements are presented in **Appendices 4.1b to 4.1d.** The locations of identified fixed noise sources including ventilation openings of the West Kowloon Terminus as proposed in the approved EIA and updated available information of the XRL project are shown in **Figures 4.4a and 4.4b**. All identified fixed noise sources are subject to change based on the best and latest available information for the assessment.

The potential noise impact from the proposed electricity substation has also been taken into account in the assessment. Installation of wind turbines is an optional component of WKCD, subject to funding and final decision making. The potential noise impact from wind turbines has also been included in the assessment based on currently best available information, adopting a conservative approach.

The existing TST fire station is located at the east part of the WKCD. The distance between the nearest planned residential parcel (NSR P7) to TST fire station is 105m and there is no direct line of sight to the entrance of the fire station. Noise from fire stations would be related to emergency duties which are short duration and infrequent. Adverse noise impact due to TST fire station is not expected. In addition, the relocation of TST Fire Station is expected to be around year 2022 to 2025 and thus no long term noise impact, if any, is anticipated.

Optional automatic refuse collection system would be built in WKCD if technically feasible and financially viable. Major noise sources generally are related to air blowers, refuse compactor, refuse separator and the collection point, which are highly depend on detail design layout plan which subject to further study. Preventive measures such as careful siting of noisy equipment like air blowers, refuse compactor, de-odorising facilities and exhaust should be adopted in first place. Further mitigation measures such as silencers, acoustic enclosure and shielding should be considered if necessary in order to comply with noise standards. Most of the system could be underground or located in shielded areas and associated impacts could be controlled. Adverse impacts are not expected.

14.4.5 Assessment Methodology

14.4.5.1 Construction Noise

Assessment approach to the noise impact is in line with the Guidance Note titled “Preparation of Construction Noise Impact Assessment under the Environmental Impact Assessment Ordinance” (GN 9/2010).

In addition, the assessment of construction noise impact is based on standard acoustic principles, and the guidelines given in GW-TM issued under the NCO where appropriate. Where no sound power level (SWL) can be found in the relevant TM, reference has been made to BS 5228 Part 1:2009 or noise emission levels measured for PME used in previous projects in Hong Kong. The general approach is summarized below:

i. Formulate a typical construction schedule/ programme;

ii. Identify a typical project-specific equipment inventory for each work stage together with the number;

iii. Obtain from GW-TM, the Sound Power Level (SWL) for each PME assumed in the equipment inventory;

iv. Select representative NSRs for the construction noise impact assessment;

v. Calculate the unmitigated Predicted Noise Level (PNL) and correct it for facade reflection to obtain the Corrected Noise Level (CNL) at any NSRs;

vi. If necessary, re-select typical project-specific silenced equipment and calculate the mitigated noise impact;

vii. Compare the mitigated CNL with the noise standards to determine acceptability and the need for further mitigation.

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

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

where

Sound Pressure Levels, SPL in dB(A)

Sound Power Levels, SWL in dB(A)

Distance Attenuation, DC in dB(A) = $20 \cdot \log(D)+8$ (where D is the distance between NSRs and noise source in meters)

Façade Correction, FC in dB(A) = 3dB(A)

For the cumulative noise impact during construction phase, projects which included Express Rail Link, Road Works at West Kowloon and Road Improvement Works in West Kowloon Reclamation Development were considered in the noise assessment. The Central Kowloon Route project as listed in **Section 14.2.8** was not taken into account due to out of the 300m study area.

In addition, a current concrete batching plant (CBP) of XRL at east of Project area as shown in **Figures 4.2b to 4.2e** will be handed over to WKCDA in year 2014. The operation, demolition and relocation of that CBP have been taken into account in the construction noise impact assessment accordingly. It is assumed that the CBP will be relocated to the west of Project area in year 2017 for worst case scenario consideration as shown in **Figures 4.2f to 4.2i**.

14.4.5.2 Road Traffic Noise

Road traffic noise levels at the representative assessment points will be calculated based on the peak hour traffic flow within a 15 years period upon commencement of operation of the road project i.e. the assessment year. Traffic noise will be predicted using the model “RoadNoise”, which has been used before in other similar EIA studies. The model has fully incorporated the procedures and methodology

documented in “Calculation of Road Traffic Noise (CRTN)” (1988) published by the U.K. Department of Transport.

The planned noise sensitive use facades within WKCD and vicinity NSRs may have potential road traffic noise impact from major roads surrounding WKCD. The peak hour traffic flows of the surrounding road links and the locations of the road links are shown in **Appendix 4.2a**. As the PM peak hour traffic flows of those dominant surrounding road links are higher than that during the AM peak hour, the PM peak hour traffic flow will be adopted in the assessment. The key plans for WKCD external and internal road links for the design year are shown in **Appendices 4.2b**, **4.2c and 4.2d**.

The proposed underpass will be connected to the Austin Road West in interim scheme before permanently connected to the Canton Road upon relocation of the existing TST Fire Station. The traffic noise impact to the identified NSRs will be assessed under both the interim and permanent schemes to identify the worst traffic noise impact within a 15 years period upon commencement of operation of the road project.

As a large portion of the proposed underpass of the Project will be fully enclosed by the above ground structures, it is anticipated that the contribution from the underpass to overall road traffic noise impact shall be minimal. Noise from the open road sections of the access to the underpass have been taken into account in the assessment of the road traffic noise impact.

An assessment of the unmitigated road traffic noise levels at the representative NSRs under both interim and permanent scheme in the assessment year has been carried out. If exceedance of the relevant road traffic noise criteria is predicted and which is contributed significantly by the proposed road sections under the Project, direct noise mitigation measures will be considered. In case the proposed direct noise mitigation measures could not be implemented due to site constraints and other uncertainties, indirect noise mitigation measures have also been considered.

Other than the existing road sections paved with low noise surfacing, the extent of low noise road surfacing, barriers and semi-enclosures proposed in the Road Works at West Kowloon project has also been considered in the unmitigated scenario of the road traffic noise impact assessment.

14.4.5.3 Fixed Plant Noise

In the absence of any detailed information and noise specification for the proposed fixed plant, the maximum allowable noise emission levels at the shaft/ exhaust openings have been determined for future detailed design of the fixed plant.

For the assessment of noise from the fixed plant, the maximum allowable sound power levels (Max SWLs) of the identified fixed noise sources were determined by adopting standard acoustics principles. The following formula was used for calculating the Max SWLs of the fixed plant:

SPL = Max SWL – DC + FC - BC

where

SPL:	Sound Pressure Level in dB(A)
Max SWL:	Maximum Allowable Sound Power Level in dB(A)
DC:	Distance Attenuation in dB(A) = 20 log D + 8 [where D is the distance in m]
FC:	Façade Correction in dB(A) = +3 dB(A)
BC:	Barrier Correction in dB(A)

For those fixed plant noise sources falling within the view angle of the NSR but with no direct line of sight to the opening, a 5 dB(A) attenuation would be applied. For the case where the NSR with no direct line of sight to the source/opening which is located on the other side of the building or completely blocked by other building(s), a 10 dB(A) attenuation would be applied. If the noise sources do not fall within the view angle of the representative NSR under assessment, it is assumed that these noise sources are insignificant to that NSR. However, these noise sources are still taken into account in the assessment for conservative approach but a 10 dB(A) attenuation would be applied.

If exceedance to the noise criteria is found for one NSR, the initial SWL of the dominant sources to that NSR would be gradually lowered until the corrected SPL at that NSR meets the acceptable level. The process would be repeated for other representative NSRs with exceedance of the noise criteria until all corrected SPLs at the representative NSRs meet the noise criteria. The maximum allowable SWLs of the proposed fixed plants have been predicted by this approach.

For those proposed fixed plant of Express Rail Link (XRL) West Kowloon Terminus, the locations and maximum allowable sound power levels were made reference to latest information in the Environmental Review Report for the application of variation of Environmental Permit conditions (VEP) of the approved XRL project. For those existing fixed plant noise sources, the design information were made reference to the relevant approved EIA Reports or obtained from the relevant authorities. Should information of certain sources which was not available during the course of preparing this assessment, site visits and noise measurements were carried out to determine the locations of the fixed sources and regarding sound power levels. The noise impact from these sources would then be assessed with the use of the same methodology as stated above for the planned sources.

Corrections of tonality, intermittency or impulsiveness are not considered in the assessment. If the noise exhibits any of these characteristics during the operation of the plant, the maximum allowable sound power level should be reduced in accordance with the recommendation given in Section 3.3 of the IND-TM.

14.4.6 Evaluation and Assessment of the Noise Impacts

14.4.6.1 Construction Noise

The type and quantity of Powered Mechanical Equipment (PME) likely to be used for the site formation works and construction of the underpass and their Sound Power Levels (SWLs) are shown in **Appendices 4.4a to 4.4d**.

According to the tentative construction programme, it is likely that there will be an overlap of this Project with some other potentially concurrent projects including “Express Rail Link”, “Road Works at West Kowloon” and “Road Improvement Works in West Kowloon Reclamation Development”. These projects are described in **Section 14.2.8**. MTRCL has recently confirmed that the assumptions adopted in the approved Road Works at West Kowloon and XRL EIA reports remained valid during the preparation of this EIA Report except for construction programme of West Kowloon Terminal have been delayed for 6 months and the revised assumptions in “Environmental Review for Proposed West Kowloon Terminus Concrete Batching Facility” (i.e. update in construction commencement date from Dec 2009 to Jun 2010 for Works Area V WKT Zone 1 to 3 and Work Area W and updated plant inventory associated with the concrete batching plant) which have been considered in this construction impact assessment. Since the EIA of “Road Improvement Works in West Kowloon Reclamation Development” project was still in-progress at the time of preparing this EIA, the relevant findings of the Preliminary Environment Review (PER) for that project have been adopted in the cumulative construction noise impact assessment. The findings in

relevant approved EIA, revised construction programme and PER reports have been referenced in the assessment for the cumulative construction noise impact.

The unmitigated noise levels from this Project are predicted and presented in **Table 14.4.8** below. Details of the construction noise impact at the representative NSRs are shown in **Appendices 4.4a to 4.4d**.

The prediction results indicate that the noise impact of unmitigated construction activities from this project would cause exceedance of the relevant daytime construction noise criteria. Mitigation measures are therefore required for these NSRs in order to alleviate the noise impacts generated during the construction phase.

Table 14.4.8: Unmitigated Construction Airborne Noise Impact from this Project

NSR ID	Use	Predicted Noise Level dB(A)						Noise Criteria dB(A)	Exceedance of Noise Criteria?	Mitigation Measure required?
		2014	2015	2016	2017	2022 to 2030**	Overall			
HT1	Residential	**79-85**	**79-81**	**79-81**	**77-79**	72	72-**85**	75	Yes	Yes
HT3	Residential	**78-83**	**79-80**	**79-80**	**76-78**	72	72-**83**	75	Yes	Yes
AST	Residential	**79-84**	**79-81**	**79-81**	**77-79**	70	70-**84**	75	Yes	Yes
RD[#]	Residential	-	**76-77**	75-**77**	72-74	74	74-**77**	75	Yes	Yes
WOB	Residential	**76-79**	75-**76**	73-**76**	70-73	73	70-**79**	75	Yes	Yes
VT1	Residential	**78-81**	**77-78**	75-**78**	71-74	**79**	71-**81**	75	Yes	Yes
VT2	Residential	**77-80**	**76-77**	74-**77**	71-74	**76**	71-**80**	75	Yes	Yes
LCS	Educational	**77-80**	**76-78**	**75-78**	**72-75**	**81**	**72-81**	70/65^	Yes	Yes
CRGPS	Educational	**76-79**	**75-77**	**75-77**	**71-75**	**81**	**71-81**	70/65^	Yes	Yes
FQ[#]	Residential	**81-84**	**80-82**	**81-82**	**77-81**	**--**	**77-84**	75	Yes	Yes
CUL	Residential	72-**76**	73-74	73-74	71-73	**78**	69-**78**	75	Yes	Yes
P7[#]	Residential	--	--	--	--	**83**	**83**	75	Yes	Yes

Note: **Bold** figures denotes the predicted noise level is higher than the relevant daytime construction noise criteria

(**) The remaining part of the underpass would be carried out between 2022 and 2030 after demolition of the TST Fire Station. The predicted noise levels of construction of permanent underpass are taken from that of excluded area construction between year 2022 and year 2030 in **Appendix 4.4i**. Concurrent construction works within WKCD has been included in the predicted noise levels.

(^) Criteria for examination period

([#]) MTR confirmed that the residential development next to Austin Station will be occupied in middle of 2015.

FQ will be relocated before permanent underpass construction.

P7 is assumed to be occupied after Year 2017.

14.4.6.2 Road Traffic Noise

The proposed underpass is scheduled to be commenced operation in 2017. According to the projection of the traffic impact assessment, the year with maximum traffic flow within a 15-year period upon commencement of operation of the proposed underpass is determined to be 2032. Therefore, the peak hour traffic data for year 2032 has been adopted for the assessment. After reviewing both morning and afternoon peak hour flow data, the afternoon peak hour flow data was chosen for the assessment as greater noise impact will be predicted at the NSRs in WKCD.

A large portion of the proposed underpass will be fully enclosed by the above ground structures, the contribution from the underground section of the underpass to the overall road traffic noise impact is anticipated to be insignificant. The potential unmitigated road traffic noise impacts on the NSRs for the Project at Year 2032 due to operation of the open road sections of the access connecting the underpass, as well as the overall noise impacts cumulating with other existing and planned roads sections nearby have been assessed.

The assessment results are summarised in **Table 14.4.9** and **Table 14.4.10** below for the scenario with interim access at Austin Road West and the scenario with permanent access at Canton Road respectively. Detailed breakdowns of road traffic noise impacts are shown in **Appendices 14.4.1 and 14.4.2**. Location of road plots is shown in **Appendix 4.5e**.

Table 14.4.9: Unmitigated Road Traffic Noise Impact in Year 2032 – Scenario with Interim Access at Austin Road West

NSR ID	Noise Criteria, $L_{10(1\ hr)}$ dB(A)	Predicted Road Traffic Noise Level, $L_{10\ (1hr)}$ dB(A)		
		Underpass Access	Overall	Contribution from Underpass Access
P3a	70	N/A*	54 - 63	0.0
P3b	70	N/A*	65 - **72**	0.0
P5	70	58 - 59	**71** - **72**	0.2 - 0.3
P9	70	54	70 - **71**	0.1
VT1	70	22 - 42	**72** - **78**	0.0 – 0.1
LCS	65	17	**81** - **84**	0.0

Note: * Road traffic noise level of Project roads is negligible.

Bold figures denotes the predicted noise level is exceeded the relevant traffic noise criteria.

Table 14.4.10: Unmitigated Road Traffic Noise Impact in Year 2032 – Scenario with Permanent Access at Canton Road

NSR ID	Noise Criteria, $L_{10(1\ hr)}$ dB(A)	Predicted Road Traffic Noise Level, $L_{10\ (1hr)}$ dB(A)		
		Underpass Access	Overall	Contribution from Underpass Access
P3a	70	N/A*	54 - 63	0.0
P3b	70	41 - 51	65 - **72**	0.0
P5	70	N/A*	**71** - **72**	0.0
P9	70	N/A*	70	0.0
VT1	70	51 - 55	**72** - **78**	0.0 – 0.1
LCS	65	56 - 59	**81** - **84**	0.0

Note: * Road traffic noise level of Project roads is negligible.
Bold figures denotes the predicted noise level is exceeded the relevant traffic noise criteria.

Exceedances of noise criteria were found at NSRs P3b, P5, P9, VT1 and LCS. However, the exceedances were found dominated by the contributions of noise from the surrounding existing and the committed RWWK roads sections. The predicted noise contributions to the overall traffic noise levels from the proposed underpass of this Project are estimated to be less than 1.0 dB(A) at these affected NSRs and the road traffic noise levels of the proposed roads are all below the relevant noise criteria. Direct noise mitigation measures on the Project road sections are deemed not necessary as they would be ineffective in improving the noise environment at the NSRs. The underpass proposed under this WKCD Project is hence not anticipated to have a significant contribution to the overall road traffic noise impact.

The traffic noise generated inside the underpass might reverberate within the structure and emit through the portals, resulting in increase of traffic noise level at the identified NSRs. However, according to research findings, the noise from portal would not be significant provided that a tunnel length equivalent to approximately 2-3 time of diameter is installed with sound-absorbing materials. To address the potential portal noise problem, mitigation measures in form of installing sound-absorbing materials on the inner walls and ceiling of the portals is recommended where necessary. Details of the mitigation measures are briefed in **Section 14.4.7.2**.

An assessment of the scenario without the Project has been conducted and the results with detailed breakdown of road traffic noise impacts are shown in **Appendix 14.4.3** for reference.

14.4.6.3 Fixed Plant Noise

According to the preliminary design information, noise from fixed plant of the Project would mainly be associated with the above ground ventilation openings serving the underground facilities. Sixty-six locations were identified within WKCD for these openings. These 66 openings and other identified major fixed plant noise sources are summarized in **Table 14.4.11** below and the regarding locations are shown in **Figures 4.4a to 4.4b**.

Table 14.4.11: Summary of Fixed Plant Noise Sources

Fixed Noise Source	Existing/ Planned	Number of Source Facade	Opening ID#
Louvres along the Austin Road West (ICC, The Harbourside and The Element)	Existing	4	N3 to N6*
Louvres along the Lin Cheung Road	Existing	5	N7 to N11*
Louvres from XRL West Kowloon Terminus	Planned	19	N12 to N15***
Louvres from Austin Station	Existing	4	N16 to N19**
Fixed Plants from Austin Station	Existing	3	N20 to N22**
Fixed Plants from Kowloon Station Tunnel Ventilation Building	Existing	4	N23 to N26*
Western Harbour Crossing Tunnel Ventilation Building	Existing	4	N27 to N30*
Louvres of China Harbour City	Existing	1	N31*
China Ferry Terminal	Existing	1	N32*^
Canton Road Plant Building	Existing	4	N33 to N36**
Ventilation Openings within WKCD for Underpass	Planned	43	01D to 04D, 05D1 to 05D3,

Fixed Noise Source	Existing/ Planned	Number of Source Facade	Opening ID[#]
Section and Basement Facilities (including District Cooling System and Sewage Pump Sumps)			06D1 to 06D2, 07D, 08D1 to 08D2, 10D1 to 10D4, 11D, 12D1 to 12D3, 13D1 to 13D4, 14D1 to 14D2, 15D1 to 15D3, 17D to 20D, 26D to 27D, 29D to 32D, 39D1 to 39D2, 40D1 to 40D2
West Kowloon Terminus Ventilation Opening	Planned	15	09VS7, 13TVS1, 14VS6, 14PVS6***
Ventilation Openings for CLP Electricity Substation	Planned	4	42D1 to 42D4
Proposed Wind Turbine	Planned	38	W1 to W38

Notes: (#) Noise Source Opening ID N1 and N2 are not used.

(*) The sound power levels were determined from on-site measurements (details given in **Appendix 4.1a**)

(**) The sound power levels were made reference to the relevant approved KSL EIA report Table 6-22.

(***) The sound power levels were made reference to the latest information in VEP of XRL project.

(^) Fixed plant is not in operation during night time period.

According to the noise measurements for existing fixed noise sources as shown in **Appendix 4.1b**, KSL EIA and latest information in VEP of XRL project. The other identified major fixed plant noise sources are summarized in **Table 14.4.12** below.

Table 14.4.12: SWLs of the Existing Fixed Plant and Fixed Plant from XRL projects

Fixed Noise Source	Source ID	SWL, dB(A)		
		Daytime	Evening Time	Night time
Louvres along the Austin Road West* (ICC, The Harbourside and The Element)	N3	95	93	93
	N4	93	92	88
	N5	93	92	89
	N6	88	88	85
Louvres along the Lin Cheung Road*^	N7	92	88	--
	N8	96	96	--
	N9	95	99	--
	N10	95	101	--
	N11	107	104	--
Louvres from XRL West Kowloon Terminus***	N12a-d	88	88	78
	N12e-f	89	89	79
	N13a-b	88	88	78
	N14a-g	89	89	79
	N15a-d	89	89	79
Louvres from Austin Station**	N16	78	78	68
	N17	72	72	62
	N18	72	72	62
	N19	78	78	68
Fixed Plants from Austin Station**	N20	73	73	63
	N21	73	73	63
	N22	73	73	63

Fixed Noise Source	Source ID	SWL, dB(A) Daytime	Evening Time	Night time
Fixed Plants from Kowloon Station Tunnel Ventilation Building*	N23	99	99	99
	N24	99	99	99
	N25	99	99	99
	N26	99	99	99
Western Harbour Crossing Tunnel Ventilation Building*	N27	97	97	97
	N28	97	97	97
	N29	97	97	97
	N30	97	97	97
Louvres of China Harbour City*^	N31	95	95	--
China Ferry Terminal*^	N32	99	99	--
Canton Road Plant Building**	N33	105	105	95
	N34	110	110	100
	N35	105	105	95
	N36	104	104	96
West Kowloon Terminus Ventilation Opening at Parcel 9 of WKCD***	VS7-1	77	77	67
	(1&2)	77	77	67
	VS7-2	77	77	67
	VS7-3	77	77	67
	(1&2)	77	77	67
	VS7-4	77	77	67
	(1&2)	77	77	67
	VS7-5	77	77	67
	(1&2)	77	77	67
West Kowloon Terminus Ventilation Opening at Parcel 13 of WKCD***	TVS1-1	83	83	73
West Kowloon Terminus Ventilation Opening at Parcel 14 of WKCD***	VS6-1	80	80	70
	VS6-2	80	80	70
	VS6-3	80	80	70
	PVS6-1	78	78	68
	PVS6-2	77	77	67

Notes: (#) Noise Source Opening ID N1 and N2 are not used.

(*) The sound power levels were determined from on-site measurements (details given in **Appendix 4.1a**)

(**) The sound power levels were made reference to the relevant approved KSL EIA report Table 6-22.

(***) The sound power levels were made reference to the latest information in VEP of XRL project.

(^) Fixed plant is not in operation during night time period.

Based on the methodology mentioned in **Section 14.4.5.3**, the maximum allowable SWLs of the proposed fixed plants during daytime and night-time are predicted as summarized in **Table 14.4.13** below.

Table 14.4.13: Maximum Allowable SWLs of the Fixed Plant within WKCD

Fixed Noise Source	Source ID	Maximum Allowable SWL, dB(A) Daytime	Evening Time	Night time

Fixed Noise Source	Source ID	Maximum Allowable SWL, dB(A)		
		Daytime	Evening Time	Night time
Ventilation Openings of Parcel 1 within WKCD for Underpass Section and Basement Facilities	01D	85	85	69
Ventilation Openings of Parcel 2 within WKCD for Underpass Section and Basement Facilities	02D	82	76	69
Ventilation Openings of Parcel 3 within WKCD for Underpass Section and Basement Facilities	03D	80	80	70
Ventilation Openings of Parcel 4 within WKCD for Underpass Section and Basement Facilities	04D	85	85	70
Ventilation Openings of Parcel 5 within WKCD for Underpass Section and Basement Facilities	05D1	83	82	70
	05D2	83	82	70
	05D3	83	82	70
Ventilation Openings of Parcel 6 within WKCD for Underpass Section and Basement Facilities	06D1	85	80	75
	06D2	85	80	75
Ventilation Openings of Parcel 7 within WKCD for Underpass Section and Basement Facilities	07D	87	87	65
Ventilation Openings of Parcel 8 within WKCD for Underpass Section and Basement Facilities	08D1	80	80	70
	08D2	80	80	70
Ventilation Openings of Parcel 10 within WKCD for Underpass Section and Basement Facilities	10D1	78	74	65
	10D2	78	74	65
	10D3	78	74	65
	10D4	78	74	65
Ventilation Openings of Parcel 11 within WKCD for Underpass Section and Basement Facilities	11D	77	73	66
Ventilation Openings of Parcel 12 within WKCD for Underpass Section and Basement Facilities	12D1	85	83	69
	12D2	85	83	69
	12D3	85	83	69
Ventilation Openings of Parcel 13 within WKCD for Underpass Section and Basement Facilities	13D1	79	76	70
	13D2	79	76	70
	13D3	79	76	70
	13D4	79	76	70
Ventilation Openings of Parcel 14 within WKCD for Underpass Section and Basement Facilities	14D1	85	82	72
	14D2	85	82	72
Ventilation Openings of Parcel 15 within WKCD for Underpass Section and Basement Facilities	15D1	85	82	72
	15D2	85	82	72
	15D3	85	82	72
Ventilation Openings of Parcel 17 within WKCD for Underpass Section and Basement Facilities	17D	87	84	78
Ventilation Openings of Parcel 18 within WKCD for Underpass Section and Basement Facilities	18D	87	87	80
Ventilation Openings of Parcel 19 within WKCD for Underpass Section	19D	86	86	75

Fixed Noise Source	Source ID	Maximum Allowable SWL, dB(A)		
		Daytime	Evening Time	Night time
and Basement Facilities				
Ventilation Openings of Parcel 20 within WKCD for Underpass Section and Basement Facilities	20D	86	86	84
Ventilation Openings of Parcel 26 within WKCD for Underpass Section and Basement Facilities	26D	87	87	70
Ventilation Openings of Parcel 27 within WKCD for Underpass Section and Basement Facilities	27D	87	87	78
Ventilation Openings of Parcel 29 within WKCD for Underpass Section and Basement Facilities	29D	87	85	70
Ventilation Openings of Parcel 30 within WKCD for Underpass Section and Basement Facilities	30D	84	81	74
Ventilation Openings of Parcel 31 within WKCD for Underpass Section and Basement Facilities	31D	86	85	75
Ventilation Openings of Parcel 32 within WKCD for Underpass Section and Basement Facilities	32D	85	80	72
Ventilation Openings of Parcel 39 within WKCD for Underpass Section and Basement Facilities	39D1	98	96	87
	39D2	98	96	87
Ventilation Openings of Parcel 40 within WKCD for Underpass Section and Basement Facilities	40D1	98	96	87
	40D2	98	96	87
Ventilation Openings of Parcel 42 within WKCD for CLP Electricity	42D1	98	96	80
	42D2	98	96	80
	42D3	98	96	80
	42D4	98	96	80
Proposed Wind Turbine	W1 to W38	82	82	82

With the adoption of the proposed maximum allowable SWLs of the proposed fixed plants, the fixed plant noise impacts to the NSRs within or in the vicinity of the WKCD are presented in **Appendix 4.6**. The impact noise levels at all selected NSRs complied with the relevant noise criteria for the daytime, evening time and night time periods. Therefore, no adverse fixed plant noise impact to the existing NSRs is anticipated.

14.4.7 Mitigation Measures

14.4.7.1 Construction Noise

Mitigation measures for each construction site are detailed below, and the following forms of mitigation measures are recommended and should be incorporated into the Contract Specifications:

- good site practice to limit noise emissions at source;
- selection of quieter plant;
- use of movable noise barrier;
- use of noise enclosure/ acoustic shed;
- use of noise insulating fabric, and

- scheduling of construction works outside school examination periods.

While it is recognised that the Contractor may develop a different package of mitigation measures to meet the required noise standards, the following suite of practical and implementable measures demonstrate an approach that would be feasible to reduce noise to acceptable levels.

Good Site Practice

Good site practice and noise management can significantly reduce the impact of construction site activities on nearby NSRs. The following package of measures should be followed during each phase of construction:

- only well-maintained plant to be operated on-site and plant should be serviced regularly during the construction works;
- machines and plant that may be in intermittent use to be shut down between work periods or should be throttled down to a minimum;
- plant known to emit noise strongly in one direction, should, where possible, be orientated to direct noise away from the NSRs;
- mobile plant should be sited as far away from NSRs as possible; and
- material stockpiles and other structures to be effectively utilised, where practicable, to screen noise from on-site construction activities.

Selecting Quieter Plant

The Contractor may be able to obtain particular models of plant that are quieter than the standards given in the GW-TM. This is one of the most effective measures and is increasingly practicable because of the availability of quiet equipment.

Quiet plant whose actual SWL is less than the value specified in GW-TM for the same piece of equipment. Examples of SWLs for specific silenced PME taken from EPD's QPME Inventory and "*Sound Power Levels of Other Commonly Used PME*" are presented in **Table 14.4.14**. It should be noted that various types of silenced equipment can be found in Hong Kong.

Table 14.4.14 Quieter PME Recommended for Adoption during Construction Phase

PME	Power rating/size, weight	Reference	SWL, dB(A)
Crane, mobile	213kW	EPD-01516	101
Excavator, wheeled / tracked	112.5kW	EPD-01230	99
Dump truck	5.5 tonne < gross vehicle weight ≤ 38 tonne	EPD document "Sound Power Levels of Other Commonly Used PME"	105
Lorry	5.5 tonne < gross vehicle weight ≤ 38 tonne	EPD document "Sound Power Levels of Other Commonly Used PME"	105

Whilst quieter PME are listed, the Contractor may be able to obtain particular models of plant that are quieter than the PMEs given in GW-TM.

Use of Movable Noise Barriers

Movable noise barriers can be very effective in screening noise from particular items of plant when constructing the Project. Noise barriers located along the active works area close to the noise generating component of a PME could produce at least 10 dB(A) screening for stationary plant and 5 dB(A) for mobile plant provided the direct line of sight between the PME and the NSRs is blocked. A schematic configuration of a single movable noise barrier for PME is shown in **Figure 4.9**.

Use of Noise Enclosure/ Acoustic Shed

The use of noise enclosure or acoustic shed is to cover stationary PME such as air compressor and concrete pump. With the adoption of the noise enclosure, the PME could be completely screened, and noise reduction of 15 dB(A) can be achieved according to the EIAO Guidance Note No.9/2010. A schematic configuration of full noise enclosure for PME is shown in **Figure 4.10**.

Use of Noise Insulating Fabric

Noise insulating fabric can also be adopted for certain PME (e.g. drill rig, pilling machine etc). The fabric should be lapped such that there are no openings or gaps on the joints. According to the approved Tsim Sha Tsui Station Northern Subway EIA report (AEIAR-127/2008), a noise reduction of 10 dB(A) can be achieved for the PME lapped with the noise insulating fabric.

The noise screening benefit for each item of plant considered in this assessment is listed in **Table 14.4.15**.

Table 14.4.15 Noise Mitigation Measures for Certain PME during Construction Phase

PME	Mitigation Measures Proposed	Noise Reduction, dB(A)
Air compressor	Noise enclosure	15
Generator	Noise enclosure	15
Water pump	Noise enclosure	15
Piling, large diameter bored, grab and chisel	Noise insulating fabric	10
Piling, large diameter bored, reverse circulation drill	Noise insulating fabric	10
Piling, large diameter bored, oscillator	Noise insulating fabric	10
Piling, diaphragm wall, hydraulic extractor	Noise insulating fabric	10
Piling rig	Noise insulating fabric	10
Drill rig, rotary type	Noise insulating fabric	10
Grout mixer	Movable noise barrier	10
Grout pump	Movable noise barrier	10
Poker, vibratory, hand-held	Movable noise barrier	10
Welding set	Movable noise barrier	10
Concrete pump, lorry mounted	Movable noise barrier	10

PME	Mitigation Measures Proposed	Noise Reduction, dB(A)
Bar bender and cutter	Movable noise barrier	10
Handheld breaker	Movable noise barrier	10
Circular wood saw	Movable noise barrier	10
Hand-held drill/grinder	Movable noise barrier	10
Concrete mixer	Movable noise barrier	10
Concrete lorry mixer	Movable noise barrier	5
Excavator	Movable noise barrier	5
Mobile crane	Movable noise barrier	5
Dump truck	Movable noise barrier	5
Crane lorry	Movable noise barrier	5
Site fork lift truck	Movable noise barrier	5
Lorry	Movable noise barrier	5
Tipper lorry	Movable noise barrier	5

These enclosures and noise barriers should be free of gaps and made of materials having a surface mass density in excess of 10 kg/m^2. To improve the effectiveness of noise reduction, non-flammable absorptive lining can be adhered on the inner surface of the noise barriers. The barrier can be in the form of vertical or bend top barrier with an effective height to block the line of sight to NSRs.

Scheduling of Construction Works outside School Examination Periods

The daytime construction noise criterion during school examination period is 65 dB(A), which is lower than the normal daytime school criterion of 70 dB(A). During construction phase, the contractor should liaise with the educational institutions (including NSRs LCS and CRGPS) to obtain the examination schedule and avoid the noisy construction activities during school examination periods.

Mitigated Construction Noise Impacts

The effect of the use of quiet plant and using movable barriers, enclosure and insulating fabric has been investigated for the practicable construction activities. The mitigated noise levels from this Project are presented in **Table 14.4.16**. Mitigated Construction Plant Inventory and details of the mitigated construction noise impact are shown in **Appendices 4.10a to 4.10d**.

Table 14.4.16: Mitigated Construction Airborne Noise Impact from this Project

NSR ID	Use	Predicted Noise Level dB(A)						Noise Criteria dB(A)	Exceedance of Noise Criteria	Residual Impact?
		2014	2015	2016	2017	2022-2030**	Overall			
HT1	Residential	67-73	68-70	69-70	68-70	62	62-73	75	No	No
HT3	Residential	66-72	67-69	69-70	67-70	62	62-72	75	No	No
AST	Residential	66-73	67-70	69-70	67-70	60	60-73	75	No	No
RD[#]	Residential	-	67-68	65-68	63-65	64	63-68	75	No	No
WOB	Residential	65-67	65-66	63-66	61-63	63	61-67	75	No	No
VT1	Residential	67-69	67-68	64-69	63-65	69	63-69	75	No	No
VT2	Residential	66-69	67-68	64-68	62-64	66	62-69	75	No	No
LCS	Educational	67-68	66-67	65-67	63-65	70	63-70	70/65^	Yes	Yes
CRGPS	Educational	66-68	65-67	64-67	63-65	70	63-70	70/65^	Yes	Yes
FQ[#]	Residential	71-73	71-72	69-72	68-71	--	68-73	75	No	No
CUL	Residential	61-65	62-64	64-65	63-66	64	61-65	75	No	No
P7[#]	Residential	--	--	--	--	73	73	75	No	No

Note: (**) The remaining part of the underpass would be carried out between 2022 and 2030 after demolition of the TST Fire Station. The predicted noise levels of construction of permanent underpass are taken from that of excluded area construction between year 2022 and year 2030 in **Appendix 4.10i**. Concurrent construction works within WKCD has been included in the predicted noise levels.

(^) Criteria for examination period.

([#]) MTR confirmed that the residential development next to Austin Station will be occupied in middle of 2015.
FQ will be relocated before permanent underpass construction.
P7 is assumed to be occupied after Year 2017.

With the incorporation of quiet plant and use of movable noise barriers, enclosure and insulating fabric, the results indicated that the mitigated noise impact associated with the construction of the Project would comply with the daytime construction noise criterion at most of the representative NSRs. Residual construction noise impact was predicted at two educational NSRs during examination periods, namely “LCS” and “CRGPS”. According to the website of Lai Chack Middle School, March, June and December are examination periods. The CRGPS has been assumed same months as the examination periods. During the examination periods, the predicted exceedances for these NSRs are 1-5 dB(A). All practicable mitigation measures including movable barrier, enclosure, insulating fabric and quiet plants have been proposed and exhausted to minimise the noise impact. In addition, it is noted that noise insulation works have been installed at this two schools and therefore significant noise impact would not be anticipated.

Cumulative Construction Noise Impacts

The overall cumulative construction noise levels from this Project and the concurrent projects are presented in **Table 14.4.17**. The predicted noise levels have included the cumulative impacts from other potentially concurrent projects. Details of the cumulative mitigated construction noise impact are shown in **Appendices 4.10a to 4.10i**.

Table 14.4.17: Overall Cumulative Construction Noise Impact

NSR ID	Use	Predicted Noise Level dB(A)*						Noise Criteria dB(A)	Exceedance of Noise Criteria	Residual Impact?
		2014	2015	2016	2017	2022-2030**	Overall			
HT1	Residential	70-75	68-70	69-70	68-70	62	68-75	75	No	No
HT3	Residential	69-74	67-69	69-70	67-70	62	67-74	75	Yes	No
AST	Residential	71-**76**	68-72	69-70	67-70	60	67-**76**	75	Yes	Yes
RD[#]	Residential	-	67-70	65-68	63-65	64	63-70	75	No	No
WOB	Residential	68-73	65-68	63-66	61-63	63	61-73	75	No	No
VT1	Residential	69-72	67-69	64-69	63-65	69	63-72	75	No	No
VT2	Residential	68-71	67-68	64-68	62-64	66	62-71	75	No	No
LCS	Educational	68-**72**	66-68	65-67	63-65	70	63-**72**	70/65^	Yes	Yes
CRGPS	Educational	67-**71**	65-67	64-67	63-65	70	63-**71**	70/65^	Yes	Yes
FQ[#]	Residential	72-75	71-72	69-72	68-71	**--**	68-75	75	No	No
CUL	Residential	61-74	63-73	64-65	63-66	64	60-74	75	No	No
P7[#]	Residential	--	--	--	--	73	73	75	No	No

Note: **Bold** figures denotes the predicted noise level is higher than the relevant daytime construction noise criteria

(*)The remaining part of the underpass would be carried out between 2022 and 2030 after demolition of the TST Fire Station. The noise level of Express Rail Link, Road Works at West Kowloon and Proposed Road Improvement Works in West Kowloon Reclamation Development have been taken into account in the predicted noise level. The predicted noise level shown is the overall cumulative noise level.

(**) The predicted noise levels of construction of permanent underpass are taken from that of excluded area construction between year 2022 and year 2030 in **Appendix 4.10i**.

(^) Criteria for examination period

([#]) MTR confirmed that the residential development next to Austin Station will be occupied in middle of 2015.

FQ will be relocated before permanent underpass construction.

P7 is assumed to be occupied after Year 2017.

Based on the results shown in the table above, the cumulative construction noise impact predicted at the existing NSR AST exceeded the relevant noise criterion for 1 dB(A). The exceedance was identified as contributed by the concurrent XRL and Road Works at West Kowloon projects and the noise from this Project is only 66 dB(A). All practicable mitigation measures including movable barrier, enclosure, insulating fabric and quiet plants have been proposed and exhausted to minimise the noise impact. However, NSR AST would still be subject to residual impact which contributed dominantly by concurrent projects.

Residual cumulative construction noise impact was predicted at two educational NSR, namely “LCS” and “CRGPS” during normal school period. The predicted exceendances for these NSRs are 1-2 dB(A) and 1 dB(A) respectively during normal school periods. The exceedance was identified as dominantly contributed by the concurrent XRL and Road Works at West Kowloon projects and the noise from this Project is only 68 dB(A) at both NSRs. All practicable mitigation measures including movable barrier, enclosure, insulating fabric and quiet plants have been proposed and exhausted to minimise the noise impact.

According to the website of Lai Chack Middle School, March, June and December are examination periods. The CRGPS has been assumed same months as the examination periods. During the examination periods, the predicted exceendances for these NSRs are 1-5 dB(A). All practicable mitigation measures including movable barrier, enclosure, insulating fabric and quiet plants have been proposed and exhausted to minimise the noise impact. In addition, it is noted that noise insulation works have been installed at this two schools and therefore significant noise impact would not be anticipated.

14.4.7.2 Road Traffic Noise

Exceedances of the traffic noise criteria were found at NSRs P3b, P5, P9, VT1 and LCS. However, the exceedances were identified as dominantly contributed by the existing roads and the committed Roads Works at West Kowloon. The predicted noise contributions from the proposed roads of this Project to the overall noise impacts are less than 1.0 dB(A) and the road traffic noise levels of the proposed roads are all below relevant noise criteria. Direct noise mitigation measures on the Project road sections are deemed not necessary as they would not be effective in improving the noise environment at the sensitive receivers. The underpass proposed under this WKCD Project is hence not anticipated to have a significant contribution to the overall road traffic noise impact.

Existing and planned NSRs are likely to have direct line-of-sight to the portal at the junction of Lin Cheung Road and Austin Road West, the portal of the interim access (i.e. on Austin Road West) as well as the portal of the permanent access (i.e. on Canton Road side) to the proposed underpass. To avoid traffic noise reverberation inside the tunnel resulting in increased traffic noise to these NSRs, it is recommended to install on the inner walls and ceilings of the underpass with sound-absorbing materials at these three portals. Such sound-absorbing materials should be extended at least 30m into the underpass at each portal and opening being treated. The locations of these three underpass portals requiring acoustic treatment are shown in **Figure 4.17**.

14.4.7.3 Fixed Plant Noise

With the fixed plant properly designed to meet the maximum SWL listed in **Table 14.4.13**, there would not be any residual impacts predicted. However, it is also recommended that the following noise reduction measures should be considered as far as practicable during design stage:

- Choose quieter plant such as those which have been effectively silenced.
- Include noise levels specification when ordering new plant (including chillier and E/M equipment).
- Locate fixed plant/louvre away from any NSRs as far as practicable.
- Locate fixed plant in walled plant rooms or in specially designed enclosures.
- Locate noisy machines in a basement or a completely separate building.
- Install direct noise mitigation measures including silencers, acoustic louvres and acoustic enclosure where necessary.
- Develop and implement a regularly scheduled plant maintenance programme so that equipment is properly operated and serviced in order to maintain a controlled level of noise.

14.4.8 Evaluation of Cumulative and Residual Impacts

14.4.8.1 Construction Phase

The cumulative construction noise impact predicted at the existing NSR AST exceeded the relevant noise criterion for 1 dB(A) for a duration of 1 month. The exceedance was identified as dominantly contributed by the concurrent XRL and Road Works at West Kowloon projects and the noise from this Project is only 66 dB(A). All practicable mitigation measures including movable barrier, enclosure, insulating fabric and quiet plants have been proposed and exhausted to minimise the noise impact. However, NSR AST would still be subject to residual impact which contributed dominantly by concurrent projects.

Residual construction noise impact was also predicted at two educational NSR, namely “LCS” and “CRGPS” during normal school periods. The predicted exceendance for NSR LCS is 1-2 dB(A) for a duration of 5 months. The predicted exceedance for NSR CRGPS is 1 dB(A) for a duration of 1 month. All practicable mitigation measures including movable barrier, enclosure, insulating fabric and quiet plants have been proposed and exhausted to minimise the noise impact. However, the NSR is educational use and it is noted that noise insulation works have been installed and therefore significant noise impacts are not anticipated.

According to the website of Lai Chack Middle School, March, June and December are examination periods. The CRGPS has been assumed same months as the examination periods. The predicted exceendances for NSR “LCS” and “CRGPS” are 1-5 dB(A) for a duration of 18 months and 16 months respectively. All practicable mitigation measures including movable barrier, enclosure, insulating fabric and quiet plants have been proposed and exhausted to minimise the noise impact. However, the NSR is of educational use and it is noted that noise insulation works have been installed and therefore significant noise impacts would not be anticipated.

The residual impacts during construction phase are assessed in accordance with Section 4.4.3 of the TM-EIAO as shown in **Table 14.4.18** below:

Table 14.4.18: Assessment of Residual Impacts during Construction Phase

Criteria	Assessment
Effects on public health and health of biota or risk of life	The extent of noise nuisance would be unlikely to induce public health concern
Magnitude of the adverse environmental impacts	The predicted exceendance of construction noise for NSR

Criteria	Assessment
	AST is 1 dB(A). The exceedance was identified as contributed by the concurrent XRL and Road Works at West Kowloon projects and the noise from this Project is only 66 dB(A). All practicable mitigation measures have been proposed and exhausted to minimise the noise impact. However, NSR AST would still be subject to residual impact which contributed dominantly by concurrent projects. The predicted exceedance of construction noise for NSR LCS is 1-2 dB(A) during normal school period and 1-5 dB(A) during examination period. The predicted exceedance for NSR CRGPS is 1 dB(A) during normal school period and 1-5 dB(A) during examination period. All practicable measures have been proposed and exhausted to minimise the noise impact. In addition, it is noted that noise insulation works have been installed at this two schools and therefore significant noise impact would not be anticipated.
Geographic extent of the adverse environmental impact	The geographic extent of the adverse impacts from noise is anticipated to be limited to one residential use at Austin Road West and two educational uses at Canton Road.
Duration and frequency of the adverse environmental impacts	The predicted exceedance duration of construction noise for NSR AST is 1 month. The predicted exceedance duration of construction noise for NSR LCS is 5 months during normal school period and 18 months during examination period. The predicted exceedance duration for NSR CRGPS is 1 month during normal school period and 16 months for examination period. All practicable measures have been proposed and exhausted to minimise the noise impact. All the construction noise exceedance is temporary and reversible
Likely size of the community or the environmental that may be affected by the adverse impacts	One residential at Austin Road West and two educational uses at Canton Road would be temporarily affected by residual construction noise.
Degree to which the adverse environmental impacts are reversible or irreversible	Construction phase impact should be reversible.
Ecological context	Not Applicable in noise section
Degree of disruption to sites of cultural heritage	Not Applicable in noise section
International and regional importance	The impacts are localized and not of international and regional importance
Likelihood and degree of uncertainty of adverse environmental impact	The impacts predicted are based upon worst case assumptions and as such, would not occur to the extent predicted on all occasions.

Base on the above information, the potential construction phase residual impacts have been assessed to be acceptable in view of the nature, magnitude, duration, and frequency of the noise impacts as well as the conservative assessment results.

14.4.8.2 Operation Phase

Exceedances of the traffic noise criteria were found at NSRs P3b, P5, P9, VT1 and LCS. The exceedances were identified as dominantly contributed by the existing roads and the committed RWWK project. The predicted noise contributions from the proposed underpass to the overall noise levels at all representative NSRs would be less than 1.0 dB(A) and the road noise levels of the underpass are all be below the relevant noise criteria. Direct noise mitigation measures on the Project road sections are deemed not

necessary as they would be ineffective in improving the noise environment at the sensitive receivers. No adverse impacts arising from the proposed underpass would be predicted at any of the representative NSRs. With implementations of proposed noise mitigation measures such as underpass with sound-absorbing materials, adverse road traffic noise impact is not anticipated.

Adverse fixed plant noise impact is not anticipated. In order to ensure compliance of the operational noise level with the stipulated noise standards in TM, noise commissioning tests for all major fixed noise sources should be included in the Contract Document.

14.4.9 Environmental Monitoring and Audit

14.4.9.1 Construction Phase

Residual airborne noise impact is predicted during the construction phase. To ensure that the nearby NSRs will not be subject to unacceptable construction noise impact, an Environmental Monitoring and Audit (EM&A) is recommended. Details on the noise monitoring requirements, methodology and action plans would be described in a separate EM&A Manual.

14.4.9.2 Operation Phase

No adverse road traffic noise impacts are anticipated from the operation of the Project, hence no environmental monitoring and audit is proposed.

Prior to the operation phase of the Project, as part of the design process, commissioning tests should be conducted to ensure the operational noise from the fixed plant within WKCD would comply with the relevant EIAO-TM noise criteria.

14.4.10 Conclusion

14.4.10.1 Construction Phase

The construction phase noise impact assessment has been made based on the best available information, taking into account other expected concurrent projects. Having exhausted practicable mitigation measures in the form of quiet plant, movable noise barrier, enclosure and insulting fabric, the construction noise levels at most of the representative NSRs are predicted to comply with the noise standards stipulated in the EIAO-TM. The cumulative construction noise impact predicted at one existing residential development at Austin Road West would exceed the relevant noise criterion by 1 dB(A) for a duration of 1 month. The exceedance was identified as dominantly contributed by the concurrent XRL and Road Works at West Kowloon projects and the noise from this Project is only 66 dB(A). Residual construction noise impacts are also predicted at two representative NSRs of educational use at Canton Road. The NSRs have already been implemented with noise insulation works and therefore significant noise impact is not anticipated during the construction. Notwithstanding this, it is recommended that the particularly noisy construction activities should be scheduled to avoid examination periods of these NSRs as far as practicable.

14.4.10.2 Operation Phase

The potential road traffic noise impacts have been assessed based on the peak traffic flows in 2032. The exceedances were identified as dominantly contributed by the surrounding existing roads and the committed RWWK project road sections. The predicted noise contributions from the proposed roads of this

Project are less than 1.0 dB(A) at those affected NSRs and the road traffic noise levels of the proposed roads are all below the relevant noise criteria. Direct noise mitigation measures on the Project road sections are deemed not necessary as they would be ineffective in improving the noise environment at the sensitive receivers. No adverse noise impacts arising from the proposed underpass are predicted at any of the representative NSRs.

Noise impact from the planned fixed plants could be effectively mitigated by implementing noise control measures at sources during the detailed design stage. With the adoption of the proposed maximum allowable SWLs of the proposed fixed plant, the impact noise levels at all selected NSRs would comply with the relevant noise criteria for the daytime, evening time and night time periods. Therefore, significant fixed plant noise impact to the existing NSRs is not anticipated.

14.5 Water Quality Impact

This section presents an assessment of potential water quality impacts which may arise from the construction and operational stages of underpass road for the WKCD. Recommendations for mitigation measures have been made, where necessary, to minimise the identified water quality impacts to an acceptable level.

14.5.1 Water Quality Legislations, Standards and Guidelines

The criteria for evaluating water quality impacts include the following:

- Water Pollution Control Ordinance (WPCO) Cap. 358;
- Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS); and
- Practice Note for Professional Persons on Construction Site Drainage (ProPECC Note PN 1/94).

14.5.1.1 Water Pollution Control Ordinance (WPCO)

The Water Pollution Control Ordinance (WPCO) (Cap. 358) provides the statutory framework for the protection and control of water quality in Hong Kong. According to the WPCO and its subsidiary legislation, Hong Kong waters are divided into ten Water Control Zones (WCZs). Water Quality Objectives (WQOs) were established to protect the beneficial uses of water quality in WCZs. Specific WQOs are applied to each WCZ. The proposed underpass road for the WKCD development is located within the Victoria Harbour, Western Buffer and Eastern Buffer WCZs and their corresponding WQOs are listed in **Tables 14.5.1, 14.5.2** and **14.5.3** respectively. The WQOs for the aforementioned WCZs had been used as the basis for assessment of water quality impacts.

Table 14.5.1: Water Quality Objectives for Victoria Harbour WCZ

Parameters	Objectives	Sub-Zone
Offensive Odour, Tints	Not to be present	Whole zone
Colour	Not to exceed 50 Hazen units, due to human activity	Inland waters
Visible foam, oil scum, litter	Not to be present	Whole zone
E. coli	Not to exceed 1000 per 100mL, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days	Inland waters

Parameters	Objectives	Sub-Zone
Dissolved Oxygen (DO) within 2 m of the seabed	Not less than 2 mg L^{-1} for 90% of the sampling occasions during the whole year	Marine waters
Depth-averaged DO	Not less than 4 mg L^{-1} for 90% of the sampling occasions during the whole year; values should be calculated as the annual water column average (expressed normally as the arithmetic mean of at least 3 measurements at 1m below surface, mid depth and 1m above the seabed. However in water of a depth of 5m of less the mean shall be that of 2 measurements – 1m below surface and 1m above seabed, and in water of less than 3m the 1m below surface sample only shall apply.)	Marine waters
Dissolved Oxygen (DO)	Not less than 4 mg L^{-1}	Inland waters
pH	To be in the range of 6.5 - 8.5, change due to human activity not to exceed 0.2	Marine waters
Salinity	Change due to human activity not to exceed 10% of ambient	Whole zone
Temperature	Change due to human activity not to exceed 2 ^{o}C	Whole zone
Suspended Solids (SS)	Not to raise the ambient level by 30% caused by human activity	Marine waters
	Annual median not to exceed 25 mgL^{-1} due to human activity	Inland waters
Unionised Ammonia (UIA)	Annual mean not to exceed 0.021 mg L^{-1} as unionised form	Whole zone
Nutrients	Shall not cause excessive algal growth	Marine waters
	Annual mean depth-averaged inorganic nitrogen not to exceed 0.4 mg L^{-1}	Marine waters
BOD_5	Not to exceed 5 mg L^{-1}	Inland waters
	Not to exceed 30 mg L^{-1}	Inland waters
Toxic substances	Should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole zone
	Human activity should not cause a risk to any beneficial use of the aquatic environment.	Whole zone

Source: Statement of Water Quality Objectives (Victoria Harbour (Phases One, Two and Three) Water Control Zone).

Table 14.5.2: Water Quality Objectives for the Western Buffer WCZ

Parameters	Objectives	Sub-Zone
Offensive Odour, Tints	Not to be present	Whole zone
Colour	Not to exceed 30 Hazen units, due to human activity	Water gathering ground subzones
	Not to exceed 50 Hazen units, due to human activity	Other inland waters
Visible foam, oil scum, litter	Not to be present	Whole zone
E. coli	Not to exceed 610 per 100 mL, calculated as the geometric mean of all samples collected in a calendar year	Secondary contact recreation subzones and Fish culture subzones
	Not to exceed 180 per 100 mL, calculated as the geometric mean of all samples collected from March to October inclusive in 1 calendar year. Samples should be taken at least 3 times in 1 calendar month at intervals of between 3 and 14 days	Recreation subzones

Parameters	Objectives	Sub-Zone
	Less than 1 per 100 mL, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days	Water gathering ground subzones
	Not to exceed 1000 per 100 mL, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days	Other Inland waters
Depth-averaged Dissolved Oxygen (DO)	Not less than 4 mg L^{-1} for 90% of the sampling occasions during the whole year; values should be calculated as water column average (arithmetic mean of at least 3 measurements at 1m below surface, mid-depth and 1m above seabed)	Marine waters except Fish culture subzones
	Not less than 5 mg L^{-1} for 90% of the sampling occasions during the year; values should be calculated as water column average (arithmetic mean of at least 3 measurements at 1m below surface, mid-depth and 1m above seabed)	Fish culture subzones
Dissolved Oxygen (DO) within 2 m of the seabed	Not less than 2 mg L^{-1} for 90% of the sampling occasions during the whole year	Marine waters and Fish culture subzones
Dissolved Oxygen (DO)	Not less than 4 mg L^{-1}	Water gathering ground subzones and other inland waters
pH	To be in the range of 6.5 - 8.5, change due to human activity not to exceed 0.2	Marine waters
	Not to exceed the range of 6.0 – 8.5 due to human activity	Water gathering ground subzones
	Not to exceed the range of 6.0 - 9.0 due to human activity	Other inland waters
Salinity	Change due to human activity not to exceed 10% of ambient	Whole zone
Temperature	Change due to human activity not to exceed 2 ^{o}C	Whole zone
Suspended Solids (SS)	Not to raise the ambient level by 30% caused by human activity and shall not accumulate to affect aquatic communities	Marine waters
	Annual median not to exceed 20 mg L^{-1} due to human activity	Water gathering ground subzones
	Annual median not to exceed 25 mg L^{-1} due to human activity	Other inland waters
Unionised ammonia (UIA)	Annual mean not to exceed 0.021 mg L^{-1} as unionised form	Whole zone
Nutrients	Shall not cause excessive algal growth	Marine waters
	Annual mean depth-averaged inorganic nitrogen not to exceed 0.4 mg L^{-1}	Marine waters
5-day biochemical oxygen demand (BOD_5)	Not to exceed 3 mg L^{-1}	Water gathering ground subzones
	Not to exceed 5 mg L^{-1}	Other inland waters
Chemical Oxygen Demand (COD)	Not to exceed 15 mg L^{-1}	Water gathering ground subzones
	Not to exceed 30 mg L^{-1}	Other inland waters
Toxic substances	Should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole zone
	Human activity should not cause a risk to any beneficial use of the aquatic environment.	Whole zone

Source: Statement of Water Quality Objectives (Western Buffer Water Control Zone).

Table 14.5.3: Water Quality Objectives for the Eastern Buffer WCZ

Parameters	Objectives	Sub-Zone
Offensive Odour, Tints	Not to be present	Whole zone
Visible foam, oil scum, litter	Not to be present	Whole zone
Dissolved oxygen (DO) within 2m of the seabed	Not less than 2 mg L^{-1} for 90% of the sampling occasions during the whole year	Marine waters and Fish culture subzones
Depth-averaged DO	Not less than 4 mg L^{-1} for 90% of the sampling occasions during the whole year; values should be calculated as water column average (arithmetic mean of at least 3 measurements at 1m below surface, mid-depth and 1m above seabed)	Marine waters excepting fish culture subzones
	Not less than 5 mg L^{-1} for 90% of the sampling occasions during the year; values should be calculated as water column average (arithmetic mean of at least 3 measurements at 1m below surface, mid-depth and 1m above seabed)	Fish culture subzones
	Not less than 4 mg L^{-1}	Water gathering ground subzone and other inland waters
5-day biochemical oxygen demand (BOD_5)	Not to exceed 3 mg L^{-1}	Water gathering ground subzones
	Not to exceed 5 mg L^{-1}	Other inland waters
Chemical oxygen demand (COD)	Not to exceed 15 mg L^{-1}	Water gathering ground subzones
	Not to exceed 30 mg L^{-1}	Other inland waters
pH	To be in the range of 6.5 – 8.5, change due to human activity not to exceed 0.2	Marine waters
	To be in the range of 6.5 – 8.5	Water gathering ground subzones
	To be in the range of 6.0 – 9.0	Other inland waters
Salinity	Change due to waste discharges not to exceed 10% of ambient	Whole zone
Temperature	Change due to waste discharges not to exceed 2 ^{o}C	Whole zone
Suspended solids (SS)	Not to raise the ambient level by 30% caused by human activity and shall not accumulate to affect aquatic communities	Marine waters
	Change due to human activity not to exceed 20 mg L^{-1} of annual median	Water gathering ground subzones
	Change due to human activity not to exceed 25 mg L^{-1} of annual median	Other inland waters
Unionized ammonia (UIA)	Annual mean not to exceed 0.021mg L^{-1} as unionized form	Whole zone
Nutrients	Shall not cause excessive algal growth	Marine waters
	Annual mean depth-averaged inorganic nitrogen not to exceed 0.4 mg L^{-1}	Marine waters
Toxic substances	Should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole zone
	Human activity should not cause a risk to any beneficial use of the aquatic environment	Whole zone
E. coli	Not exceed 610 per 100mL, calculated as the geometric mean of all samples collected in one calendar year	Fish culture subzones
	Less than 1 per 100mL, calculated as the geometric mean of the	Water gathering ground

Parameters	Objectives	Sub-Zone
	most recent 5 consecutive samples taken at intervals of between 7 and 21 days	subzones
	Not exceed 1000 per 100mL, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days	Other inland waters
Colour	Change due to human activity not to exceed 30 Hazen units	Water gathering ground
	Change due to human activity not to exceed 50 Hazen units	Other inland waters

Source: Statement of Water Quality Objectives (Eastern Buffer Water Control Zone).

14.5.1.2 Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS)

Discharges of effluents are subject to control under the WPCO. The *Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters* (TM-DSS) sets limits for effluent discharges. Specific limits apply for different areas and are different between surface waters and sewers. The limits vary with the rate of effluent flow. Sewage from the proposed construction activities should comply with the standards for effluent discharged into foul sewers, inshore waters or marine waters of the Victoria Harbour, Western Buffer and Eastern Buffer WCZs, as shown in Tables 9a, 9b, 10a and 10b of the TM-DSS.

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

A practice note for professional persons was issued by the EPD to provide guidelines for handling and disposal of construction site discharges. The *Practice Note for Professional Persons on Construction Site Drainage* (ProPECC Note PN 1/94) provides good practice guidelines for dealing with various types of discharge from a construction site. Practices outlined in ProPECC Note PN 1/94 should be followed as far as possible during construction to minimize the water quality impact due to construction site drainage.

14.5.2 Assessment Area, Water Sensitive Receivers and Baseline Conditions

14.5.2.1 Assessment Area

Water quality impact assessment had been carried out in the Victoria Harbour, Western Buffer and Eastern Buffer Water Control Zones (WCZs) and all areas within 500m from the proposed underpass road boundary. Locations of the water control zones are shown in **Figure 14.5.1**.

14.5.2.2 Water Sensitive Receivers

Key water sensitive receivers that may potentially be affected by the proposed underpass road include:

- Yau Ma Tei Typhoon Shelter;
- WSD Flushing Water Intakes;
- Cooling Water Intakes; and
- Fish Culture Zones.

Locations of the key water sensitive receivers are shown in **Figure 14.5.2**.

14.5.2.3 Baseline Conditions

Marine Water Quality in Victoria Harbour

A summary of marine water quality data for EPD monitoring stations at Victoria Harbour (VM6 and 7), and Stonecutters Island (VM15) extracted from EPD's publication "Marine Water Quality in Hong Kong 2010" are presented in **Table 14.5.4**. Locations of these monitoring stations are shown in **Figure 14.5.1**.

Table 14.5.4: Marine Water Quality at Victoria Harbour and Stonecutters Island in 2010

Parameter	Monitoring Station		
	Victoria Harbour (Central)	Victoria Harbour (West)	Stonecutters Island
	VM6	VM7	VM15
Temperature (^{o}C)	23.2 (16.6 – 27.7)	23.0 (17.9 – 27.2)	23.4 (16.8 – 27.6)
Salinity	31.4 (28.8 – 33.4)	31.2 (26.1 – 33.3)	31.0 (26.7 – 33.5)
Dissolved Oxygen (mg/L)	5.2 (3.6 – 6.5)	5.8 (4.5 – 7.5)	5.5 (3.9 – 6.3)
Dissolved Oxygen (Bottom) (mg/L)	4.2 (1.9 – 5.2)	5.6 (3.4 – 7.0)	4.8 (1.3 – 6.4)
pH	7.9 (7.6 – 8.2)	7.9 (7.6 – 8.2)	7.9 (7.6 – 8.2)
Secchi Disc Depth (m)	2.7 (1.0 – 5.2)	2.7 (1.7 – 4.0)	2.4 (1.2 – 3.6)
Turbidity (NTU)	3.1 (1.0 – 5.5)	3.5 (1.0 – 6.6)	3.7 (1.3 – 7.5)
Suspended Solids (mg/L)	3.5 (1.0 – 6.9)	3.8 (1.6 – 5.6)	4.2 (1.3 – 8.7)
BOD_5 (mg/L)	1.0 (0.6 – 1.7)	1.0 (0.5 – 1.8)	0.9 (0.5 – 2.0)
Ammonia Nitrogen (mg/L)	0.177 (0.109 – 0.310)	0.163 (0.090 – 0.293)	0.199 (0.114 – 0.333)
Unionised Ammonia (mg/L)	0.006 (0.002 – 0.018)	0.005 (0.002 – 0.014)	0.007 (0.002 – 0.021)
Nitrite Nitrogen (mg/L)	0.031 (0.009 – 0.053)	0.034 (0.016 – 0.078)	0.034 (0.012 – 0.057)
Nitrate Nitrogen (mg/L)	0.141 (0.051 – 0.270)	0.157 (0.068 – 0.347)	0.147 (0.046 – 0.307)
Total Inorganic Nitrogen (mg/L)	0.35 (0.19 – 0.51)	0.35 (0.20 – 0.49)	0.38 (0.18 – 0.62)
Total Kjeldahl Nitrogen (mg/L)	0.32 (0.23 – 0.47)	0.35 (0.25 – 0.48)	0.34 (0.23 – 0.47)
Total Nitrogen (mg/L)	0.49 (0.30 – 0.67)	0.55 (0.45 – 0.65)	0.53 (0.29 – 0.73)

Orthophosphate Phosphorus (mg/L)	0.030 (0.017 – 0.048)	0.025 (0.008 – 0.039)	0.031 (0.016 – 0.046)
Total Phosphorus (mg/L)	0.05 (0.03 – 0.06)	0.05 (0.04 – 0.06)	0.05 (0.04 – 0.06)
Silica (SiO_2) (mg/L)	0.91 (0.36 – 1.80)	0.81 (0.13 – 2.13)	0.93 (0.16 – 1.87)
Chlorophyll-a (µg/L)	3.3 (0.3 – 15.6)	5.0 (0.4 – 13.7)	4.1 (0.2 – 21.8)
E.coli (count/100mL)	4400 (550 – 13000)	2800 (520 – 16000)	1800 (430 – 5900)
Faecal Coliforms (count/100mL)	11000 (1300 – 29000)	6100 (1000 – 28000)	4600 (880 – 28000)

Notes:

Unless otherwise specified, data represented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B)

Data presented are annual arithmetic means the depth-averaged results except for E.coli and faecal coliforms which are annual geometric means.

Data in brackets indicated the ranges.

Marine Water Quality in Yau Ma Tei Typhoon Shelter

A summary of marine water quality data for EPD monitoring stations at Yau Ma Tei Typhoon Shelter (VT10) extracted from EPD's publication "Marine Water Quality in Hong Kong 2010" are presented in **Table 14.5.5**. Location of this monitoring station is shown in **Figure 14.5.1**.

Table 14.5.5: Marine Water Quality at Yau Ma Tei Typhoon Shelter in 2010

Parameter	Yau Mei Tei
	VT10
Temperature (^oC)	23.6 (18.2 – 27.9)
Salinity	30.8 (29.1 – 31.8)
Dissolved Oxygen (mg/L)	4.1 (1.6 – 5.1)
Dissolved Oxygen (Bottom) (mg/L)	4.5 (3.1 – 5.6)
pH	7.7 (7.5 – 7.8)
Secchi Disc Depth (m)	1.8 (1.0 – 2.7)
Turbidity (NTU)	5.9 (1.3 – 13.6)
Suspended Solids (mg/L)	6.9 (2.8 – 15.5)
BOD_5 (mg/L)	1.3 (1.0 – 1.8)

Parameter	Yau Mei Tei
	VT10
Ammonia Nitrogen (mg/L)	0.309 (0.193 – 0.450)
Unionised Ammonia (mg/L)	0.006 (0.003 – 0.011)
Nitrite Nitrogen (mg/L)	0.038 (0.023 – 0.050)
Nitrate Nitrogen (mg/L)	0.147 (0.097 – 0.200)
Total Inorganic Nitrogen (mg/L)	0.49 (0.37 – 0.64)
Total Kjeldahl Nitrogen (mg/L)	0.50 (0.41 – 0.66)
Total Nitrogen (mg/L)	0.68 (0.59 – 0.85)
Orthophosphate Phosphorus (mg/L)	0.040 (0.024 – 0.051)
Total Phosphorus (mg/L)	0.06 (0.04 – 0.07)
Silica (as SiO_2) (mg/L)	0.83 (0.12 – 1.23)
Chlorophyll-a (µg/L)	6.6 (0.8 – 21.3)
E.coli (count/100mL)	2800 (1500 – 35000)
Faecal Coliforms (count/100mL)	7400 (2700 – 71000)

Notes:

Unless otherwise specified, data represented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B)

Data presented are annual arithmetic means the depth-averaged results except for E.coli and faecal coliforms which are annual geometric means.

Data in brackets indicated the ranges.

14.5.3 Identification of Water Quality Impact

14.5.3.1 Construction Phase

Potential sources of water quality impact associated with the construction activities for the proposed underpass road for the WKCD development had been identified. These include:

- Construction site runoff and drainage;
- Barging facilities and activities;
- Sewage effluent from construction workforce; and
- General construction activities.

14.5.3.2 Operation Phase

During operation phase, the only potential source of water quality impact associated with operation of the proposed underpass road is road and surface runoff.

14.5.4 Evaluation of Water Quality Impact

14.5.4.1 Construction Phase

Construction site runoff and drainage

Runoff from the surface construction works areas may contain increased loads of sediments, other suspended solids (SS) and contaminants. Potential sources of pollution from site drainage include:

- Runoff from and erosion from site surfaces, drainage channels, earth working areas and stockpiles;
- Release of any bentonite slurries, concrete washings and other grouting materials with construction run-off and storm water;
- Wash water from dust suppression sprays and wheel wash facilities; and
- Fuel, oil, solvents and lubricants from maintenance of construction vehicles and mechanical equipment.

Sediment laden runoff particularly from works areas subjected to excavation or earth works, if uncontrolled, may carry pollutants (adsorbed onto the particle surfaces) into any nearby storm water drains. Bentonite and chemical grouting may be required for diaphragm walling works and as a result may pollute surface runoff.

As a good site practice, mitigation measures should be implemented to control construction site runoff and drainage from the works areas, and to prevent runoff and drainage water with high levels of SS from entering any nearby storm water drains. With the implementation of adequate construction site drainage and provision of sediment removal facilities, unacceptable water quality impacts are not anticipated. The construction phase discharge would be collected by the temporary drainage system installed by the Contractor and then treated or desilted on-site before discharge to storm water drains. The Contractor would be required to obtain a license from EPD under the WPCO for discharge to the public drainage system.

Barging facilities and activities

Barging point facilities of the Hong Kong Section of Guangzhou - Shenzhen - Hong Kong Express Rail Link project at the West Kowloon seafront would be used for handling of spoil generated from excavation works for the proposed underpass road associated with the WKCD development. Barging activities might cause adverse impact on water quality if not handled properly. Mitigation measures are recommended to control any pollutant discharge into the sea due to barging activities. Impact due to barging activities is expected to be insignificant provided all recommended mitigation measures are properly implemented.

Sewage effluent from construction workforce

Domestic sewage would be generated from the workforce during construction phase. However, portable chemical toilets should be installed within the construction site. The Contractor has the responsibility to ensure that chemical toilets are used and properly maintained, and that licensed Contractors are employed

to collect and dispose of the waste off-site at approved locations. Therefore, water quality impact is not anticipated.

General construction activities

On-site construction activities may result in water pollution from the following:

- Uncontrolled discharge of debris and rubbish such as packaging, construction materials and refuse; and
- Spillages of liquids stored on-site, such as oil, diesel and solvents etc.

Good construction and site management practices should be observed to ensure that litter, fuels and solvents do not enter the public drainage system.

14.5.4.2 Operation Phase

Road and surface runoff

Surface runoff from the underpass road proposed under the WKCD development may be contaminated by oils leaked from passing vehicles. It is considered that impacts upon water quality would be minimal provided that the proposed underpass road is designed with adequate drainage systems and appropriate oil interceptors, as required in accordance with *Highways Department Guidance Notes RD/GN/035 – Road Pavement Drainage Design*.

14.5.5 Mitigation of Adverse Impacts

14.5.5.1 Construction Phase

Construction site runoff and drainage

The site practices outlined in ProPECC Note PN 1/94 should be followed as far as practicable in order to minimise surface runoff and the chance of erosion. The following measures are recommended to protect water quality and sensitive uses of the coastal area, and when properly implemented should be sufficient to adequately control site discharges so as to avoid water quality impacts:

- At the start of site establishment, perimeter cut-off drains to direct off-site water around the site should be constructed with internal drainage works and erosion and sedimentation control facilities implemented. Channels, earth bunds or sand bag barriers should be provided on site to direct storm water to silt removal facilities. The design of the temporary on-site drainage system should be undertaken by the WKCDA's Contractor prior to the commencement of construction;
- Sand/silt removal facilities such as sand/silt traps and sediment basins should be provided to remove sand/silt particles from runoff to meet the requirements of the TM standards under the WPCO. The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC Note PN 1/94. Sizes may vary depending upon the flow rate. The detailed design of the sand/silt traps should be undertaken by the WKCDA's Contractor prior to the commencement of construction.
- All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly during rainstorms. Deposited silt and grit should be regularly removed, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times.

- Measures should be taken to minimize the ingress of site drainage into excavations. If excavation of trenches in wet periods is necessary, they should be dug and backfilled in short sections wherever practicable. Water pumped out from foundation excavations should be discharged into storm drains via silt removal facilities.
- All vehicles and plant should be cleaned before leaving a construction site to ensure no earth, mud, debris and the like is deposited by them on roads. An adequately designed and sited wheel washing facility should be provided at construction site exit where practicable. Wash-water should have sand and silt settled out and removed regularly to ensure the continued efficiency of the process. The section of access road leading to, and exiting from, the wheel-wash bay to the public road should be paved with sufficient backfall toward the wheel-wash bay to prevent vehicle tracking of soil and silty water to public roads and drains.
- Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.
- Manholes (including newly constructed ones) should be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the drainage system and stormwater runoff being directed into foul sewers.
- Precautions should be taken at any time of the year when rainstorms are likely. Actions should be taken when a rainstorm is imminent or forecasted and actions to be taken during or after rainstorms are summarized in Appendix A2 of ProPECC Note PN 1/94. Particular attention should be paid to the control of silty surface runoff during storm events, especially for areas located near steep slopes.
- Bentonite slurries used in piling or slurry walling should be reconditioned and reused wherever practicable. Temporary enclosed storage locations should be provided on-site for any unused bentonite that needs to be transported away after all the related construction activities are completed. The requirements in ProPECC Note PN 1/94 should be adhered to in the handling and disposal of bentonite slurries.

Barging facilities and activities

Adverse impacts related to marine water quality are not expected to arise from operation of the proposed barging point, provided that good site practices are strictly followed. Recommendations for good site practices during operation of the proposed barging point include:

- all vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tide conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash;
- loading of barges and hoppers should be controlled to prevent splashing of material into the surrounding water. Barges or hoppers should not be filled to a level that will cause the overflow of materials or polluted water during loading or transportation;
- all hopper barges should be fitted with tight fitting seals to their bottom openings to prevent leakage of material; and
- construction activities should not cause foam, oil, grease, scum, litter or other objectionable matter to be present on the water within the site.

Sewage effluent from construction workforce

Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site where necessary to handle sewage from the workforce. A licensed contractor should be employed to provide appropriate and adequate portable toilets and be responsible for appropriate disposal and maintenance.

General construction activities

Construction solid waste, debris and refuse generated on-site should be collected, handled and disposed of properly to avoid entering any nearby storm water drain. Stockpiles of cement and other construction materials should be kept covered when not being used.

Oils and fuels should only be stored in designated areas which have pollution prevention facilities. To prevent spillage of fuels and solvents to any nearby storm water drain, all fuel tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. The bund should be drained of rainwater after a rain event.

14.5.5.2 Operational Phase

Road and surface runoff

For operation of the proposed underpass road, a surface water drainage system would be provided to collect road and surface runoff. It is recommended that the road drainage should be provided with adequately designed silt trap and oil interceptors, as necessary. The design of the operation phase mitigation measures for the underpass road should take into account the guidelines published in the *Practice Note for Professional Persons on Drainage Plans Subject to Comment by the Environmental Protection Department* (ProPECC Note PN 5/93) and *Highways Department Guidance Notes RD/GN/035 – Road Pavement Drainage Design*.

14.5.6 Evaluation of Cumulative and Residual Impacts

Provided that proper mitigation measures would be implemented by each of the concurrent projects such as XRL, no adverse cumulative land-based and marine-based water quality impacts would be expected.

With the implementation of the recommended mitigation measures for the construction and operation phases of the proposed underpass road, no residual water quality impact is anticipated.

14.5.7 Water Quality Monitoring and Audit

Adverse water quality impact was not predicted during the construction and operation phases of the proposed underpass road. Nevertheless, appropriate mitigation measures are recommended to minimize potential water quality impacts.

Water quality monitoring is recommended to obtain a robust, defensible database of baseline information of marine water quality before construction, and thereafter, to monitor any variation of water quality from the baseline conditions and exceedances of WQOs at sensitive receivers during construction and to ensure the recommended mitigation measures are properly implemented.

Regular audit of the implementation of the recommended mitigation measures during the construction phase at the work areas should also be undertaken to ensure the recommended mitigation measures are properly implemented.

Details of the water quality monitoring and audit programme and the Event and Action Plan are provided in the stand-alone EM&A Manual.

14.5.8 Conclusion

14.5.8.1 Construction Phase

The key issue in terms of water quality during the construction phase of the underpass road would be the potential for release of wastewater into coastal waters from construction site runoff and drainage.

Deterioration in water quality could be minimised to acceptable levels through implementing adequate mitigation measures such as control measures on suspended solids release, on-site runoff and drainage from the works areas to minimise suspended solids spillage and construction runoff prior to discharge. Proper site management and good housekeeping practices would also be required to ensure that construction wastes and other construction-related materials would not enter the public drainage system and coastal waters. Sewage effluent arising from the construction workforce would also be handled through provision of portable toilets.

With the implementation of these recommended mitigation measures, no unacceptable impacts on water quality from the construction works for the underpass road are anticipated. Water quality monitoring and site inspections during construction phase should be undertaken routinely to inspect the construction activities and works areas to ensure the recommended mitigation measures are properly implemented.

14.5.8.2 Operation Phase

Surface runoff from the proposed underpass road may be contaminated by oils leaked from passing vehicles. It is considered that impacts upon water quality will be acceptable provided that the proposed underpass road is designed with adequate drainage systems and appropriate oil interceptors, as required.

14.6 Sewerage and Sewage Treatment Implication

The underpass road is part of a network of infrastructure within the WKCD development to meet the connectivity and accessibility requirements of the WKCD. This Schedule 2 Designated Project does not require or generate any sewage or sewerage related facilities. Consequently, there are no sewerage and sewage treatment implications associated with the underpass road.

Sewerage and sewage treatment implications associated with the other WKCD facilities is presented in **Section 6**.

14.7 Waste Management Implication

14.7.1 Waste Management Legislations, Standards and Guidelines

The criteria and guidelines for assessing waste management implications are outlined respectively in Annexes 7 and 15 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM).

The following legislation relates to the handling, treatment and disposal of wastes in Hong Kong and has been used in assessing potential impacts:

- Waste Disposal Ordinance (Cap. 354)
- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C)
- Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N)
- Public Health and Municipal Services Ordinance (Cap. 132) - Public Cleansing and Prevention of Nuisances Regulation
- Land (Miscellaneous Provisions) Ordinance (Cap. 28)
- Dumping at Sea Ordinance (Cap. 466)

14.7.1.1 Waste Management

The Waste Disposal Ordinance (WDO) prohibits the unauthorised disposal of wastes. Construction waste is defined as any substance, matter or thing that is generated from construction work and abandoned, whether or not it has been processed or stockpiled before being abandoned, but does not include any sludge, screenings or matter removed in or generated from any desludging, desilting or dredging works. Under the WDO, wastes can be disposed of only at designated waste disposal facilities.

Under the WDO, the Chemical Waste (General) Regulation provides regulations for chemical waste control, and administers the possession, storage, collection, transport and disposal of chemical wastes. The Environmental Protection Department (EPD) has also issued a ‘guideline’ document, the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992), which details how the Contractor should comply with the regulations on chemical wastes.

The Public Cleansing and Prevention of Nuisances Regulation provides control on illegal tipping of wastes on unauthorised (unlicensed) sites.

14.7.1.2 Inert Construction and Demolition (C&D) Materials

The current policy related to the dumping of inert C&D materials is documented in the Works Branch Technical Circular No. 2/93, ‘Public Dumps’. Construction and demolition materials that are wholly inert, namely public fill, should not be disposed of to landfill, but taken to public filling areas, which usually form part of reclamation schemes. The Land (Miscellaneous Provisions) Ordinance requires that dumping licences be obtained by individuals or companies who deliver public fill to public filling areas. The Civil Engineering & Development Department (CEDD) issues the licences under delegated powers from the Director of Lands.

Under the Waste Disposal (Charges for Disposal of Construction Waste) Regulation, enacted in January 2006, construction waste delivered to a landfill for disposal must not contain more than 50% by weight of inert material. Construction waste delivered to a sorting facility for disposal must contain more than 50% by weight of inert material, and construction waste delivered to a public fill reception facility for disposal must consist entirely of inert material.

14.7.1.3 Excavated Sediment

Practice Notes for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers, PNAP No. ADV-21 (Previous Reference: PNAP No. 252) Management Framework for Disposal of Dredged / Excavated Sediment sets out the procedures for seeking approval to dredge/excavate sediment and the management framework for marine disposal of such sediment. Excavated sediment arising from the Project, if any, will be managed in accordance with the requirements of PNAP ADV-21.

In accordance with the Dumping at Sea Ordinance (DASO), application for dumping permits from EPD is required for marine disposal of dredged/excavated sediment, if any.

14.7.2 Assessment Methodology

The criteria for assessing waste management implications are outlined in Annex 7 of the EIAO-TM. The methods for assessing potential waste management impacts during construction and operation phases of the underpass road follow those presented in Annex 15 of the EIAO-TM and include the following:

- Identify the quantity, quality and timing of waste arising as a result of the construction and operation activities of the Project.
- Assessment of potential impacts from the management of solid waste with respect to potential hazards, air and odour emissions, noise, wastewater discharges and public transport.
- Assessment of impacts on the capacity of waste collection, transfer and disposal facilities.

14.7.3 Identification, Prediction and Evaluation of Environmental Impact

14.7.3.1 Construction Phase

The activities to be carried out for construction of the underpass road would generate a variety of wastes that can be divided into different key categories based on their composition and ultimate method of disposal. The identified waste types include:

- Inert Construction and demolition (C&D) materials;
- C&D materials from site clearance;
- Chemical waste; and
- General refuse.

Each type of the above waste arising is described below, together with an evaluation of the potential environmental impacts associated with the waste generation, handling, storage, transport and disposal. It should be noted that no marine sediments would be excavated from the WKCD site.

Construction and Demolition (C&D) Materials

Key sources of Inert C&D materials

The excavation works for WKCD basement (including the underpass road and the flyover) will be the major source of inert C&D materials (mainly soil) generated by the Project. It is estimated that the total amount of inert C&D materials to be generated would be approximately 1,882,830 m^3, in which about 1,837,200 m^3 would be generated from excavation work for the WKCD basement and the remaining 45,630 m^3 would be from construction of superstructures and substructures until 2017. The bulk excavation for the basement will be proceeded on a zone-by-zone basis from 2013 to 2017, and the construction of superstructures and substructures would be carried out progressively from 2013 to 2020. Based on the tentative construction programme (see **Appendix 2.4**), the amounts of inert C&D materials to be generated in different years from 2013 to 2017 have been estimated as summarized in **Table 14.7.1**.

While the excavation work at Zone 4 and construction of superstructure are part of the entire WKCD Project but not part of this underpass road project, the inert C&D materials associated with such works will not be segregated for separate handling (i.e., on-site/off-site reuse and disposal). Hence, all the inert C&D materials for the entire WKCD Project up to 2017 (the scheduled completion year of the underpass road) are presented in this section.

Table 14.7.1: Estimates of inert C&D Materials to be Generated by WKCD Project

Year	Estimated Amount of Inert C&D Materials from WKCD Basement Excavation (m^3)	Estimated Amount of Inert C&D Materials from Construction of Superstructures and Substructures (m^3)	Estimated Total (m^3)
2013	17,000	7,270	24,270
2014	521,800	9,400	531,200
2015	639,400	9,600	649,000
2016	405,500	9,720	415,220
2017	253,500	9,640	263,140
Total	1,837,200	45,630	1,882,830

Note: Marine sediments not included in the above estimates.

The quantity of inert C&D materials to be generated from construction of superstructures and substructures has been estimated by applying the generation rate of 0.1m^3 per m^2 of gross floor area (GFA), which is based on the Reduction of Construction Waste Final Report published by the Hong Kong Polytechnic University and Hong Kong Construction Association. Given that the total GFA of WKCD is around 730,000m^2, the amount of inert C&D materials due to construction of superstructures and substructures would be approximately 73,000 m^3 from 2013 to 2020 (Completion of Phase 1). However, the estimated amount of inert C&D materials from construction of superstructures and substructures will be 45,630 m^3 from 2013 to 2017 (see **Table 7.1**).

On-site reuse / import of inert C&D Materials as fill materials

The WKCD development will require fill material for construction of the Park and the materials are proposed to be obtained from reuse of the inert C&D materials generated by the Project as far as practicable. Nevertheless, it is anticipated that newly imported material will be required, though all practicable measures will be employed for reuse of the inert C&D materials generated by the Project before consideration of importing material.

It is estimated that the WKCD Project would require a total of 491,880 m^3 of fill materials for construction of the Park from 2013 to 2017. While all practicable measures will be employed for reuse of the inert C&D materials generated by the WKCD Project before consideration of importing material, it is anticipated that

about 146,740 m^3 of the inert C&D materials generated by the WKCD Project would be reused as the fill material mainly for construction of the Park from 2013 to 2017. Therefore, about 345,140 m^3 (491,880 – 146,740 m^3) of fill material will need to be imported to this Project, as detailed in **Table 14.7.2,** whereas about 1,736,090 m^3 (1,882,830 – 146,740 m^3) of inert C&D materials will require off-site reuse by other projects or disposal during the period from 2013 to 2017. The overall proportion of inert C&D materials to be reused on-site from 2013 to 2017 appears to be relatively low (about 30% of the total amount of fill materials required) chiefly because of the space constraints for stockpiling within the WKCD site, and hence the inert C&D materials generated by the Project would be required to be immediately transported to other available projects for off-site reuse wherever practicable. Nevertheless, subject to the future contractor's detailed construction programme the amount of inert C&D materials that can actually be reused on-site may be higher than the current estimates.

Table 14.7.2: Estimates of Fill Materials to be Imported from Other Potential Projects and/or Government's Fill Banks

Year	Estimated Fill Material required at WKCD (m^3)	Estimated inert C&D Materials to be reused on-site as Fill Material (m^3)	Estimated Fill Materials to be imported from Other Potential Projects and/or Government's Public Fill Reception Facilities (m^3)
2013	54,200	8,270	45,930
2014	127,230	42,400	84,830
2015	108,200	37,500	70,700
2016	96,530	32,230	64,300
2017	105,720	26,340	79,380
Total (round up figure)	491,880	146,740	345,140

Off-site reuse of surplus inert C&D materials

There will be a number of large infrastructures projects under construction phase during the period from 2013 to 2017, which are identified as potential users of the excavated inert C&D materials from the WKCD Project. The proponents of such projects have been approached to identify the possibility of using the inert C&D materials from this Project. Based on the feedback from the project proponents, two potential projects have been identified, namely, the Hong Kong-Zhuhai-Macao Bridge (HZMB) and the 3rd runway project (copies of the relevant correspondences attached in **Appendix 7.5**).

As discussed in the meeting with the consultant of HZMB project on 31 July 2012, it is possible for the HZMB project to use the surplus inert C&D materials from this WKCD Project. Based on the fill demand provided from the contractor of HZMB project, the surplus inert C&D materials could be delivered to HZMB during the period from December 2013 - August 2014. Communication mechanism has been established with the HZMB project consultant, and regular meetings will be conducted with the HZMB project consultant and contractor for further liaison of logistics arrangement.

Based on the project profile entitled "Expansion of Hong Kong International Airport into a Three-Runway System" (i.e., 3rd runway project) available from the EPD's website, major construction works of the project, which will involve land formation of about 650 ha, would be expected to commence in mid 2015 and completion of the project would be expected by end 2022. Verbal response from the project proponent indicated that provided construction of the 3rd runway project could be commenced as expected in the project profile, it would be possible for the project to receive the inert C&D materials generated from this WKCD Project. According to the information presented in the project profile, it would be reasonable to anticipate that the 3rd runway project could receive fill materials for its land formation work from the WKCD

Project in 2016 and 2017. Liaison with the project proponent regarding the arrangement of using the inert C&D materials from WKCD Project will be made at a later stage when the programme of the 3rd runway project has become clearer.

In view of the responses received and the available information, it can be estimated that the total amount of inert C&D materials to be used by the HZMB project and/or the 3rd runway project in 2013, 2014, 2016 and 2017 would be about 905,000 m^3, as detailed in **Table 14.7.3** below. In 2015 and after 2017, however, none of the inert C&D materials generated could be used by either of the two projects. The actual quantities and arrangement for using the inert C&D materials from WKCD Project will be subject to the programmes of the two projects and liaison with the relevant parties.

Table 14.7.3: Estimates of inert C&D Materials to be Used by Other Potential Projects

Year	Potential user projects of inert C&D materials	Estimated quantity of inert C&D materials that would be used by the projects (m^3)	Assumptions
2013	HZMB	16,000	90% of the amount of inert C&D materials to be generated in December 2013 (17,800 m^3) would be used by the potential project
2014	HZMB	278,500	90% of the amount of inert C&D materials to be generated from January to August 2014 (309,400 m^3) would be used by the potential project
2015	None	0	Not applicable
2016	3rd runway project	373,700	90% of the amount of inert C&D materials to be generated in 2016 (415,220 m^3) would be used by the potential project
2017	3rd runway project	236,800	90% of the amount of inert C&D materials to be generated in 2017 (263,140 m^3) would be used by the potential project
	Total	905,000	

During the detailed design stage, further alternative disposal arrangement (e.g., other potential projects that could receive inert C&D materials from the WKCD Project) shall be continuously explored and identified. If no potential projects could receive the surplus inert C&D materials, the remaining inert C&D materials could be disposed of at the Government's Public Fill Reception Facilities (PFRFs) for beneficial use by any other projects in Hong Kong. No construction work is allowed to proceed until the issues on management of C&D materials have been resolved and all relevant arrangements have been endorsed by the relevant authorities (i.e. CEDD and EPD).

Off-site disposal of inert C&D materials

From the above estimates, the amount of inert C&D materials produced from the WKCD Project that would neither be reused on-site nor be reused by the two potential projects would be about 831,090 m^3 (1,882,830 – 146,740 - 905,000 m^3), which will need to be disposed of at the Government's Public Fill Reception Facilities (PFRFs) for beneficial use by other projects in Hong Kong. Hence, the forecast quantities for yearly generation, on-site reuse, off-site reuse and disposal of inert C&D materials at PFRFs are as summarised in **Table 14.7.4** below.

Table 14.7.4 Estimates of Inert C&D Materials to be Generated, Reused On-site, Reused Off-site and Disposed

Year	Amount of Inert C&D Materials (m^3)			
	Generation	On-site Reuse	Off-site Reuse	Disposed of at PFRF
2013	24,270	8,270	16,000	0
2014	531,200	42,400	278,500	210,300
2015	649,000	37,500	0	611,500
2016	415,220	32,230	373,700	9,290
2017	263,140	26,340	236,800	0
Total (round up figure)	1,882,830	146,740	905,000	831,090

Liaison with the CEDD Public Fill Committee (PFC) on the allocation of space for disposal of the inert C&D materials at PFRFs is underway. No construction work is allowed to proceed until all issues on management of inert C&D materials have been resolved and all relevant arrangements have been endorsed by the relevant authorities including PFC and EPD.

It is proposed that four temporary barging points at the south of the site will be handed over from the XRL project to WKCD for handling the inert C&D materials of this Project. Dump trucks will be used for removal of inert C&D materials generated from construction site to the barging points. The estimated maximum total handling volume of inert C&D materials at the four barging points will be 4,000 m^3/day. The indicative locations of the barging points are as shown in **Figure 3.4a**.

Both land and marine access to the PFRFs are subject to capacity limitations, and hence quota and booking systems may be applied in order to ensure the disposal is carried out in controlled manner. The storage, handling, transport and disposal of surplus inert C&D materials, if not managed properly, would have the potential to create visual, water quality and dust impacts. Therefore, the waste reduction measures and good site practices as detailed in **Section 14.7.4.1** will be implemented to minimize the amount of surplus inert C&D materials as well as to prevent or reduce the associated potential impacts.

Review of any excavated marine sediments

Excavation depths at different zones are proposed to accommodate the underground vehicular traffic and various facilities including parking, loading & unloading areas and electrical & mechanical (E&M) plant and locations of the zones are provided in **Appendix 7.1**. The anticipated excavation levels for bulk excavation of the basement at different zones are indicated as follows:

Zone 1 : -2.1mPD
Zones 2a and 2b : -6.5mPD
Zone 3 : -1.1mPD

The WKCD site is a piece of reclaimed land. Based on the previous reports available from the Geotechnical Engineering Office and relevant approved EIA reports, past site investigation had been undertaken for previous projects within or near the proposed WKCD Project area, including the West Kowloon Reclamation, MTRC Kowloon Station, Kowloon Southern Link (KSL) and Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) projects etc. In addition, ground investigation (GI) works were carried out for the WKCD Project for part of its site. Review of the relevant reports and available GI results for WKCD site has revealed that excavation of marine sediments is not anticipated at all the aforementioned Zones. Details of the justifications are given below.

Zone 1

According to the GI completed for the WKCD site at Zone 1 in March 2013, covering a total of 5 drillholes (A1-A, A2-B, A3-B, A4-A and A5-B), no marine sediment was encountered in drillholes A2-B, A3-B, A4-A and A5-B whereas a thin layer of marine sediment was found locally in drillhole A1-A between the depths of -12.68mPD and -14.73mPD. Details of the drillhole locations and records are given in **Appendix 7.1**. Based on the relevant drillhole record no. KSD100/DHE056 from the EIA report for KSL project (see **Appendix 7.1**), it was suspected that marine sediments might be present between the depths of -2.29 mPD and -7.29 mPD at Zone 1.

Given that the 5 drillhole records (A1-A, A2-B, A3-B, A4-A and A5-B) show no marine sediments down to -12.68mPD; the presence of marine sediment at drillhole KSD100/DHE056 (between -2.29 mPD and -7.29 mPD) was not ascertained; and the proposed excavation level at this Zone is only down to about -2.1 mPD, it is considered that marine deposit would not be excavated at Zone 1.

Zone 2a

The site in Zone 2a was reclaimed in early 2000. This Zone is currently the construction site for the Hong Kong Section of XRL project and the proposed ventilation facilities in West Kowloon Terminus (WKT) were proposed to be built underneath this Zone with approximately -22mPD by excavation (see **Appendix 7.2**). Sediment was found at certain sections of the proposed WKT with reference to the geological profile information. It is noted in the XRL EIA Report that the construction method for WKT is by cut-and-cover and the sediment is expected to be removed during the construction work. Also, marine deposit is not present outside the zone for proposed WKT with reference to the geological profile information. From the above quoted results, it is considered that marine deposit would not be excavated at Zone 2a.

Zone 2b

The site in this Zone was reclaimed in 1990s. Ground investigation works were carried out at Zone 2b under the project for MTRC Kowloon Station Package 5, 6 and 7 for water cooling system in 2001. The relevant drillhole records (drillhole nos. BH4 and BH5 as shown in **Appendix 7.3**) showed that only fill material was present while marine deposit was not present at the proposed excavation depth for this Zone, i.e -6.5mPD.

In addition, based on the project for West Kowloon Reclamation Southern Area Roads Roads D10, D12 and D13 in 1994, the relevant drillhole records (drillhole nos. 62 - 68 as shown in **Appendix 7.3**) showed that only fill material was present while marine deposit was not present at the proposed excavation depth to this Zone, i.e. -6.5mPD. From the above quoted results, it is considered that marine deposit would not be excavated at Zone 2b.

Zone 3

The site in this Zone was reclaimed in 1990s. Ground investigation works were carried out at Zone 3 under the project for West Kowloon Reclamation Southern Area Roads D10, D12 and D13 in 1994. The relevant drillhole records (drillhole nos. 73, 73A, 74 and 75 as shown in **Appendix 7.4**) showed that only fill material was present while marine deposit was not present at the proposed excavation depth for this Zone, i.e -1.1mPD. From the above quoted results, it is considered that marine deposit would not be excavated at Zone 3.

C&D Materials from Site Clearance Works

During the general site clearance in preparation for the subsequent construction works, it is estimated that the top 0.3m soil layer of the entire site excluding the XRL works area temporarily occupying the site (with a net area of around 40 – 3.9 = 36.1 ha) would be removed, and hence approximately 108,300m^3 of C&D materials would be generated. The XRL works area is excluded from the estimation because it is reasonable to assume that the XRL works area will have been cleared when it is returned to the Project Proponent. This C&D materials would mainly be a mixture of topsoil and vegetative material, and is considered as not suitable for direct reuse by any earthworks on site due to its non-inert contents. However, the inert materials should be segregated from the C&D materials on site for reuse as far as practicable, subject to constraints of the site area. The segregated inert materials that cannot be reused on site will be disposed of at the Government's PFRFs for beneficial use by other projects in Hong Kong. The amount of such segregated materials to be reused on site should be estimated in the Waste Management Plan to be prepared by the Contractor. The remaining non-inert portion of the C&D materials will be disposed of at a designated landfill site. 10% of the C&D materials (i.e. 108,300 x 10% = 10,830m^3) would be assumed for disposal of at the landfill. Time schedule for the disposal would be from 2013 to 2017.

Chemical Waste

Chemical wastes arising during the construction phase may pose environmental, health and safety hazards if not stored and disposed of in an appropriate manner as stipulated in the Waste Disposal (Chemical Waste) (General) Regulations. The potential hazards include:

- Toxic effects to workers;
- Adverse impacts on water quality from spills and associated adverse impacts on marine biota; and
- Fire hazards.

The maintenance and servicing of construction plant and equipment may generate some chemical wastes such as used solvents, contaminated rags and waste lubricating oil. It is difficult to quantify the amount of chemical waste that will arise from the construction activities since it will be dependent on the Contractor's on-site maintenance requirements and the amount of plant utilised. However, it is anticipated that the quantity of chemical waste, such as waste lubricating oil and solvents produced from plant maintenance, will be small and in the order of a few cubic metres per month. The amount of chemical waste to be generated will be quantified in the Waste Management Plan to be prepared by the Contractor for the site.

Materials classified as chemical wastes will require special handling and storage arrangements before removal for off-site disposal at the approved Chemical Waste Treatment Facility or recycling by licensed facilities. Mitigation and control requirements for chemical wastes are detailed in **Section 14.7.4.1**. Provided that the handling, storage and disposal of chemical wastes are in accordance with these requirements, adverse environmental impacts are not expected.

General Refuse

The construction workforce will generate refuse comprising food scraps, waste paper and empty containers etc. Such refuse will be properly managed so that intentional or accidental release to the surrounding environment will be avoided. Disposal of refuse at sites other than approved waste transfer or disposal facilities will be prohibited. Effective collection of site wastes will be required to prevent waste materials being blown around by wind, flushed or leached into the marine environment, or creating an odour nuisance or pest/vermin problem. Waste storage areas will be well maintained and cleaned regularly. The daily arising of general refuse from the construction workforce can be estimated based on a generation rate

of 0.65 kg per worker per day.

The maximum number of construction workers to be employed for each year from 2013 to 2017 is stated in **Table 14.7.5**. Based on a generation rate of 0.65 kg per worker per day, the maximum daily arising of general refuse during the construction period would be approximately 975 kg and this waste can be effectively controlled by normal measures.

Table 14.7.5: Estimation of Maximum Number of Construction Workers during Construction Phase

Construction Year	Maximum Number of Construction Workers	Maximum Daily Arising of General Refuse (kg/day)
2013	600	390
2014	1000	650
2015	1100	715
2016	1500	975
2017	1500	975

With the implementation of good waste management practices at the site as detailed in **Section 14.7.4.1**, adverse environmental impacts are not expected to arise from the storage, handling and transportation of the general refuse from construction workforce.

14.7.3.2 Summary

Table 14.7.6 presents a summary of all key types of waste arising during the construction phase of the Project.

Table 14.7.6 Summary of Waste Arisings during Construction Phase

Waste Type	Key Sources of Waste Generation	Timing of Waste Generation	Estimated Quantity of Waste Generation	Waste Reuse or Disposal	Waste Handling
Inert C&D Materials	Majority from excavation work for the WKCD basement (including the underpass road and the flyover); and minority from construction of superstructures and substructures (Note: Excavation of marine sediments is not anticipated)	Tentatively from 2013 to 2017	About 1,882,830 m^3 in total	About 146,740 m^3 to be reused on-site as fill materials for the Park About 905,000 m^3 to be reused by two potential projects, viz., HZMB project and 3rd runway project. Remaining quantity of about 831,090 m^3 to be disposed of at the Government's PFRFs for beneficial use by other projects in Hong Kong (subject to endorsement by the relevant authorities including PFC of CEDD and EPD) (Note: During the detailed design stage, further alternative disposal arrangement, e.g., other potential projects that could receive Inert C&D materials from the WKCD Project, shall be continuously explored and identified. If no potential projects could receive the surplus inert C&D materials, the remaining inert C&D materials could be disposed of at the Government's Public Fill Reception Facilities (PFRFs) for beneficial use by any other projects in Hong Kong. No construction work is allowed to proceed until the issues on management of C&D materials have been resolved and all relevant arrangements have been endorsed by the relevant authorities (i.e. CEDD and EPD).)	Segregate inert C&D materials to avoid contamination from other waste arising

Waste Type	Key Sources of Waste Generation	Timing of Waste Generation	Estimated Quantity of Waste Generation	Waste Reuse or Disposal	Waste Handling
C&D Materials from Site Clearance	General site clearance	Tentatively from 2013 to 2017	About 108,300 m^3 in total	Any inert materials segregated from the C&D materials to be reused on-site as far as practicable or disposed of at the Government's PFRFs for beneficial use by other projects in Hong Kong Non-inert materials segregated from the C&D materials to be disposed of at the designated landfill sites	Segregate on site the C&D materials into inert and non-inert materials
General Refuse	Waste paper, discarded containers, etc. generated from the site workforce	Tentatively from 2013 to 2017	0.65 kg per worker per day, the maximum daily arising of general refuse during the construction period would be approximately 975 kg	Refuse station for compaction and containerisation and then to landfill for disposal	Provide on-site refuse collection points
Chemical Waste	Used solvents, contaminated rags, waste lubricating oil, etc., from maintenance and servicing of construction plant and equipment	Tentatively from 2013 to 2017	Few cubic metres per month (preliminary estimate)	Disposal of at the Chemical Waste Treatment Centre or other licensed recycling facilities	Stored on-site by suitably designed containers for off-site disposal or recycling

14.7.3.3 Operation Phase

During operation phase, this underpass road project will not involve any waste generating activities. Therefore, no adverse waste management impact is anticipated during operation phase.

14.7.4 Mitigation of Adverse Environmental Impact

14.7.4.1 Construction Phase

Good Site Practices

Adverse impacts related to waste management such as dust, odour, noise and wastewater discharge will not be expected to arise, provided that good site practices will be strictly followed. Recommendations for good site practices during the construction activities include:

- Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site
- Training of site personnel in proper waste management and chemical handling procedures
- Provision of sufficient waste disposal points and regular collection of waste
- Appropriate measures to minimise windblown litter and dust/odour during transportation of waste by either covering trucks or by transporting wastes in enclosed containers
- Provision of wheel washing facilities before the trucks leaving the works area so as to minimise dust introduction to public roads
- Well planned delivery programme for offsite disposal such that adverse environmental impact from transporting the inert or non-inert C&D materials is not anticipated

Waste Reduction Measures

Good management and control can prevent the generation of a significant amount of waste. Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:

- Sort inert C&D materials to recover any recyclable portions such as metals
- Segregation and storage of different types of waste in different containers or skips to enhance reuse or recycling of materials and their proper disposal
- Encourage collection of recyclable waste such as waste paper and aluminium cans by providing separate labelled bins to enable such waste to be segregated from other general refuse generated by the work force
- Proper site practices to minimise the potential for damage or contamination of inert C&D materials
- Plan the use of construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste

In addition to the above measures, specific mitigation measures are recommended below for the identified waste arising to minimise environmental impacts during handling, transportation and disposal of these wastes.

Inert and Non-inert C&D Materials

In order to minimise impacts resulting from collection and transportation of inert C&D materials for off-site disposal, the excavated materials should be reused on-site as fill material as far as practicable. In addition, inert C&D materials generated from excavation works could be reused as fill materials in local projects that require public fill for reclamation.

The surplus inert C&D materials will be disposed of at the Government's PFRFs for beneficial use by other projects in Hong Kong.

Liaison with the CEDD Public Fill Committee (PFC) on the allocation of space for disposal of the inert C&D materials at PFRF is underway. No construction work is allowed to proceed until all issues on management of inert C&D materials have been resolved and all relevant arrangements have been endorsed by the relevant authorities including PFC and EPD.

The C&D materials generated from general site clearance should be sorted on site to segregate any inert materials for reuse or disposal of at PFRFs whereas the non-inert materials will be disposed of at the designated landfill site.

In order to monitor the disposal of inert and non-inert C&D materials at respectively PFRFs and the designated landfill site, and to control fly-tipping, it is recommended that the Contractor should follow the Technical Circular (Works) No.6/2010 for Trip Ticket System for Disposal of Construction & Demolition Materials issued by Development Bureau. In addition, it is also recommended that the Contractor should prepare and implement a Waste Management Plan detailing their various waste arising and waste management practices in accordance with the relevant requirements of the Technical Circular (Works) No. 19/2005 Environmental Management on Construction Site.

Chemical Waste

If chemical wastes are produced at the construction site, the Contractor will be required to register with the EPD as a chemical waste producer and to follow the guidelines stated in the "Code of Practice on the Packaging Labelling and Storage of Chemical Wastes". Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosive, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor should use a licensed collector to transport and dispose of the chemical wastes at the approved Chemical Waste Treatment Centre or other licensed recycling facilities, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

Potential environmental impacts arising from the handling activities (including storage, collection, transportation and disposal of chemical waste) are expected to be minimal with the implementation of appropriate mitigation measures as recommended.

General Refuse

General refuse should be stored in enclosed bins or compaction units separated from inert C&D materials. A reputable waste collector should be employed by the Contractor to remove general refuse from the site, separately from inert C&D materials. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.

14.7.4.2 Operation Phase

During operation phase, this underpass road project will not involve any waste generating activities. Therefore, no adverse waste management impact is anticipated during operation phase, and no mitigation measures are required.

14.7.5 Evaluation of Residual Impact

With the implementation of the recommended mitigation measures for the handling, transportation and disposal of the identified waste arising, residual impacts are not expected for both construction and operation phases.

14.7.6 Environmental Monitoring and Audit

It will be the Contractor's responsibilities to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices and the relevant regulations and requirements. The recommended mitigation measures shall form the basis of the Waste Management Plan to be developed by the Contractor in the construction phase.

During construction phase, regular site inspection as part of the EM&A procedures should be carried out to determine if various types of waste are being managed in accordance with approved procedures and the Waste Management Plan. It should cover different aspects of waste management including waste generation, storage, recycling, treatment, transport and disposal.

14.7.7 Conclusion

14.7.7.1 Construction Phase

The major waste types generated by the construction activities will include inert C&D materials from excavation works for the basement (including the underpass road and the flyover) as well as from construction of superstructures and substructures; C&D materials from general site clearance; chemical waste from maintenance and servicing of construction plant and equipment; and general refuse from the workforce. Provided that all these identified wastes are handled, transported and disposed of in strict accordance with the relevant legislative and recommended requirements and that the recommended good site practices and mitigation measures are properly implemented, no adverse environmental impact is expected during the construction phase.

14.7.7.2 Operation Phase

During operation phase, this underpass road project will not involve any waste generating activities. Therefore, no adverse waste management impact is anticipated during operation phase, and no mitigation measures are required.

14.8 Land Contamination

The potential environmental issues associated with land contamination at the location of the proposed underpass road have been reviewed and are presented in this section. The review is comprised of desktop studies of previous EIAs and land contamination assessments undertaken in the area by other projects as well as earlier assessments undertaken by the Conceptual Plan Consultants for the WKCD development. Potential impacts from contaminated sites during construction phase and the need for mitigation measures have been qualitatively assessed in accordance with the clause 3.4.9 of the EIA Study Brief (ESB-237/2011).

In accordance with the requirement set out in Appendix E2 of the EIA Study Brief, a Contamination Assessment Plan (CAP) has been prepared for the WKCD development and was submitted in January 2012. The CAP is attached in **Appendix 8.1**.

14.8.1 Environmental Legislations, Standards and Guidelines

The relevant standards and guidelines on land contamination assessment and remediation include the following:

- Section 3 of Annex 19 to the EIAO-TM;
- Guidance Note for Contaminated Land Assessment and Remediation (August 2007);
- Guidance Manual for Use of Risk-Based Remediation Goals for Contaminated Land Management (RBRGs Guidance Manual) (December 2007); and
- Practice Guide for Investigation and Remediation of Contaminated Land (August 2011).

The uses that may have the potential to cause land contamination include among others:

- Oil installations including oil depots and petrol filling stations;
- Gas works;
- Power plants;
- Shipyards/boatyards;
- Chemical manufacturing/processing plants;
- Steel mills/metal workshops;
- Car repairing and dismantling workshops; and
- Scrap yards.

14.8.2 Description of the Environmental Baseline Conditions

The proposed underpass road is located on the West Kowloon Reclamation south of Austin Road West and the Western Harbour Crossing Toll Plaza. The site is currently zoned as “Other Specified Uses” annotated “Arts, Cultural, Entertainment, Commercial and Other Uses” under the South West Kowloon Outline Zoning Plan, and combined with the proposed WKCD basement structure, comprises approximately 15 ha of previously undeveloped land bordering the Jordan/Tsim Sha Tsui area.

The site reserved for the WKCD basement structure with associated underpass road is currently occupied by works sites, local roads, temporary storage / parking facilities, some existing infrastructure and utility facilities, the existing Tsim Sha Tsui Fire Station and the works site and temporary works areas for the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) project.

14.8.3 Assessment Methodology

In order to identify the presence of any potentially contaminative land within or in the proximity of the Project area, the following tasks have been undertaken:

- Desktop study to review the current and historical land uses;
- Acquisition of information related to potential land contamination from Environmental Compliance Division of Environmental Protection Department (EPD) and Fire Services Department (FSD); and
- Site surveys to identify the existing land uses.

Relevant information were collected and reviewed as part of the desktop study, including:

- Historical aerial photographs of the Project area;
- Records of active (current) and inactive (past) registered chemical waste producers in the areas of interest from EPD;
- Records of current and past dangerous good (DG) licences in the areas of interest from FSD;
- Records of accidents that involved spillage/leakage of chemical waste or DG from EPD and FSD; and
- Previously approved studies, including previously approved EIA Reports

Site surveys were undertaken to identify current land uses in the Project area and verify the findings of the desktop study.

14.8.3.1 Desktop Study

Review of Historical Aerial Photographs

Relevant historical aerial photographs taken between 1963 and 2004 and covering the Project area, where available, were collected and reviewed. The historical land uses identified from the review are summarised in **Table 14.8.1** below for evaluation of potential land contamination.

Table 14.8.1: Land Use History of Project Area

Date	Ref. no.	Height (ft)	Land Use
25/01/1963	5186	2,700	open sea, bare ground, low rise buildings
29/01/1976	13085	4,000	open sea, bare ground, low rise buildings
27/09/1995	CN11223	3,500	reclaimed land, construction site, low rise buildings
28/09/2004	CW59616	4,000	reclaimed land, bare ground, ventilation buildings, low rise buildings
25/07/2008	CS13725	6,000	reclaimed land, bare ground, ventilation buildings, parking facilities, construction site, low rise buildings

* Please refer to Appendix A of the CAP prepared for WKCD (see **Appendix 8.1**) for the selected aerial photos

Review of Previously Approved Studies/Reports

The relevant study area for this project as mentioned in the Contamination Assessment Plan (CAP) and the Contamination Assessment Report and Remediation Action Plan (CAR/RAP) of the approved Kowloon Southern Link (KSL) EIA Report (Ref. No. EIA-098/2004) were reviewed. As stated in Section 3.5.2 of the KSL CAP, there are two underground fuel oil storage tanks at Tsim Sha Tsui (TST) Fire Station, one for storage of diesel and the other for petrol. The volume of each tank is approximately 4.6m^3 and have been used for more than 30 years, with no record of previous spillage/leakage at the time. Information extracted from the approved CAP and CAR/RAP of KSL is provided in Appendix B of the CAP prepared for WKCD (see **Appendix 8.1)** for reference.

The CAP for KSL proposed five sampling locations, two of which are located in the immediate vicinity of the TST Fire Station (drillholes ref. KSD100/DHEPZ052 and KSD100/DHE056). As documented in Section 5 of the approved CAR/RAP for KSL, laboratory test results for samples taken from those two drillholes (as shown in Appendix B of the CAP prepared for WKCD – see **Appendix 8.1**) indicated no contamination with reference to the Dutch B levels (the standards adopted at the time of preparing the KSL EIA). However, given that the Risk Based Remediation Goals (RBRG) has been introduced by EPD for land contamination assessment since August 2007 to replace Dutch B levels, the previous site investigation results from the KSL study were checked against the RBRG criteria in order to confirm compliance under the new assessment criteria.

Based on the RBRG land use classification under the Guidance Manual, the Project site (which includes the WKCD development with planned residential developments) should be classified under the more stringent “Urban Residential” land use category. **Table 14.8.2** shows the corresponding RBRG standards against the results from KSL.

Table 14.8.2: Comparison of KSL site investigation results against RBRG criteria

Chemical Parameters (tested in KSL CAR/RAP)	Units	RBRG Limit Level for ‘Urban Residential’	Maximum Concentration Detected in Drillhole KSD100/DHEPZ052	Maximum Concentration Detected in Drillhole KSD100/DHE056
Metals				
Cadmium	mg/kg	73.8	0.5	0.02
Chromium	mg/kg	221	13	0.9
Copper	mg/kg	2950	6.4	1.4
Nickel	mg/kg	1480	4	0.7
Lead	mg/kg	258	93	140
Zinc	mg/kg	10000	170	18
Mercury	mg/kg	11	0.5	0.2
Arsenic	mg/kg	22.1	4.3	1.5
Barium	mg/kg	10000	75	41
Cobalt	mg/kg	1480	4.1	5.5
Molybdenum	mg/kg	369	9.5	4.9
Tin	mg/kg	10000	<5	<5
TPH				
C6 – C9	mg/kg	1410(C6-8), 2240(C9)	<2	<2
C10 –C14	mg/kg	2240	<50	<50

Chemical Parameters (tested in KSL CAR/RAP)	Units	RBRG Limit Level for 'Urban Residential'	Maximum Concentration Detected in Drillhole KSD100/DHEPZ052	Maximum Concentration Detected in Drillhole KSD100/DHE056
C15 – C28	mg/kg	2240(C15-16), 10000(C17-28)	<100	246
C29 – C36	mg/kg	10000	<100	167
BTEX				
Benzene	mg/kg	0.704	<0.2	<0.2
Ethylbenzene	mg/kg	709	<0.2	<0.2
Toluene	mg/kg	1440	<0.2	<0.2
Meta - & Para Xylene	mg/kg	95	<0.4	<0.4
Ortho Xylene	mg/kg		<0.2	<0.2
Others				
Cyanide	mg/kg	1480	<1	<1
Sulphate (acid soluble)	mg/kg	-	0.96	0.04

Source: KSL EIA Report, Appendix 10-2 – Contamination Assessment Report and Remediation Action Plan

As shown in **Table 14.8.2**, the results from the CAR/RAP for KSL are all well within the RBRG limit levels, which reaffirms the findings of the CAR/RAP for KSL.

Aside from the TST Fire Station, the ex-government dockyard was also identified in the KSL study as a potentially contaminated site, however, it is located entirely outside the Project boundary, and as mentioned in the CAR/RAP for KSL, the contamination at the ex-government dockyard was found to be localized and was planned to be remediated under KSL project. Based on the aforementioned information, no historical land contamination is anticipated within the Project area that has been covered by the KSL EIA.

Relevant information from the West Kowloon Cut and Cover Section (WKCC) of the Express Rail Link (XRL) project including CAP and CAR of the approved XRL EIA Report were also reviewed. The study area of the WKCC partly falls within the Project area. Site appraisal conducted for XRL has concluded that within the Project boundary, there were no adverse land contamination impacts identified. In the CAP for WKCC, sampling and testing plan was only recommended for the area of City Golf Club which is located entirely outside the Project boundary and therefore has no implication on the Project.

Review of Records from Government Departments

Relevant data, including records of active and inactive registered chemical waste producers, records of current and past dangerous goods (DG) licences, and records of any accident that involved spillage/leakage of chemical waste or DG within or in the immediate vicinity of the Project area were collected from EPD and FSD. Records of registered chemical waste producers collected from EPD are presented in Appendix C of the CAP prepared for WKCD (see **Appendix 8.1**). Replies from the two Government departments in response to the information requests are presented in Appendix D of the CAP prepared for WKCD (see **Appendix 8.1**) for reference.

A review of the records from EPD revealed that while there are a number of registered chemical waste producers in the area surrounding the Project, the Project area will not encroach onto these existing facilities. There was also no record of any accident that involved spillage/leakage of chemical waste within or in the proximity of the Project area.

Reply from FSD revealed that the only licensed DG stores in the proximity of Project area are the two underground fuel oil storage tanks (each with a capacity of 4,600 litres) located at the TST Fire Station, but no incident records of spillage/leakage of DG were identified.

14.8.3.2 Site Surveys

Site surveys were carried out from July to December 2011 to identify current land uses along the Project area and to verify the findings of the desktop appraisal (see **Appendix 8.1** for the CAP prepared for WKCD). The following land uses along the Project area were identified:

- Local roads;
- Temporary storage/parking facilities;
- Some existing infrastructure and utility facilities;
- Tsim Sha Tsui Fire Station; and
- Works site and temporary works areas for the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) project.

14.8.4 Identification and Evaluation of Environmental Impact

14.8.4.1 Construction Phase

Based on the findings from the desktop study, the current land uses, including potentially contaminative uses within or in the vicinity of the Project area, have been identified as summarized in **Table 14.8.3**.

Table 14.8.3: Potential Contamination for the Project Area and its vicinity

Areas	Current Land Use	Historical Land Use	Potential Land Contamination Impact on the Project Area	Need for Further Site Investigation
Tsim Sha Tsui (TST) Fire Station	Fire station	Fire station	Petroleum Carbon Ranges, Volatile organic compounds (VOC) and semi-VOC (SVOC)	Yes
Other land uses in West Kowloon Reclamation Area	Temporary works area, parking area, open area, ventilation buildings, waterfront promenade	Reclaimed land, open sea; (near eastern boundary) open area	No contaminative land uses were identified	No

Although there were no records of any accidents involving spillage/leakage of chemical waste or DG within or in the proximity of the Project area, it is proposed to carry out further site investigation for the TST Fire Station location to identify any potential sources of land contamination that may be due to, but not limited to, leakage or spillage from the fuel oil tanks, pipes, or during refilling. The reason is as follows.

Based on the latest WKCD implementation programme, it is aimed to commence construction works for the critical elements of WKCD (including part of the underpass road) in as early as 2013 so as to commission the Phase 1 arts and cultural facilities in stages from 2014/2015 to 2020. While the existing TST Fire Station is scheduled to be relocated in phases, it will unlikely be relocated before 2020. During the period between now and 2020, the TST Fire Station will remain in operation, and leakage or spillage from the underground fuel oil tanks or pipes, or during refilling might occur. As such, further site visit and site investigation/laboratory chemical analysis are suggested to be conducted after land acquisition, so that the

investigation results will be up to date. For this, the CAP prepared for WKCD has included the proposed site investigation work for the TST Fire Station area (see **Appendix 8.1**).

The site investigation should be assessed by a competent land contamination specialist, and the specialist should carry out the assessment to determine whether the location of the TST Fire Station is contaminated and to assess the extent of any contamination identified. Should any area be identified/suspected of being contaminated, soil and groundwater samples should be collected for analysis, and the sampling points should be located at or near potential sources of contamination, e.g. near the underground storage tanks or pipes. The recommended testing as described in Section 4 of the CAP (see **Appendix 8.1**) should be undertaken or referenced to identify any contamination.

The updated CAP should include proposals on the sampling and analysis and should be submitted to EPD for approval prior to the demolition work. Upon approval of the CAP, the Project Proponent should conduct a land contamination assessment and the findings should be presented in a CAR. If land contamination is confirmed with reference to the relevant RBRG levels, the Project Proponent should prepare a RAP in which further hotspots of contaminated soil that require soil remediation should be identified. Section 4 of the current CAP (see **Appendix 8.1**) has provided an outline of the proposed site investigation plan to be conducted after land acquisition at the TST Fire Station.

Other than the TST Fire Station area, the land contamination potential of the Project area is considered as low because the area is a short-history reclaimed land and has been used as open area/ temporary works area without any indication of industrial activities. Recent site inspection has identified no major change in land use and confirmed the validity of previous land contamination assessment. No major land contaminative uses were identified in the area.

14.8.4.2 Operation Phase

During operation phase, the underpass road will be used as an access for vehicles moving to and from the WKCD site and its associated facilities. There will be no industrial activities taking place at the Project area during operation phase. Therefore, no contaminated land issue is anticipated.

14.8.5 Mitigation of Adverse Environmental Impact

The potential for land contamination issues at the TST Fire Station due to its future relocation will be confirmed by site investigation after land acquisition. Where necessary, mitigation measures for minimising potential exposure to contaminated materials (if any) or remediation measures will be identified. If contaminated land is identified (e.g., during decommissioning of fuel oil storage tanks) after the commencement of works, mitigation measures are proposed in order to minimize the potentially adverse effects on the health and safety of construction workers and impacts arising from the disposal of potentially contaminated materials.

The following measures are proposed for excavation and transportation of contaminated material:

- To minimize the chance for construction workers to come into contact with any contaminated materials, bulk earth-moving excavation equipment should be employed;
- Contact with contaminated materials can be minimised by wearing appropriate clothing and personal protective equipment such as gloves and masks (especially when interacting directly with contaminated material), provision of washing facilities and prohibition of smoking and eating on site;

- Stockpiling of contaminated excavated materials on site should be avoided as far as possible;
- The use of contaminated soil for landscaping purpose should be avoided unless pre-treatment was carried out;
- Vehicles containing any contaminated excavated materials should be suitably covered to reduce dust emissions and/or release of contaminated wastewater;
- Truck bodies and tailgates should be sealed to stop any discharge;
- Only licensed waste haulers should be used to collect and transport contaminated material to treatment/disposal site and should be equipped with tracking system to avoid fly tipping;
- Speed control for trucks carrying contaminated materials should be exercised;
- Observe all relevant regulations in relation to waste handling, such as Waste Disposal Ordinance (Cap 354), Waste Disposal (Chemical Waste) (General) Regulation (Cap 354) and obtain all necessary permits where required; and
- Maintain records of waste generation and disposal quantities and disposal arrangements.

14.8.6 Evaluation of Residual Impact

Based on the desktop review and available site investigation results for land contamination assessment of the Project, no major contaminated land issue has been revealed, although site investigation is suggested for the TST Fire Station area after its land acquisition. Hence, no land remediation action is proposed at this stage, and no residual impact in relation to land remediation is anticipated.

14.8.7 Environmental Monitoring and Audit

As explained above, land remediation is not expected at this stage. Therefore, environmental monitoring in relation to land remediation is not required, unless a need for land remediation is identified during the future site investigation for the TST Fire Station area.

However, during construction phase, environmental monitoring and audit (EM&A) is to be carried out in the form of regular site inspection. All related procedures and facilities for handling or storage of chemicals and chemical wastes will be audited regularly to make sure they are in order and intact and reported in the EM&A reports as such.

14.8.8 Conclusion

The land contamination assessment has been conducted by reviewing historical/current land uses, desktop review and site surveys with respect to the potential land contamination at the Project area. Other relevant information was also collected from the related Government Departments.

Based on the findings of the site surveys on the existing and historical land uses in the Project area and review of relevant records and reports, adverse land contamination impacts associated with the construction and operation of the Project is not anticipated except for demolition of the two underground fuel oil storage tanks and associated pipes at the existing TST Fire Station within the WKCD site. As the existing TST Fire Station will remain in operation until its relocation in phases, which will unlikely be started before 2020, it is proposed to carry out further site investigation after obtaining access to the Fire Station in order to obtain up-to–date site investigation findings for assessment of land contamination that may occur

between now and its future relocation. The site investigation findings should be documented in a CAR and where necessary a RAP should also be prepared for submission to EPD for approval.

Mitigation measures for handling of contaminated materials, in case it is discovered after commencement of the works, and regular site audits are recommended to minimize the potential adverse impacts on workers' health and safety and disposal of any potentially contaminated materials.

14.9 Ecological Impact

The ecological impact assessment has been conducted in accordance with the requirements of Annexes 8 and 16 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) and the requirements stated in Section 3.2.1 (viii), Section 3.4.10 and Appendix F of the EIA Study Brief (No. ESB-237/2011). This section presents the potential ecological impacts that may arise due to construction and operation of the underpass road for the WKCD development.

14.9.1 Ecological Legislations, Standards and Guidelines

A number of international conventions, local legislation and guidelines provide the framework for protection of species and habitats of ecological importance. Those of relevance include:

- *Forests and Countryside Ordinance* (Cap. 96), which protects the rare plant species from selling, offering for sale, or possession illegally;
- *Wild Animals Protection Ordinance* (Cap. 170), which protects wild animals listed under the second schedule from being hunted, possession, sale or export, disturbance of their nest or egg without permission by authorized officer;
- *Protection of Endangered Species of Animals and Plants Ordinance* (Cap. 586), which regulates the import, introduction from the sea, export, re-export, and possession of specimens of a scheduled species, including the live, dead, parts or derivatives. The Ordinance applies to all activities involving endangered species which include the parties of traders, tourists and individuals;
- *Environmental Impact Assessment Ordinance* (EIAO) (Cap. 499), which specifies designated projects under the Ordinance, unless exempted, must follow the statutory environmental impact assessment (EIA) process;
- *Annexes 8 and 16 of the Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM): Annex 8 recommends the criteria for evaluating ecological impacts. Annex 16 sets out the general approach and methodology for assessment of ecological impacts arising from a project or proposal, to allow a complete and objective identification, prediction and evaluation of the potential ecological impacts;
- EIAO Guidance Note No. 7/2010 "*Ecological Baseline Survey for Ecological Assessment*", provides the general guidelines for conducting an ecological baseline survey to fulfil the requirements stipulated in the EIAO-TM in respect of ecological assessment for a proposed development;
- EIAO Guidance Note No. 10/2010 "*Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys*", provides some methodologies in conducting terrestrial and freshwater ecological baseline surveys. This guidance note should be read in conjunction with EIAO Guidance Note 7/2010;
- *Town Planning Ordinance* (Cap. 131), which gives designation to country parks, conservation area, green belts, sites of special scientific interest, coastal protection area and other specified uses to promote conservation , protection and education of the valuable environment; and

- *Hong Kong Planning Standards and Guidelines Chapter* 10 (HKPSG) provides the guidelines on landscape and conservation to achieve a balance between the need for development and the need to minimise disruption of the landscape and natural resources.

14.9.2 Assessment Methodology

14.9.2.1 Study Area

The Study Area for impact assessment of terrestrial ecology covers all the areas within 500m from the underpass road site boundary and the areas likely to be affected by the underpass road. The study was firstly conducted by literature review and supplemented by on site ecological baseline surveys where it is found necessary.

14.9.2.2 Literature Review

The ecological baseline condition of the Study Area was collected through a combination of both literature review and updated field survey. Preliminary desktop study and literature review were conducted to investigate the existing condition within the Study Area and identify habitats or species with conservation concern. Available sources of information relevant to this Project including Government and private sector reports, published literature and academic studies were covered in the literature review.

14.9.2.3 Ecological Baseline Surveys

Since previous literature for this urban area is very limited, ecological baseline survey was conducted to supplement the literature review finding. The ecological baseline condition was updated through ecological field surveys, which were conducted in accordance with the requirements stated in the EIA Study Brief (No. ESB-237/2011) and guidelines stated in EIAO Guidance Note No. 7/2010 "*Ecological Baseline Survey for Ecological Assessment*" and EIAO Guidance Note No. 10/2010 "*Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys*".

Habitat and vegetation surveys were conducted for 4 months (during July to December 2011) covering both wet and dry seasons within the ecological Study Area. Special attention was paid on species of conservation concern and habitats within the proposed works area where the vegetation will be directly impacted.

Habitat map of suitable scale showing the type and location of habitats recorded within the Study Area, with the overlay plot of the Project boundary was produced, as shown in **Figure 14.9.1**.

Fauna surveys were conducted within the Study Area for 4 months (during July to December 2011) covering both wet and dry seasons. Since the Project Area are newly created through reclamation and enclosed by developed area, the colonization of flora and fauna species are of low ecological importance. Only the highly mobile bird species would have better chance of colonization of the newly created habitat and also use the habitat for stopover ground during migration; so, the baseline survey is mainly focused on avifauna. Transect count surveys were adopted with the aid by a pair of binoculars to assist the identification of species. The transect route is indicated in **Figure 14.9.2**.

14.9.3 Baseline Conditions

14.9.3.1 Terrestrial Habitat and Vegetation

The Project Area is located at the West Kowloon reclamation area at the south of Austin Road West and the West Harbour Crossing toll plaza. The site reserved for the West Kowloon Cultural District (WKCD) development is currently occupied by local roads, temporary storage/ packing facilities and a number of existing infrastructure and utility facilities.

There are 4 types of terrestrial habitat identified in the Study Area, namely:

- Plantation;
- Open Field;
- Artificial Seawall; and
- Developed Area.

A habitat map showing the location of each type of habitat is presented in **Figure 14.9.1**. Representative photographs of each type of habitats are illustrated in **Appendix 9.1**. Brief descriptions of these habitat types and the dominant floral species assemble of the habitat are described as follows:

Plantation

- Plantation refers to landscape plantation. This man-made habitat comprises short shrubs and ornamental trees. This habitat is scattered at a few locations within the Project Area for the underpass road, mainly at the site boundary near the Western Harbour Crossing. Dominant tree species identified in these locations are common native species such as *Acacia auriculiformis*, *Ficus microcarpa* and *Hibiscus tiliaceus*, and exotic species *Leucaena leucocephala*.

Open Field

- Open field refers to bare ground or wasteland. This type of habitat is mainly identified close to West Kowloon Waterfront Promenade. It is sparsely vegetated with a few common self-seeded species, e.g. *Rhynchelytrum repens, Imperata koenigii* and *Bidens alba*.

Artificial Seawall

- The artificial seawall refers to the sloping waterfront formed by large boulders for protection of shoreline and typhoon shelter. It happens in the southwest of the WKCD site boundary and the breakwaters in the New Yau Ma Tei Typhoon Shelter. Owing to the short history of the artificial habitat, the intertidal habitat are mainly colonized by pioneer species which are common and widespread in Hong Kong coastal area.

Developed Area

- Developed areas are artificial habitats. This man-made habitat comprises the existing buildings, sitting-out area, work site, paths and roads within the Project Area for the underpass road. This urbanised land use is of negligible ecological importance.
- To the northwest of the Project Area for the underpass road is a New Yau Ma Tei Typhoon Shelter, which is enclosed by artificial breakwater structure. It is generally of low ecological value due to high level of marine traffic but sometimes used by ardeid species for foraging.

Within the Project Area for the underpass road, both open field and plantation habitats are of limited ecological value owing to the high level of anthropogenic disturbance, low vegetation cover, high commonness of the flora and fauna species and short history of the vegetated habitat. The fauna species associated with these two habitats are mostly common species adapted to urbanized areas. The bird species found in the site is dominated by generalist species such as Tree Sparrow, Chinese Bulbul and Black-collared Starling, which are common in urban areas.

The West Kowloon district is an urbanized area where ecological resources are limited. Habitats recorded outside the Project Area for the underpass road but within the Study Area comprise mainly developed area and plantation Vegetated habitat is mainly found along roadside in form of plantation and in urban park plantation, noticeably in Kowloon Park, where it is used by a small number of fauna species adapted to urbanized areas. No site of conservation importance was identified in the Study Area.

14.9.3.2 Terrestrial Fauna

The fauna species inhabiting the Project Area for the underpass road are mostly generalist species adapted to urban area, with some migratory bird species which sometimes use the fragmented vegetated habitat in urban area as temporary stopover point during their migratory journey. It is noted that open field and plantation in urban area are generally not the prime habitats for wild birds. Field surveys were conducted during July to December 2011 to verify the ecological status of the habitats.

Field surveys for avifauna were conducted on 18 July, 26 September, 30 November and 28 December 2011 covering both summer and winter periods, which also include bird's breeding and wintering season. The checklist of avifauna recorded within the Project Area for the underpass road is presented in **Appendix 9.2**. It was observed that the open field and plantation habitats within the Project Area were inhabited by a number of generalist species, such as Black-collared Starling, Eurasian Tree Sparrow, Spotted Dove, Chinese Bulbul, Red-whiskered Bulbul and Crested Myna. All of them are very common in urban area. Long-tailed Shrike and Plain Prinia are less common in urban area; both were seen in the open field area. A few migratory species including Brown Shrike, Blackbird, Blue Rock Thrush and Yellow-browed Warbler were seen during the surveys conducted in September to December 2011, in the period of migratory season. The low number of migratory species recorded indicates that the habitats within the Study Area are not the prime habitat for migratory birds, probably due to lack of mature vegetation and proximity to high rise buildings. With regard to raptor species, only Black Kite, which is of conservation concern, was recorded during the survey. The wintering population of Black Kite forage along Victoria Harbour, therefore it is quite common along the Victoria Harbour coast.

The southern part of the New Yau Ma Tei Typhoon Shelter lies within the 500m Study Area. Typhoon shelter is generally not an optimal habitat for avifauna but a few seashore associated species such as ardeids and Black Kite are often found foraging in the typhoon shelter. Also, a passage migrant species Whiskered Tern was recorded in autumn migration period.

To the south of the project area is Victoria Harbour which is also not a prime habitat for bird species, but ardeids species and Black Kites are also common in the area. Low density of ardeids was recorded along the coastline of Victoria Harbour whilst Black Kites are commonly found soaring over the sky of Victoria Harbour.

Kowloon Park located about 200m east to the WKCD boundary is considered as an oasis for avifauna in the urbanized area environed by modern buildings. The park is well vegetated with various type of tall trees resembling natural habitats for wild birds. The Bird Lake within the Park also provides an artificial wetland

habitat for wild waterbirds. It supports a small population of Black-crowned Night Heron and provides a sub-optimal habitat for other wild bird species. The checklist of avifauna recorded in the park during the field survey is presented in **Appendix 9.2**.

14.9.3.3 Habitat Evaluation

Habitats identified within the Ecological Study Area are evaluated in accordance with the guidelines set forth in the Annex 8 of the EIAO-TM. Overall ecological values for each habitat type are ranked as follows:

- High
- High-moderate
- Moderate
- Moderate-low
- Low
- Very Low

Evaluation of these habitats is given in **Table 14.9.1**. Each habitat is evaluated in accordance with the requirements stipulated in Annex 8, Table (2) of the EIAO-TM.

Table 14.9.1: Habitat Evaluation

Criteria	Developed Area	Open Field	Plantation	Artificial Seawall
Naturalness	Man-made habitat	Man-made habitat	Man-made habitat	Man-made habitat
Size	Large (113.79 ha)	Small (11.84 ha)	Small (10.48 ha)	Small (1.30 ha)
Diversity	Low in both fauna and flora species diversity	Low in both fauna and flora species diversity; self-seeded flora species are common and widespread	Low in both fauna and flora species diversity	Low diversity of coastal fauna in new artificial habitat
Rarity	Habitat not rare	Common habitat	Common habitat	Common artificial habitat
Re-creatability	Readily re-creatable	Readily re-creatable	Readily re-creatable	Readily re-creatable
Fragmentation	N/A	N/A	These habitats are patchily created/ modified for urban land use	N/A
Ecological linkage	No ecological linkage	Low ecological linkage with other habitats	Low ecological linkage with other habitats	Ecological linkage to marine habitat
Potential value	Low potential value	Low potential value	Low potential value as the habitat is being maintained for urban landscaping	Low potential value
Nursery/ breeding ground	Not significant nursery/ breeding ground	Not significant nursery/ breeding ground	Not significant nursery/ breeding ground	Not significant nursery/ breeding ground
Age	N/A	5 – 10 years	Mostly around 10 years	Mostly around 10 years
Abundance/ Richness of wildlife	Low	Low	Low	Low
Overall	Very Low	Very low	Low	Low

Criteria	Developed Area	Open Field	Plantation	Artificial Seawall
Ecological Value				

14.9.4 Evaluation and Assessment of Ecological Impacts

In view of the developments proposed in Section 2, ecological impact on habitat, flora and fauna species are predicted and evaluated in accordance with Annex 16 of the EIAO-TM and the criteria set forth in Annex 8 of the EIAO-TM.

The potential ecological impact due to the construction and operation of the Project include following:

- Habitat Loss
- Indirect Impact
- Habitat Fragmentation
- Operation Phase Impact

Evaluation of the impacts is given below and a summary of the ecological impact is presented in **Table 14.9.2**.

14.9.4.1 Habitat Loss

The construction and operation of the underpass road would cause the loss of existing habitat in the West Kowloon Reclamation area. Owing to the low ecological value of the artificial habitat, the ecological impact due to the loss of open field and plantation is considered to be insignificant. With regard to avifauna, since the habitats are used by very common generalist species, the impact on avifauna due to loss of open field and plantation is also insignificant.

14.9.4.2 Indirect Impact

Indirect impact through construction activities may cause local disturbance to off-site habitats. Excessive noise, vibrations, dust generation and increased human activities may all contribute to disturbance impact during construction and operation phases. The fauna species occurring in urban areas can generally tolerate a high level of human disturbance, so the impact on fauna species is considered to be minimal. Given that the West Kowloon Reclamation and adjacent area are predominately urbanized area with low to very low ecological value, the impact of indirect off-site disturbance is also considered to be insignificant.

New Yau Ma Tei Typhoon Shelter

As observed in the field survey, Black Kite was commonly seen soaring high above the New Yau Ma Tei Typhoon Shelter. Although it is the only raptor of conservation concern recorded, no impact on this species is predicted as it is adapted to urbanized area along the Victoria Harbour coast.

Also commonly recorded in the New Yau Ma Tei Typhoon Shelter is the ardeid species, foraging at the breakwater or standing on boats. The New Yau Ma Tei Typhoon Shelter is not particularly important to the ardeids as this species is common along the coastline in Victoria Harbour. The ardeids at the typhoon shelter has adapted a certain level of human activities, e.g. marine traffic, therefore it is expected the indirect off-site impact to the ardeids in New Yau Ma Tei Typhoon Shelter is not significant.

During the survey in September, a group of Whiskered Tern were observed foraging over the sea around the typhoon shelter. This species is an uncommon passage migrant in Hong Kong, not of conservation concern. It is not anticipated that construction activities for the underpass road will have any indirect impact on this species.

Victoria Harbour

Little Egret were commonly found passing and sometimes foraging along the coast of Victoria Harbour. As similar habitat is readily available in the vicinity for their foraging activities, they are unlikely to be affected by the construction activities. Also, no indirect impact on the Black Kite recorded is predicted as it is adapted to urbanized area along the Victoria Harbour coast.

Kowloon Park

The existing buildings surrounding Kowloon Park act as a buffer zone for any potential indirect disturbance of construction of the underpass road on the bird community inhabit in the Kowloon Park. In considering the Kowloon Park is at least 200m apart from the proposed construction and environed by modern buildings, and the bird community in Kowloon Park have isolated themselves from the surrounding urbanized area, the indirect disturbance on this bird community is anticipated to be of insignificant.

14.9.4.3 Habitat Fragmentation

Given that the Project Area neighbours with urban area and no habitat of conservation concern is identified in the Study Area, there is no ecological linkage identified in the Study Area. As such, there is no habitat fragmentation impact.

14.9.4.4 Potential Impacts during Operation Phase

No ecological impacts are anticipated during the operation of the proposed underpass road. Conversely, the underpass road will be located below ground with a considerable amount of green area in the form of landscape measures to be provisioned at ground level. During operation phase, the fauna species inhabit in the area above the underpass road will adapt to the WKCD environment, and they will locate themselves to the area with lesser disturbance, e.g. location with lesser light intensity.

Table 14.9.2: Summary of the potential ecological impact

Criteria	Habitat Loss	Indirect Impact (disturbance)	Habitat Fragmentation	Operation Phase
Duration	Construction Phase	Construction Phase	Construction and operation phase	Operation Phase
Reversibility	Not Reversible	Reversible	Reversible	Not Reversible
Magnitude	Moderate-low for loss of open field of large size but of very low ecological value	Moderate	Low	Low
Impact Severity	Insignificant, the habitat to be lost is of low to very low ecological value	Insignificant, the ecological value of the urbanized area is very low	Negligible	Insignificant / potentially positive

14.9.5 Mitigation Measures

Since no significant ecological impact due to the underpass road was identified, no specific ecological mitigation measures other than good site practice is required.

14.9.6 Residual Impacts

Since no significant ecological impact will arise from the proposed underpass road, no residual impact is expected without specific ecological mitigation measures.

14.9.7 Environmental Monitoring and Audit

The implementation of good site practices would avoid and minimize any ecological impacts to an acceptable level. No specific ecological monitoring programme is thus required for the underpass road.

14.9.8 Conclusion

The findings from the field survey and desktop review indicated that the major terrestrial habitats in the Study Area are developed area, open field and plantation, with small amount of sloping seawall along the coastline. All these habitats are with low vegetation cover, short planting history and of low to very low ecological value. Therefore, direct ecological impact on loss of habitat is considered to be of insignificant. The indirect disturbance impact to offsite habitat is considered to be of insignificant in both construction and operation phases, since the proposed underpass road is surrounded by urbanized area. The plantation and landscape planting included in the development plan would have potential positive contribution to the local ecology.

14.9.9 References

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14.10 Landscape and Visual Impact

14.10.1 Introduction

The landscape and visual impact assessment (LVIA) has been conducted in accordance with the requirements of *Annexes 10 and 18 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)*; the *EIAO Guidance Note No. 8/2010 - Preparation of Landscape and Visual Impact Assessment*, and the requirements stated in Section 3.4.12 and Appendix H of the EIA Study Brief (No. ESB-237/2011).

The purpose of this LVIA is to:

- Define the existing landscape and visual quality of the Assessment Area;
- Identify key landscape and visual resources as well as landscape and visually sensitive receivers (VSRs);
- Identify and evaluate the potential landscape and visual impacts associated with the Project during both construction and operation phases;
- Define significance and magnitude of the landscape and visual impacts before and after mitigation;
- Propose mitigation measures to reduce the impact on the existing landscape and visual quality; and
- Describe the implementation, maintenance and management of these recommended mitigation measures.

14.10.2 Landscape and Visual Legislations, Standards and Guidelines

The following legislation, standards and guidelines are applicable to the evaluation of landscape and visual impacts associated with the construction and operation phases of the underpass road serving the WKCD Development.

- *Environmental Impact Assessment Ordinance (Cap. 499, Section 16);*
- *EIAO Guidance Note No. 8/2010: Preparation of Landscape and Visual Impact Assessment under the Environmental Impact Assessment Ordinance;*
- *Hong Kong Planning Standards and Guidelines -Chapter 4 and 10;*
- *Approved South West Kowloon Outline Zoning Plan No. S/K20/28 gazetted on 08/01/2013;*
- *Approved West Kowloon Cultural District Development Plan No.S/K20/WKCD/2* gazetted on 08/01/2013*;*
- *Landscape Value Mapping Study in Hong Kong;*

- *WBTC No. 7/2002 -Tree Planting in Public Works;*
- *WBTC No. 14/2002 -Management and Maintenance of Natural Vegetation and Landscape Works, and Tree Preservation;*
- *ETWB TCW No. 11/2004 on Cyber Manual for Greening;*
- *ETWB TCW No. 3/2006 -Tree Preservation;*
- *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;*
- *Planning Study on the Harbour and its Waterfront Areas (February 2003);*
- *Environmental Impact Assessment Study Brief No. ESB-197/2008 -Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail link (XRL) (November 2008);*
- *Environmental Impact Assessment Study Brief No. ESB-202/2009 -Road Works at West Kowloon (April 2009);*
- *Environmental Impact Assessment of Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link (May 2009)*
- *Environmental Impact Assessment of Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link -Environmental Impact Assessment Report Executive Summary (May 2009);*
- *Greening Master Plan for Mong Kok and Yau Ma Tei; and*
- *Greening Master Plan for Tsim Sha Tsui.*

14.10.2.1 Review of Relevant Guidelines on Landscape Strategies and Framework and Land Use Zoning

Relevant planning documents have been reviewed to gain an insight to the planning intentions of the site and its surroundings so as to assess whether the Project can fit into the setting of the project site and its surroundings as a whole.

The review of the relevant guidelines on landscape strategies and framework, and urban design for the proposed WKCD development is useful to gain an understanding of the planning and design intention of the surrounding areas and this is provided in **Section 10.2.1**.

In order to have a better understanding of the envisaged future landscape and visual characters/ context of the project site, the land use zoning and planning intentions of the project site has also been examined.

The site for the underpass road is located within the WKCD site as shown in **Figure 14.1.1**. It is currently zoned as “Other Specified Uses” annotated “Arts, Cultural, Entertainment, Commercial and Other Uses” under the Approved West Kowloon Cultural District Development Plan No.S/K20/WKCD/2. Combined with the proposed WKCD basement, it comprises approximately 15 ha of land bordering the Jordan/Tsim Sha Tsui area. The planning intention of this zone is primarily for the provision of arts and cultural facilities supported by a range of mixed office, hotel, retail, dining, recreational and entertainment uses.

The project site is currently occupied by works sites, local roads, temporary storage/packing facilities, some existing infrastructure and utility facilities, the existing Tsim Sha Tsui Fire Station and the work site and

temporary works areas for the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) project. The proposed underpass road links up Canton Road and Interim Austin Road West Entrance, running along the northern perimeter of the site and routes south and then west before the existing MTRC railway tunnel and connects to the Park Drives at the western side of WKCD. It is located mainly on the WKCD Basement Level 1 (between 0.6mPD and 1.65mPD), except the vehicular access points where the underpass road connects to existing ground level roads adjacent to the WKCD site. There are total 3 access points to the underpass road, including one at Lin Cheung Road underpass, one at the junction with the proposed WKCD Park drive (extension of Nga Cheung Road) and one at Canton Road. As the Project is mainly located at the underground level, it is anticipated that any adverse impacts that pose on landscape and visual amenity will be temporary and slight.

14.10.3 Assessment Methodology

The preparation of this LVIA follows the criteria stated in the *Annexes 10 and 18 of the Technical Memorandum to the Environmental Impact Assessment Ordinance (EIAO)*, the *EIAO Guidance Note No. 8/2010 - Preparation of Landscape and Visual Impact Assessment and* the report of *Landscape Value Mapping of Hong Kong* for evaluating and assessing the landscape and visual impacts associated with the proposed underpass road.

Relevant planning documents have been reviewed to gain an insight to the planning intentions of the site and its surroundings so as to assess whether the Project can fit into the setting of the site and its surroundings as a whole.

14.10.3.1 Assessment Area

The scope for defining the Assessment Areas for Landscape Impact Assessment (LIA) and Visual Impact Assessment (VIA) are as follows:

Landscape Impact Assessment (LIA): In accordance with the Study Brief and *EIAO Guidance Note No. 8/2010*, the Landscape Impact Assessment area covers all areas within 500m from the boundary of the underpass road project. This extent is illustrated in **Figure 14.10.1**.

Visual Impact Assessment (VIA): According to *the EIAO Guidance Note No. 8/2010,* the assessment area of the Visual Impact Assessment (VIA) covers the visual envelope which is the viewshed formed by natural or man made features such as ridgeline or building blocks. It also includes all terrestrial and aquatic areas within the visual envelope of the Project. The defined visual envelope is shown on **Figure 14.10.8**.

14.10.3.2 Baseline Survey and Assessment of Landscape Impacts

1: Identification of Key Landscape Resources and Landscape Character Areas (LCAs) within the Assessment Area

A baseline survey of the existing landscape resources (LRs) and landscape character areas (LCAs), comprising a desktop study of relevant background reports and a comprehensive field study, is undertaken. This aims to obtain information on topography and existing vegetation for further analysis.

Two categories of Landscape Resources, including Physical and Human Landscape Resources, are classified within the Assessment Area. Physical Landscape Resources include physical topography, water

body (i.e. Victoria Harbour), open space and vegetation. Human Landscape Resources includes cultural heritage features and historical features. The findings of the broad brush tree survey will be incorporated in this LIA.

The conditions of the landscape resources and resources contribute to the overall character of the site and its surroundings. The LCAs represent broad tracts of landscape which have been determined with consideration of topography, vegetation types and land use patterns. The *Landscape Value Mapping Study in Hong Kong* will be reviewed to gain an understanding of the landscape characters within the Assessment Area.

2: Assessment of the Sensitivity of the Landscape Resources (LRs) and Landscape Character Areas (LCAs)

The individual LRs /LCAs that have been identified are described qualitatively and quantitatively. Their sensitivities are then evaluated and rated as low, medium or high based on the following factors:

- Quality of landscape characters/resources;
- Importance and rarity of special landscape resources;
- Ability of the landscape to accommodate change;
- Significance of the change in local and regional context; and
- Maturity of the landscape.

The sensitivity rating for each LR / LCA are determined based on the following:

Low	Landscape or landscape resource, the nature of which is largely tolerant to change
Medium	Landscape or landscape resource of moderately valued landscape characteristics reasonably tolerant to change
High	Important landscape or landscape resource of particularly distinctive character or high importance, sensitive to relatively small changes

3: Identification of Potential Source and Type of Impacts

Various elements of the construction works and operation procedures that would generate landscape impacts are identified.

4: Assessment of the Magnitude of Landscape Impacts

The factors affecting the magnitude of change in assessing landscape impacts are as follows:

- Compatibility of the project with the surrounding landscape;
- Duration of impacts under construction and operation phases;
- Scale of development; and
- Reversibility of change.

The magnitude of change rating for each LR / LCA are determined based on the following:

Negligible	The LRs/LCAs would suffer no discernible change by the proposed development
Small	The LRs/LCAs would suffer slight or barely perceptible changes by the proposed development
Intermediate	The LRs/LCAs would suffer a moderate change by the proposed development
Large	The LRs/LCAs would suffer a major change by the proposed development

5: Identification of Potential Landscape Mitigation Measures

Potential mitigation measures are developed to avoid or reduce the adverse landscape impacts derived from the WKCD development, which also include enhancement of the landscape and visual quality. Remedial measures will be recommended such as tree preservation measures, and compensatory measures such as the implementation of landscape design measures (e.g. compensatory planting and landscape treatment etc.) to compensate for unavoidable adverse impacts and/or generate potentially beneficial long term impacts.

6: Prediction of the Significance of Landscape Impacts Before and After the Implementation of the Mitigation Measures

Landscape impacts will be classified depending on whether the impacts are adverse/beneficial, and irreversible/reversible. Significance threshold of residual impact before and after mitigation (Day 1 and Year 10) will be assessed under the following categories:

Insubstantial	No discernible change to the existing landscape quality
Slight	Adverse/ beneficial impact where the proposed development would cause a barely perceptible deterioration/improvement to existing landscape quality
Moderate	Adverse/ beneficial impact where the proposed development would cause a noticeable deterioration/improvement to existing landscape quality
Substantial:	Adverse/ beneficial impact where the proposed development would cause significant deterioration/improvement to existing landscape quality

The impact significance will also be determined. **Table 14.10.1** shows the relationship between sensitivity and magnitude of change.

Table 14.10.1: Impact significance - relationship between sensitivity and magnitude of change

Magnitude of Change caused by the proposed development	Sensitivity		
	Low	Medium	High
Large	Moderate	Moderate/Substantial	Substantial
Intermediate	Slight/Moderate	Moderate	Moderate/ Substantial
Small	Slight	Slight/Moderate	Moderate
Negligible	Insubstantial	Insubstantial	Insubstantial

7: Residual Impacts Assessment

Residual impacts are those impacts remaining after the proposed mitigation measures have been implemented. This often refers to 10 to 15 years of operation, when the planting mitigation measures are considered to have reached a level of maturity, which allow them to perform the intended design objectives.

In accordance with *Annex 10 of the EIAO TM*, an overall assessment also includes an assessment of the residual landscape and visual impacts for the project. The assessment categories for the residual landscape impacts are shown in **Table 14.10.2**.

Table 14.10.2: Assessment categories for residual impact

Beneficial	Acceptable	Acceptable with mitigation measures	Unacceptable	Undetermined
The impacts are beneficial if the proposed development will complement the landscape character of its setting, follow the relevant planning objectives and improve overall and visual quality	The impacts are acceptable if the assessment indicates that there will be no significant impacts on the landscape, no significant adverse visual impacts caused by the appearance of the proposed development, or no interference with key views.	The impacts are acceptable with mitigation measures, if there will be some adverse impacts, but these can be eliminated, reduced or offset to a large extent by specific mitigation measures	The impacts are unacceptable if the adverse impacts are considered too excessive and are unable to mitigate practically	The impacts are undetermined if the significant adverse impacts are likely, but the extent to which they may occur or may be mitigated or cannot be determined from the study. Further detailed study will be required for the individual impact in question.

14.10.3.3 Baseline Survey and Assessment of Visual Impacts

1: Identification of Visual Resources and Visually Sensitive Receivers (VSRs)

Visual resources and key visually sensitive receivers (VSRs) within the Visual Envelope and primary zone of visual influence which would be affected by the Project will be identified. The *Notes and Explanatory Statement of Approved West Kowloon Cultural District Development Plan No.S/K20/WKCD/2* and *Hong Kong Planning Standards and Guidelines – Chapter 11 Urban Design Guidelines* are reviewed to identify the VSRs. Minimum viewing distance of each VSRs are also determined.

2: Assessment of Sensitivity of Visually Sensitive Receivers (VSRs)

Visual sensitivity considers the impact on views to the site from the VSRs. A number of factors affecting the sensitivity of VSRs for evaluation of visual impacts are as follows:

1 Value and quality of exiting views

2 Availability and amenity of alternative views

3 Type and estimated number of receiver population (many, medium and few)

4 Duration (long/ medium/ short) and frequency of view (frequent/ occasional/ rare)

5 Degree of visibility (no view, glimpse, partial view, vista, open view, and panoramic view)

The sensitivity rating for the VSR are determined as follows:

High: The VSR is highly sensitive to any changes in their viewing experience.

Medium: The VSR is moderately sensitive to any changes in their viewing experience.

Low: The VSR is only slightly sensitive to any changes in their viewing experience.

3: Identification of Potential Sources of Visual Impacts

Various elements located within the site that would generate visual impacts during construction and operation phases will be identified.

4: Assessment of Potential Magnitude of Visual Impacts

Visual impacts are determined by evaluating the conditions of the existing landscape and visual character of the site and its surroundings, as well as the degree of integration of the Project's components with the existing landscape. Other major factors affecting the magnitude of change for assessing visual impacts are:

1 Scale of development

2 Compatibility of the Project with the surrounding landscape

3 Reversibility of change

4 Viewing distance

5 Potential blocking of view

6 Duration of impacts under construction and operation phases

7 Night glare effect

The potential magnitude of change is classified into four categories:

Negligible The VSRs are likely to suffer no discernible change in their viewing experience

Small The VSRs are likely to suffer a slight change in their viewing experience

Intermediate The VSRs are likely to suffer a moderate change in their viewing experience

Large The VSRs are likely to suffer a significant change in their viewing experience

5: Determination of the Visual Impacts during Construction and Operation Phases before Implementation of Mitigation Measures

The significance of the visual impacts is categorised as follows:

Insubstantial No discernible change to the existing visual quality

Slight Adverse / beneficial impact where the Project would cause a barely perceptible deterioration/ improvement to existing visual quality

Moderate Adverse / beneficial impact where the Project would cause a noticeable deterioration/ improvement to existing visual quality

Substantial Adverse / beneficial impact where the Project would cause significant deterioration/ improvement to existing visual quality

The impact significance will be determined. **Table 14.10.3** shows the relationship between sensitivity and magnitude of change.

Table 14.10.3: Impact significance – relationship between sensitivity and magnitude of change

Magnitude of Change	Sensitivity		
	Low	Medium	High
Large	Moderate	Moderate/Substantial	Substantial
Intermediate	Slight/Moderate	Moderate	Moderate/ Substantial
Small	Slight	Slight/Moderate	/Moderate
Negligible	Insubstantial	Insubstantial	Insubstantial

The assessment of visual impacts will be presented in a matrix format considering the factors including location of visually sensitive receivers (VSRs), type and approximate number of VSRs, description of existing view and degree of visibility of DP, receiver sensitivity, source of impact, minimum viewing distance of VSRs, magnitude of change, significance thresholds of potential visual impact (before mitigation), mitigation measures, and significance thresholds of residual impact (upon mitigation) during operation phase on Day 1 and in Year 10.

6: Examination of Alternative Design(s) and Construction Method(s)

Before adopting other mitigation measures to alleviate the impacts, alternative design(s) and construction method(s) that would avoid or reduce the impacts on landscape and visual amenity, or that would make the Project visually more compatible with the setting has been examined.

7. Recommendation of Mitigation Measures to Minimize Adverse Visual Impacts

Mitigation strategies will be developed to reduce the overall visual impacts derived from the Project during construction and operation phases.

8: Residual Impacts Assessment

Residual impacts from the Project are assessed based on the 5 categories for residual visual impacts including “Beneficial”, “Acceptable”, “Acceptable with Mitigation Measures”, “Unacceptable” and “Undetermined” (see **Table 14.10.2**).

9: Assessment of Cumulative l Impacts

Cumulative impacts of the concurrent projects on landscape resources, landscape character areas and visual amenity will be assessed.

Graphics Presentation

The findings of this LVIA are presented and supported by a range of illustrative materials such as computer-generated photomontages, aerial photograph, photographs and plans etc. The location of the underpass and the associated above ground structures are provided.

14.10.3.4 Scope and Content of the Project

The underpass road is an integral part of WKCD basement structure, serving as a centralised road network to connect all Arts and Cultural Facilities (CACF) and Other Arts and Cultural Facilities (OACF) as well as hotel, offices and residential (HOR) facilitates and provide major entry and exit points to and from the WKCD. The original design of the proposed underpass road is based on Foster + Partners Conceptual Plan (CP) for the WKCD, which aims to provide a people-oriented and traffic free environment at ground level and integrate the east – west road within the WKCD basement. The underpass road is located mainly on the WKCD Basement Level 1, except at the vehicular access points where the underpass road connects to existing ground level roads adjacent to the WKCD site. The proposed underpass road is comprised of three distinct sections (shown in **Figure 14.2.1**). More details on descriptions of the Project are provided in **Section 14.2.2**.

It is noted that the baseline conditions are not static and may change over time. The proposed underpass road is targeted to commence construction in 2013, so as to commission the Phase 1 arts and cultural facilities in stages starting from 2014/2015. It is assumed that construction of the proposed underpass road will be undertaken at the same time with the construction of the WKCD basement. The construction of the proposed underpass road will be divided into different zones at different times, with some of the WKCD buildings also undergoing construction at the same time.

Given that all underground activities and facilities would unlikely impose landscape and visual impacts, only potential landscape and visual impacts associated with surface construction activities and above ground permanent structures have been assessed.

The locations of the proposed ventilation shafts associated with the underpass road and a cross section of the temporary stand alone ventilation shafts are provided in **Figure 14.10.10** and **Figure 14.10.11**.

14.10.3.5 Benefits of the Project

The main purpose of the underpass road is to serve as one of the key measures to meet the “accessibility and connectivity” objective of the WKCD development mentioned in **Section 14.2.3**. Specifically, the purpose of the proposed underpass road is to connect the east and west of the site, which allows efficient and effective movement within the WKCD.

In addition to reducing the noise impacts on the WKCD and residential developments nearby, it is expected that the Project will bring more environmental benefits to the area than other design options. As the main spine of the vehicular network within the WKCD site, locating this at basement level will free up more space at ground level to maximise pedestrianisation and allow for provision of landscaping and planting which enhances the landscape and visual amenity of the WKCD development during operation phase.

14.10.3.6 Major Limitations of the Assessment

To meet the requirements of the *TM of the EIAO*, 23 VSRs within the Visual Envelope are identified for adequately assessing the visual impacts derived by the proposed underpass road and the associated ground structures. However, only viewpoints which can represent the worst-case scenarios from the most sensitive VSRs, or those which are representative in terms of the location are selected for preparing photomontages.

Due to the delayed relocation of the Tsim Sha Tsui Fire Station, the access point at Canton Road will not be constructed until after relocation of the fire station, and an interim access point will be provided at Austin Road West until the permanent access point at Canton Road is constructed, after which the interim access road will be closed off permanently.

It is noted that the baseline conditions are not static and may change over time. Due to the phased implementation of the CACF, there will be a transition period after completion of the WKCD basement when the majority of the Phase 1 CACF are completed, but the rest (including office/residential buildings which are subject to land sale) are yet to be initiated. During this transition period, temporary ventilation shafts for the WKCD basement associated with the underpass road will be present at the site prior to completion of the CACF. However, the CACF buildings will be well designed to visually hide the ventilation shafts, so the ventilation shafts will form part of the CACF buildings and they will no longer be visible as individual structures once all CACF are completed.

As these structures are temporary and given that the design of these ventilation shafts is yet to be confirmed, the potential visual impacts during the transition period will be briefly described as part of construction phase and operation phase (Day 1) in this visual impact assessment.

14.10.4 Baseline Study

The proposed underpass road forms part of the infrastructure and supporting facilities for the WKCD development, particularly it serves as an integral part of the WKCD basement structure. The project site is located within the WKCD site, which is currently occupied by work sites, local roads, temporary storage, parking facilities, some existing infrastructure and utility facilities, the existing Tsim Sha Tsui Fire Station and the works site and temporary works areas for the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) project. The underpass road is mainly located at basement level, and 3 access points are provided to connect with the underpass road.

Currently, the landscape setting of the site is mainly comprised of open spaces with some roadside amenity planting. Trees are scattered within the site, mainly at the western side (near Western Harbour Tunnel Entrance), and some trees are located at the eastern side (in front of Tsim Sha Tsui Fire Station). Most of the landscape resources with high value are located along the periphery area outside the site boundary. Two significant landscape resources within the assessment area are Kowloon Park and King George V Memorial Park.

Landscape Resources are classified into two categories including Physical Landscape Resources and Human Landscape Resources. The surrounding landscape resources mainly consist of developed area and a water body (i.e. Victoria Harbour). A description of the baseline landscape resources within the study area, their sensitivity and ability to accommodate changes are shown in **Table 14.10.4**. The baseline landscape resources during construction and operation phase are mapped in **Figure 14.10.1 and Figure 14.10.5** and photo records shown in **Figure 14.10.3a** to **Figure 14.10.3o.**

14.10.4.1 Physical Landscape Resources

Topography

The landform of the landscape impact assessment area which is the West Kowloon Cultural District comprises flat reclaimed land with no features of topographical interest or value.

Victoria Harbour

Victoria Harbour is one of the most beautiful harbours in the world. It is a unique public asset and natural resource. Its preservation is for the benefit of the current generation as well as the future ones. It is also safeguarded by the Protection of the Harbour Ordinance. This is considered as highly sensitive and of high landscape value.

Open Space

The site currently comprises 1.6 ha of temporary open space including a waterfront promenade along the Victoria Harbour. The assessment area is densely urbanized with limited provision of public open space. There are approximately 5 major public open spaces, namely the temporary waterfront promenade, Kowloon Park, King George Memorial Park, Kowloon Park Drive Playground and Roof Top Garden on Hong Kong China Ferry Terminal with a total area of 16.9ha within the assessment area. All permanent open spaces are considered to have high to medium value and sensitivity due to the limited landscape resources in the district.

14.10.4.2 Human Landscape Resources

Cultural Heritage and Historical Features

The site is a reclaimed land that does not contain any cultural heritage features or landscape with important history, however, there are cultural heritage features found within the assessment area outside the WKCD site boundary.

Important cultural/religious built heritage features within the assessment area includes the Kowloon Mosque and Islamic Centre, St. Andrew's Church. For the historical features, Kowloon Park is home to a number of built heritage features that have been listed by the Antiques and Monuments Office (AMO). These include the historic Blocks 58, S4, S61 and S 62 of the former Whitfield Barracks and the former Kowloon West II Battery. Other built heritages features located within the assessment area includes Former Kowloon British School (current Antiquities and Monument Office), No. 190 Nathan Road and some non-list buildings.

14.10.4.3 Existing Tree within the Assessment Area

A broad brush tree/vegetation survey has been carried out within the assessment area as shown in **Figure 14.10.4**.

Within the study area, there is approximately 3567 no. of trees. Many of the trees are found within public open spaces or are roadside trees or trees with amenity planting area. They are mostly exotic and common species with low to medium amenity value and poor to good condition. Trees with high amenity value and good health condition are mostly located in nearby parks, e.g. Kowloon Park and King George V Memorial Park, etc, are located outside the study area. Tree species include *Acacia auriculiformis, Acacia confusa, Ailanthus fordii, Albizia lebbeck, Aleurites moluccana, Alstonia scholaris, Aquilaria sinensis, Archontophoenix alexandrae, Bauhinia x blakeana, Senna siamea, Senna surattensis, Casuarina equisetifolia, Carica papaya, Cassia fistula, Caryota mitis, Celtis sinensis, Cinnamomum camphora, Chrysalidocarpus lutescens, Clausena lansium, Crateva unilocularis, Delonix regia, Ficus benjamina, Ficus*

elastica, Ficus microcarpa, Ficus superba, Ficus virens, Grevillea robusta, Hibiscus tiliaceus, Khaya senegalensis, Koelreuteria bipinnata, Lagerstroemia speciosa, Leucaena leucocephala, Litsea glutinosa, Livistona chinensis, Macaranga tanarius, Mangifera indica, Melaleuca quinquenervia,, Melia azedarach, Morus alba, Peltophorum pterocarpum, Plumeria rubra, Phoenix roebelenii, Pinus elliottii, Reevesia thyrsoidea, Roystonea regia, Syzygium cumini, Terminalia mantaly, and *Washingtonia robusta*.

There are a total of 45 affected trees due to the construction of the underpass road. All of them are found within the site boundary of WKCD. Trees affected are mostly located at the eastern side, in front of Tsim Sha Tsui Fire Station and within the central area of WKCD. Dominant tree species within the site boundary include *Acacia auriculiformis*, *Acacia confusa*, *Archontophoenix alexandrae*, *Bauhinia spp*., *Casuarina, equisetifolia*, *Carica papaya*, *Celtis sinensis*, *Ficus benjamina*, *Ficus microcarpa*, *Ficus virens*, *Hibiscus tiliaceus*, *Koelreuteria bipinnata*, *Leucaena leucocephala*, *Livistona chinensis*, *Melia azedarach*, *Morus alba* and *Washington robusta*, etc. Trees found within the WKCD site are self seeded species of low to medium amenity value. There are considerable numbers of *Leucaena leucocephala*, which is a self seeded weed species are found on the site. No Old and Valuable Trees (OVT) recorded within the site. There are a total of 84 OVTs found in the assessment area, of which 51 of them are within Kowloon Park. Nevertheless, the proposed development would not pose any disturbance to any of the recorded OVTs.

A list of landscape resources and their sensitivity is shown in **Table 14.10.4**. Lists of baseline landscape resources during construction phase and operation phase are mapped in **Figure 14.10.1**. Photo records are shown in **Figure 14.10.3a to Figure 14.10.3o**.

Table 14.10.4: Landscape Resources and Sensitivity

Ref. No.	Baseline Landscape Resources	Sensitivity (High, Medium and Low)
Physical Landscape Resources		
LR1: Open Space		
LR1.1	**Kowloon Park** This is the major public open space (~13.3 ha) in the district located South of Austin Road, West of Nathan Road and North of Haiphong Road. This is a popular recreation area and sightseeing point for residents and visitors. The park offers a full range of active and passive recreational facilities to the public. This LR contains many special landscape elements that are important in both district and regional context. Due to topographical and other site constraints, the northern part of Kowloon Park is selected for active recreational area whereas the passive amenities area is mainly in the south. Landscape elements in the park include a sports centre, mini-soccer pitch, children's playground, fitness trail, aviary and 5 themed gardens. There are approximately 1,500 trees with more than 90 tree species. There are a total of 51 Old and Valuable Trees (OVT) of high amenity value located in Kowloon Park with height around 14-18m, crown spread around 12-18m and DBH around 900-1500. Tree conditions range from poor to good. Kowloon Park contains a mixture of mature and young trees. OVT species include *Albizia lebbeck, Aquilaria sinensis, Cassia fistula, Celtis sinensis, Cinnamomum camphora, Ficus microcarpa, Hibiscus tiliaceus, Plumeria rubra cv. Acutifolia* and *Syzygium cumini*. Other common species includes *Archontophoenix alexandrae, Bauhinia spp, Chrysalidocarpus lutescens, Delonix regia, Ficus superba, Macaranga tanarius, Melaleuca quinquenervia, Pinus elliottii, Reevesia thyrsoidea* and *Roystonea regia*. Kowloon Park is also a home to number of built heritage features that have been listed by the Antiquities and Monuments Office (AMO). These includes the historic Block 58, S4, S61 and S62 of the former Whitfield Barraks (Block 61 and S62), which has historical interest and built heritage	High

Ref. No.	Baseline Landscape Resources	Sensitivity (High, Medium and Low)
	value, and the former Kowloon West II Battery, which formed part of the Whitfield Barracks and now has been converted to a children's playground within Kowloon Park, which the remains of the original gun emplacement. Kowloon Park is also a home to number of built heritage features that will be described in further detail in LR4.4. The following recreation grounds are found within the park: ■ **Kowloon Park Playground** This is an open space (~0.3 ha) that is predominantly hard surfaced and primarily for active recreation purposes. A 7-a-side soccer pitch is the main element in the open space. Seating areas are provided at the western side of the pitch. The pitch is directly next to 2 OVTs in Kowloon Park, namely LCSD YTM/96 and LCSD YTM/97. Both are *Ficus microcarpa* with height around 15-21m, crown spread 17-35m and DBH 1280-3800mm. Both of them are under close monitoring and fungal control and the area is considered as high in amenity value. ■ **Kowloon Park Sports Centre** This is a multi-purpose centre for sports activities, such as indoor game centre and swimming pools located within Kowloon Park. There are 3 outdoor leisure swimming pools and indoor swimming pool, linked by waterfalls, circular paddling pool and sun bathing area (~0.55 ha). It is a popular outdoor swimming area for local residents ■ **Hong Kong Heritage Discovery Centre** The Centre occupies the historic Blocks S61 and S62 of the former Whitfield Barracks at Kowloon Park built in 1910. The outdoor courtyard (~0.07 ha) is generally opened to the public and consists of a seating area. The courtyard is shaded by 1 OVT, LCSD YTM/72, *Albizia lebbeck* with height 19m, crown spread 19m and DBH 1300mm and a *Ficus microcarpa* with height around 19m, spread 20m and DBH 1100mm. The amenity value of these 2 trees are considered to be high.	
LR1.3	**Kowloon Park Drive Rest Garden** This is an open space (~0.2 ha) located next to Kowloon Park. It consists of seating areas under tree shade primarily for passive recreation purposes. There are approximately 4 young to semi-mature trees with height around 5-10m, spread 4-7m and DBH 160-250mm. Predominant tree species include *Morus alba*, *Celtis sinensis* and *Callistemon viminalis*. The amenity value is medium. The condition of the trees range from poor to fair.	Medium
LR1.4	**Roof Top Garden on Hong Kong China Ferry Terminal** This is a roof top garden (~0.46 ha) located on top of the Hong Kong China Ferry Terminal. Generally hard paved with trees and shrubs in raised planter and a seating area arranged on the edge of the roof. A dolphin sculpture is located at the centre of the garden. The usage rate is generally low. There are 21 young to semi-mature trees with height around 4-8m, crown spread around 2-4m and DBH around 200-400mm. The amenity value of these trees are medium. Tree species mainly consist of *Ficus benjamina, Livistona chinensis* and *Phoenix roebelenii*. The condition of the trees is range from poor to fair.	Medium
LR1.5	**Kowloon Park Drive Playground** This is an open space (~0.2 ha) located next to Kowloon Park. It consists of children's play equipment and seating areas under tree shade primarily for passive recreation purposes. There are approximately 60 young to semi-mature trees with height around 5-12m, crown spread 2-8m and DBH 120-550mm. Tree species include *Acacia confusa, Ailanthus fordii, Aleurites moluccana, Celtis sinensis, Cinnamomum camphora, Ficus microcarpa* and *Morus alba*. The amenity value is high. The condition of the trees range from poor to fair.	High
LR1.6	**Canton Road Playground** This is an open space (~0.06 ha) that is predominantly hard surfaced and primarily for active recreation purposes. 2 badminton courts are the main element in the open space. Seating areas are provided. There are 6 young to semi-mature trees with height around 3-14m, crown spread 2-8m and DBH 100-250mm. Amenity value is considered as high. Predominant tree species include *Ailanthus fordii* and *Phoenix roebelenii*. The condition of the trees is fair.	High
LR1.7	**Temporary open space along the waterfront promenade within the site boundary** This is a temporary open space (~1.6 ha) located along the waterfront promenade within the site	Medium

Ref. No.	Baseline Landscape Resources	Sensitivity (High, Medium and Low)
	boundary. It consists of a cycling track, children's play equipment and seating areas under trellis primarily for passive recreation purposes. There are mainly shrub planting (*Brassia actinophylla, Lantana camara*, *Hibiscus rosa-sinensis*, *Alternanthera paronychioides* and *Juniperus chinensis cv. Kaizuka*), groundcover (*Ophipogon japonicus* and *Hymenocallis speciosa*) and lawn area with lighting along pedestrian path. This area is well-maintained and the condition of the plants is fair. The amenity value is medium as most plant species are flowering species.	
LR1.8	**King George V Memorial Park** This is an open space (~1.36 ha) located in the Jordan area. It consists of children's play equipment, sports ground and seating areas both for active and passive recreation purposes. It is one of the major recreation areas for local people. There are approximately 300 trees with height ranging from 3-16m, crown spread 2-12m and DBH 120-1800mm. The amenity value is high. The condition of the trees range from poor to good. Trees range from young to mature. There is one Old and Valuable Tree in the park, *Ficus microcarpa* (LCSD YTM/98), with height 10m, crown spread 20m and DBH 1800mm. Species in the park include *Acacia auriculiformis, Aleurites moluccana, Araucaria heterophylla, Bauhinia purpurea, Bombax ceiba, Delonix regia, Erythrina indica 'Picta'', Ficus benjamina, Ficus elastica, Ficus religiosa, Macaranga tanarius, Melia azedarach, Michelia x alba, Phoenix roebelenii, Podocarpus macrophyllus* and *Spathodea campanulata*. It includes a recreation playground (~0.3 ha) that is predominantly hard surfaced and primarily for active recreation purposes. One 7-a-side soccer pitch and one basketball court are the main elements in the open space. The playground also provides a venue for temporary Chinese traditional activities such as the Yu Lan Festival.	High
LR1.15	**Public Open Space at the podium of Kowloon Station** This is a public open space (~1 ha) within the private development at the podium of Kowloon Station. It includes a large piazza area with some water features. There are approximately 30 young to semi-mature trees located at the public open space, with height around 4-6m, crown 4-5m and DBH around 95-100mm. Amenity value is medium. The tree condition is fair. Species consists of *Phoenix sylvestris*, *Livistona chinensis* and *Ficus microcarpa 'Variegata'*.	Medium
Physical Landscape Resources		
LR2: Amenity planting		
LR2.1	**Roadside Plantation along Park Lane Shopper's Boulevard** There are approximately 45 roadside young to mature roadside trees in raised planters with shrub and groundcover (~0.28ha) found along Park Lane Shopper's Boulevard, Nathan Road with height ranging from 10-16m, crown spread between 9-22m and DBH between 550-1400mm. 34 trees are listed in the Register of Old and Valuable Tree (OVT) (Including LCSD YTM/31 which was felled on 06 August 2011). Some of these OVTs were planted when Nathan Road was first completed in 1906. Amenity value is considered to be high. Tree species mainly consist of *Ficus microcarpa* and *Ficus benjamina*. The tree condition is fair.	High
LR2.2	**Roadside Plantation along Observatory Road** There are 10 young roadside trees with shrub found along Observatory Road with height around 8-10m, crown spread around 4-8m and DBH around 150-300mm. Amenity value is considered to be medium. Predominant tree species include *Khaya senegalensis*. The condition of the trees is fair.	Medium
LR2.3	**Amenity Plantation around Tsim Sha Tsui Police Station** There are total 38 young to semi-mature trees found near the Police Station. Approximately 21 trees in raised planter with shrubs (~0.11ha) along the Nathan Road, near the entrance of Tsim Sha Tsui Police Station, with height 5-15m, crown spread 5-10m and DBH between 150-450mm. Also, there are 17nos. found at the northern side of the Police station, of which 7 no Bauhinia spp. found on the slope along the Austin Road, with height 4-8m, crown spread 3-5m and DBH between 150-200mm. Tree species mainly consist of *Bauhinia x blakeana*, *Delonix regia*, *Chrysalidocarpus lutescens* and *Caryota ochlandra*. The amenity value is medium. The condition of the trees range from poor to fair.	Medium
LR2.5	**Roadside Trees along Canton Road in front of Lippo Sun Plaza** There are 6 young roadside trees found in front of Lippo Sun Plaza with height around 8m, crown spread around 4m and DBH around 120-350mm. Amenity value is considered to be medium.	Medium

Ref. No.	Baseline Landscape Resources	Sensitivity (High, Medium and Low)
	Predominant tree species is *Cinnamomum camphora*. The condition of the trees is fair.	
LR2.6	**Roadside Plantation along Haiphong Road** There are approximately 35 young to mature trees with shrub and groundcover found on the slope (~0.16ha) along Haiphong Road. 13 trees, 12 *Cinnamomum camphora* and 1 *Ficus microcarpa*, are listed in the Register of Old and Valuable Tree (OVT) with height ranging from 14-18m, crown spread 12-19m and DBH 1150-1400mm. Amenity value is considered to be high. Predominant tree species include *Cinnamomum camphora, Chrysalidocarpus lutescens* and *Livistona chinensis*. The condition of the trees range from poor to fair.	High
LR2.7	**Amenity Planting Strip along Kowloon Park Drive** This are 28 semi-mature roadside trees, with shrubs along an amenity planting strip (~0.06ha) separating the Kowloon Park Drive, with height 8-11m, crown spread 1-3m and DBH 350-500mm. Tree species are predominantly *Araucaria heterophylla, Chrysalidocarpus lutescens,* and *Roystonea regia*. The condition of the trees is fair and the amenity value is medium.	Medium
LR2.8	**Trees along Canton Road to Kowloon Park Drive** There are approximately 60 young to semi-mature roadside trees with shrubs in both at grade and raised planter (~0.17ha) along Canton Road to Kowloon Park Drive with height ranging from 5-16m, crown spread 4-8m and DBH 100-300mm. Some planting area are located under underpass road. Amenity value is considered to be medium. Tree species mainly include *Aleurites moluccana, Alstonia scholaris, Delonix regia* and *Ficus microcarpa*. Tree condition is fair.	Medium
LR2.9	**Roadside Plantation in front of Tsim Sha Tsui Fire Station** There are approximately 15 young to semi-mature roadside trees in front of Tsim Sha Tsui Fire Station with height ranging from 4-15m, crown spread 3-12m and DBH 135-650mm. Amenity value is considered to be medium. 1 *Ficus microcarpa*, is found near the TST Fire Station within the site boundary, with height 11m, crow spred 11m and DBH 941mm. Predominant tree species include *Acacia confusa, Aleurites moluccana, Ficus elastica, Ficus microcarpa, Macaranga tanarius, Litsea glutinosa, Clausena lansium* and *Morus alba*. The condition of the trees is fair.	Medium
LR2.10	**Roadside Trees along Scout Path** There are 10 young roadside trees located along Scout Path with height around 4-5m, crown spread 2-4m and DBH around 100mm. Amenity value is considered to be medium. Tree species mainly consist of *Senna siamea, Ficus benjamina* and *Peltophorum pterocarpum*. The condition of the trees is fair.	Medium
LR2.11	**Roadside Plantation along Austin Road** There are total 46 young to semi-mature roadside trees with shrubs in at grade planter (~0.09ha) located along the Austin Road, of which approximately 11 young trees located in front of Austin Station, with height around 4-10m, crown spread 4-6m and DBH around 120-200mm. Amenity value is considered to be medium. Predominant species are *Aleurites moluccana, Bischofia javanica, Crateva unilocularis, Ficus benjaminia* and *Spathodea campanulata*. The condition of the trees range from poor to fair.	Medium
LR2.13	**Roadside Plantation along Nathan Road** There are total 20 young roadside trees along Nathan Road, of which 13 street trees with shrub in both at grade and raised planter (~0.02ha) located in front of HSH Kowloon Centre with height around 2-5m, crown spread 1-4m and DBH around 100-150mm and 7 roadside trees located along both side of Nathan Road (in front of Nathan Hotel) with height around 4-8.5m, crown spread 2-4m and DBH around 95-200mm. Amenity value is medium. Predominant tree species are *Cinnamomum burmannii*, *Livistona chinensis* and *Brachychiton acerifolius*. The condition of the trees is fair.	Medium
LR2.14	**Roadside Plantation along Canton Road** There are total 38 young to semi-mature roadside trees with shrubs in raised planter (~0.13ha) located along the Canton Road, of which 34 of them located in front of King George V Memorial Park and 4 of them located at the junction of Austin Road and Canton Road, with height ranging from 4-12m, crown spread 3-7m and DBH around 100-400mm. Amenity value is considered to be medium. Predominant species is *Aleurites moluccana, Senna siamea, Ficus benjamina* and *Melaleuca quinquenervia*. The condition of the trees range from poor to fair.	Medium

Ref. No.	Baseline Landscape Resources	Sensitivity (High, Medium and Low)
LR2.15	**Roadside Plantation along Wui Cheung Road** There are approximately 25 young to semi-mature roadside trees located along Wui Cheung Road and the planter strip with height ranging from 4-10m, crown spread 1-4m and DBH around 120-200mm. Amenity value is considered to be low to medium. Predominant species is *Cassia fistula, Ormosia pinnata* and *Roystonea regia*. The condition of the trees range from poor to fair.	Medium
LR2.16	**Roadside Plantation along Jordan Road** There are approximately 20 young to semi-mature street trees with shrub in at grade planter (~0.01ha), located along Jordan Road with height ranging from 6-12m, crown spread 3-10m and DBH around 120-200mm. Amenity value is considered to be medium. Predominant species is *Delonix regia, Grevillea robusta, Khaya senegalensis* and *Michelia x alba*. The condition of the trees range from poor to fair.	Medium
LR2.17	**Roadside plantation Close to Jordan Road and Ferry Street Carpark** There are approximately 58 young to semi-mature roadside trees located close to Jordan Road Carpark with shrubs in at grade planter (~0.11ha) with height ranging from 4-12m, crown spread 4-10m and DBH 100-550mm. Amenity value is considered to be low to medium. Predominant tree species include *Senna surattensis, Ficus hispida, Hibiscus tiliaceus, Melia azedarach* and large amount of *Leucaena leucocephala*, which is self-seeded weed species in nature. The condition of the trees range from poor to fair.	Medium
LR2.27	**Amenity Planting within the Private Development at Kowloon Station** There are amenity planting areas (~0.96ha) within the private development at the podium of Kowloon Station, such as the podium garden, private open space playground (~1.10ha) and along the access road within the private development area. There are approximately 70 young to semi-mature trees with shrubs located within the private development, with height around 4-8m, crown 4.5-8m and DBH around 120-210mm. Amenity value is considered to be medium. Predominant species consists of *Phoenix sylvestris*, *Bauhinia spp.*, *Ficus microcarpa* and *Roystonea regia*. The condition of the trees range from poor to fair.	Medium
LR2.28	**Roadside Plantation along Western Harbour Crossing Bus Stop near Elements** There are approximately 54 young to semi-mature trees with shrub in at grade planter (~0.18ha) between Western Harbour Crossing Bus Stop and Elements with height around 3-8m, crown spread 1-4m and DBH 150-300mm. Some trees grow under the shade of the Ngo Cheung Road Underpass road. Amenity value is considered to be medium. All trees are in fair condition. Tree species mainly consist of *Crateva unilocularis*, *Ficus benjamina, Caryota mitis* and *Archontophoenix alexandrae*.	Medium
LR2.29	**Roadside Plantation along Austin Road West** There are approximately 96 young to semi-mature roadside trees with shrubs in raised planter (~0.65ha)along Austin Road West with height ranging from 8-11m, crown spread 2-4m and DBH 100-350mm. Amenity value is considered as medium. Species include *Bauhinia x blakeana, Senna siamea, Senna surattensis, Celtis sinensis, Cinnamomum camphora, Crateva unilocularis, Ficus benjamina, Ficus microcarpa, Ficus virens, Grevillea robusta, Lagerstroemia speciosa, Peltophorum pterocarpum, Syzygium cumini* and *Terminalia mantaly*. The condition of the trees range from poor to fair.	Medium
LR2.30	**Roadside Plantation next to Western Harbour Tunnel Administration Building** There are approximately 24 young trees with shrub in raised planter (~0.04ha) around the Administration Building with height around 8-11m, crown spread around 2m and DBH around 200mm. Amenity value is considered to be medium. Predominant tree species is *Archontophoenix alexandrae*. The condition of the trees is fair.	Medium
LR2.31	**Trees Buffering Western Harbour Tunnel Entrance** This is a tree buffer area (~1.67ha) located at the entrance of Western Harbour Tunnel. The tree buffer was developed when the former Urban Council instituted planting measures at the eastern edge of the site abutting the portal of the Western Harbour Crossing. There are approximately 250 young to semi-mature trees, of which 150 no. of trees are found within the site boundary, with height around 8-10m, crown spread around 4-5m and DBH around 250-400mm. Amenity value is considered to be low to medium. Tree species include Acacia *auriculiformis, Acacia confusa, Hibiscus tiliaceus, Casuarina equisetifolia, Ficus benjamina, Ficus microcarpa*, and a considerable	Medium

Ref. No.	Baseline Landscape Resources	Sensitivity (High, Medium and Low)
	amount of self-seeded weed species *Leucaena leucocephala*. The condition of the trees range from poor to fair.	
LR2.32	**Roadside Plantation along Western Harbour Crossing Bus Stop next to New Yau Ma Tei Typhoon Shelter** There are approximately 22 young to semi-mature trees with shrub in at grade planter (~0.03ha) next to the New Yau Ma Tei Typhoon Shelter with height around 8-10m, crown spread 4-5m and DBH 150-300mm. Amenity value is considered to be medium. Predominant tree species is *Acacia confusa*. The condition of the trees range from poor to fair.	Medium
LR2.33	**Trees along New Yau Ma Tei Typhoon Shelter Pier** There are approximately 20 young to semi-mature trees with shrubs and grassland along the typhoon shelter pier with height around 4-5m, crown spread 3-4m and DBH 150-300mm. Amenity value is considered to be medium. Predominant species are *Carica papaya, Ficus microcarpa, Koelreuteria bipinnata* and self-seeded weed species *Leucaena leucocephala*. Also, there are more than 30 undersized self-seeded weed *Leucaena leucocephala.* The condition of the trees range from poor to fair.	Medium
LR2.34	**Amenity Planting within Salt Water Pumping Station** There are total 65 young to mature trees with grassland (~ 0.08ha) located within and next to the Salt Water Pumping Station with height around 2-10m, crown spread 2-5m and DBH around 95-300mm. Approximately 30 trees are located in planter boxes (1m X 1mX 1m) and planting area within the pumping station and 35 trees with grassland (~0.8ha) are located near the pump station. Amenity value is considered to be low since most of the trees are self-seeded weed species. Predominant tree species are *Leucaena leucocephala*, *Livistona chinensis, Bauhinia spp., Ficus microcarpa, Hibiscus tiliaceus* and *Washingtonia robusta*. The condition of the trees range from poor to fair.	Low
LR2.35	**Tree Cluster in the Western Part within the Boundary Area** There are approximately 161 young to semi-mature trees with grassland (~1.41ha) located in the western part of the site with height around 6-10m, crown spread 3-10m and DBH 95-200mm. Amenity value is considered to be low since most of the trees are self-seeded species with a considerable amount of *Leucaena leucocephala* which is a weed species. Tree species mainly consist of *Leucaena leucocephala*, *Hibiscus tiliaceus, Acacia auriculiformis, Caryota mitis* and *Morus alba*. The condition of the trees range from poor to fair.	Low
LR2.36	**Tree Cluster in the Eastern Part within the Boundary Area** There are approximately 372 young to semi-mature trees with grassland (~1.54ha) located in the eastern part of the site with height around 5-10m, crown spread 3-10m and DBH around 95-200mm. Amenity value is considered to be medium. A considerable amount of *Leucaena leucocephala*, which is weed species, is surveyed. Tree species mainly consist of *Leucaena leucocephala, Casuarina equisetifolia, Melia azedarach, Hibiscus tiliaceus, Acacia auriculiformis, Ficus microcarpa, Ficus virens, Morus alba* and *Celtis sinensis* The condition of the trees range from poor to fair.	Medium
LR2.37	**Amenity Planting at the end of Ashley Road** There are approximately 2 young trees with shrub planted in the at-grade small planter (~0.007ha) located at the end of Ashley Road, which is in front of Daily House, with height around 4-4.5m, crown spread 4.5-6m and DBH around 95-100mm. Amenity value is medium. Species consist of *Elaeocarpus apiculatus* and *Elaeocarpus hainanensis*. The condition of the trees is fair.	Medium
Physical Landscape Resources		
LR3: Waterbody		
LR3.1	**Victoria Harbour** Lying in the middle of the territory's dense urban region, the harbour is famous for its deep and sheltered waters. It is a valuable natural asset of Hong Kong and is considered as highly sensitive and of high landscape value. The approximate size of Victoria Harbour within the assessment boundary is 65.09ha.	High
Human Landscape Resources		
LR4: Cultural Heritage and Historical Features		

Ref. No.	Baseline Landscape Resources	Sensitivity (High, Medium and Low)
LR4.1	**Kowloon Mosque and Islamic Centre** Kowloon Mosque and Islamic Centre is one of the four principal mosques in Hong Kong. It is located at the corner of Nathan Road and Haiphong Road next to Kowloon Park since 1984. The Mosque is currently the largest Islamic house of worship in the city. It was originally built to cater to the spiritual needs of Indian Army soldiers stationed in Hong Kong, as well as the substantial Punjabi Muslim contingent in the Hong Kong Police. The Mosque holds prayers daily and is capable of accommodating up to approximately 2000 people. It represents the unique identity of the Muslim community in Hong Kong. This traditional Muslim architecture of mosque, with 4 no. of 11m high minarets which mark the corners of the upper terrace and the extensive use of white marble on both paving and façade, distinguished itself from the nearly modern commercial building, and become one of the most striking buildings in Tsim Sha Tsui District. There are approximately 3 semi-mature trees with found near the entrance of the Kowloon Mosque and Islamic Centre, along the Nathan Road, with height ranging from 6-15m, crown spread between 408m and DBH between 200-400mm. Predominant tree species includes *Cinnamomum camphora* and *Mangifera indica*. The condition of the trees is fair. The amenity value for the trees is medium.	High
LR4.2	**St. Andrew's Church and Former Kowloon British School** St. Andrew Church was built in 1906 and is located at the bustling Nathan Road, Kowloon. It is a church of the Anglican Province of Hong Kong and in the Diocese of Western Kowloon. It is the oldest Protestant church in Kowloon. Due to its long history of religious use and its architectural features including the Gothic Revival style and red brick facades, it was very high cultural significance, and is currently proposed for upgrade from Grade 2 to Grade 1 listed historical building. Former Kowloon British School, officially opened in 1902, and is the oldest surviving school building constructed for foreign residents living in Hong Kong. The building is a typical Victorian style building with adapted with wide verandas, high ceilings and pitch roofs. It was used by the Family Welfare Associated and Tsim Sha Tsui Kaifong Association after the Second World War and now use as the Antiquities and Monuments Office after the restoration. It is a declared monument since 1991. There are total 50 young to semi-mature trees found within the Church, of which approximately 20 trees are located on the slope area along the Nathan Road, with height ranging from 8-15m, crown spread 3-5m and DBH between 200-300mm. Predominant tree species includes *Livistona chinensis* and *Bauhinia spp*. Other 30 trees are located in the amenity planting area within the Church, with height ranging from 3-19m, crown spread 3-6m and DBH 150 -350mm. Predominant tree species include *Juniperus chinensis*, *Macaranga tanarius*, *Bauhinia spp.*, *Lagerstroemia speciosa* and *Chrysalidocarpus lutescens*. The condition of the trees range from poor to fair. Also, there are 4 trees found within the Former Kowloon British School, along Observatory Road, with height around 6-7m, crown spread 4-6m and DBH between 200-300mm.Predominant tree species include *Albizia lebbeck, Aleurites moluccana* and *Erythrina spp*.	High
LR4.3	**No. 190 Nathan Road** This is a four-storey Verandah-type Shophouse believed to have been erected in 1937 and was originally for mainly residential use. In 1973, the building was purchased by a real estate company, Tai Sang Land Development Limited, and has since been converted for commercial use with various shops. This building has particular architectural significance due to its Neo-Classical architectural style with balcony details and parapet, which is now quite rare in Hong Kong.	Medium
LR4.4	**Built Heritage within Kowloon Park** The Whitfield Barracks was a designated military area in 1864, named after Major General H.W. Whitfield, Major General China, Hong Kong and Straits Settlement (1869-1874). The barrack buildings were built in the 1890s to house the British Indian garrisons, and comprised of 85 barrack buildings by 1910, as well as a mosque. There was also a network of underground tunnels which were used as air-raid shelters and as part of the basement of the barracks. In 1967, the site was handed over to the Government, and in 1970, the site was taken over by the then Urban Council and most of the barracks were demolished as part of the redevelopment of the site into Kowloon Park. Only 4 of the original barrack buildings remain, and have been reused. Block 58 is used as a store building for the Hong Kong Museum of History, and public access is restricted. Blocks S61 and S62 were taken up by the Hong Kong Museum of History from 1983 to 1998 before it was	High

Ref. No.	Baseline Landscape Resources	Sensitivity (High, Medium and Low)
	rehabilitated into the current Hong Kong Heritage Discovery Centre, which opened in October 2005. Block S4 is being used as a Health Education Exhibition and Resource Centre by the Food and Environmental Hygiene Department. This block is also home to a pair of columns from the flagship Eu Yan Sang shop that was located in Queen's Road Central in 1926, but has been relocated to the front entrance of Block S4 since 1992. All the buildings are rated Grade 1 historical building and were built as typical Colonial Neo-Classical army barrack blocks, but have undergone various degrees of modification and modernization since their original construction. The historic Blocks S61 and S62 of the former Whitfield Barracks at Kowloon Park built in 1910 is now the Hong Kong Heritage Discover Centre. The outdoor courtyard (~0.07 ha) is generally opened to the public and consists of a seating area. The courtyard is shaded by 1 OVT, LCSD YTM/72, *Albizia lebbeck* with height 19m, crown spread 19m and DBH 1300mm and a *Ficus microcarpa* with height around 19m, spread 20m and DBH 1100mm. The amenity values of these 2 trees are considered to be high. Also located in Kowloon Park is the Kowloon West II Battery, which formed part of the Whitfield Barracks and was built between 1878-1880 as part of the defense of part of the Kowloon Peninsula, where it commanded the entrance to Victoria Harbour between Stonecutters Island and Green Island. The site has been converted to a children's playground within Kowloon Park, although a number of features of its original purpose still remains. These include the original gun emplacements, which have been renovated and the 5 inch breech loading naval guns discovered at Chatham Road in 1980 are now mounted in each emplacement, as well as parts of the original stone masonry wall. The Kowloon West II Battery is listed as Grade 1 historical building.	

14.10.4.4 Landscape Character of the Assessment Area

According to the *Landscape Character Map of Hong Kong* published by Planning Department in September 2003, the project site is classified as "Reclamation/Ongoing Major Development Landscape" under the category of "Urban Fringe Landscape".

These are transitional landscapes which are currently waiting or are undergoing large scale construction or re-development. Part of the project site consists of land undergoing development, while most of the site is vacant and awaiting development. It is characterized by a flat, low, lying topography, lack of significant vegetation or significant built structures. The site includes some major earthworks and partially completed structures. It is part of the West Kowloon reclamation area and so is characterized by their proximity to the coast. As a result of their indeterminate status and the disturbance caused by ongoing construction work, the landscape of the study area has an incoherent, desolate and transient character.

The landscape character of the surrounding areas located to the east and the north of the site is classified as an Urban Landscape type "Late 20 Century/ Early 21 Century Commercial/Residential Complex Landscape", comprising Hong Kong's most recent urban landscapes. The adjacent extensive comprehensive developments, such as International Commercial Centre, the Harbourside Towers and the Elements Shopping Mall, contain a large podium for retail uses and parking, with commercial or residential towers above and are characterized by their new building block using modern building materials such as glass and steel.

Streets are wide with significant roadside landscape provision and tree planting and with footbridges connecting developments at the first floor or podium level. The result is an intensely urban landscape which is enclosed, angular, and colourful, and which is defined to a significant extent by its built form and the spaces they create. It forms a typical urban setting of Hong Kong's urban landscape.

Accordingly, the landscape character of the surrounding assessment area varies from contemporary urban landscape, transportation corridor landscape and coastal waters landscape.

WKCD is further sub-divided in a number of sub-districts in accordance with the land use and district identity. Therefore, during operation phase, the LCA01& LCA03 will be further subdivided into a number of small LCAs in accordance with the sub-district identity, and impact on these LCAs due to the underpass road serving WKCD are assessed.

Baseline Landscape Character Areas (LCAs)

The Landscape Character Areas are zoned with reference to the "*Study of Landscape Value Mapping of Hong Kong*". **Table 14.10.5** summarises the baseline LCAs and their sensitivity. The locations and photo records of the Landscape Character Areas during operation and construction period can be referred to in **Figure 14.10.5**, **and Figure 14.10.7a to h.**

Table 14.10.5: Landscape character areas and sensitivity

Ref. No.	Baseline Landscape Character Areas	Sensitivity (Low, Medium, High)
LCA01	**West Kowloon Cultural District Landscape Character Area** The approximate size of this LCA is 13.4ha. This area is where the Park would be located in the proposed development. The topography is generally flat. This area is open with clusters of trees. Tree plantation at the eastern edge of the area abutting the portal of the Western Harbour Crossing was planted by the former Urban Council. Elsewhere trees in this area are mostly self-seeded weed species. This area has held some temporary exhibitions such as the Hong Kong -Shenzhen Biennale Urbanism. The interface with Western Harbour Crossing is currently buffered by clusters of trees. As this LCA is still a vacant land reserved for WKCD development, which has no district or regional significance.	Low
LCA02	**West Kowloon Cultural District Construction Area** The approximate size of this LCA is 19.68ha. This area is currently under site formation and underground structure works. The landscape character is changing from time to time with construction operations. This LCA has no district or regional significance.	Low
LCA03	**West Kowloon Cultural District Temporary Waterfront Promenade** The approximate size of this LCA is 4.54ha. This area is currently opened to the public and allows activities along the waterfront. The temporary waterfront promenade provides basic recreation structures like seating area, children's play area, bicycle track and kiosk to the public. Generally hard paved with shrub plantings, some facilitates in the area can easily be demolished, replaced or reused. The DHL Hong Kong Balloon is temporarily located in the area. The maximum floating height is 100m, forming an icon of the area. This LCA has no district or regional significance.	Low
LCA04	**New Yau Ma Tei Typhoon Shelter Landscape** The approximate size of this LCA is 9.07ha. This is an area for typhoon shelter use in New Yau Ma Tei. It is substantially enclosed by offshore breakwater. It is located at the northern part of the WKCD and the coastal edges of Yau Ma Tei District. It is an inshore aquatic landscape formed by the armourstone breakwaters constructed to protect large numbers of moored vessels, such as freights, fishing vessels and sampans. They consist primarily of water, which incorporate the jetties, pontoons and navigational features resulting in a landscape that is a transitional one between the coastal land and sea. It is a vibrant and active landscape characterised by a variety of form and colour and often by a significant sense of enclosure. This LCA has no district or regional significance.	Low

Ref. No.	Baseline Landscape Character Areas	Sensitivity (Low, Medium, High)
LCA05	**Victoria Harbour Inshore Water Landscape** The approximate size of this LCA is 7.59ha. This side of the water is facing west of the Victoria Harbour which created a sense of openness. This area has the backdrop of Stonecutters Bridge, Tsing Yi and Lantau Island. While the landscape is characterized predominantly by horizontality and muted hues of coastal water, container barges may be spotted randomly in the area. This results in an open landscape with colour changes (from blue to sunset red) though the course of the day which is punctuated by human features. This LCA has a major district and regional significance.	High
LCA06	**Victoria Harbour Strait Landscape** The approximate size of this LCA is 48.7ha. The Victoria Harbour is a world famous harbour. This is a unique feature and a public asset with busy marine traffic flow. This landscape is characterized with significant natural and marine landscape with a distinct sense of enclosure by the developments and hills on the two sides of the Harbour. This LCA is located at the southern part of the WKCD, is enclosed by significant landform of WKCD and the Tsim Sha Tsui Promenade, creating a distinct sense of enclosure. It is characterized predominantly by their surrounding landforms and the muted hues and horizontally of their coastal waters. It includes the ferry piers, passing vessels and various marine activities. This LCA has a major district and regional significance.	High
LCA07	**New Yau Ma Tei Container Terminal Landscape** The approximate size of this LCA is 1.19ha. This is a container terminal for container barges. The height of the container barges can be up to 30m which forms vertical elements towards the skyline. This LCA has no district or regional significance.	Low
LCA08	**Western Harbour Crossing Toll Gate Landscape** The approximate size of this LCA is 8.15ha. This is one of the 3 cross harbour tunnel in Hong Kong. This area is characterized with heavy traffic. The traffic forms a linear and near static movement in peak hours but become more vibrant in normal hours. Buffering trees are planted surrounding the entrance area. This LCA has no district or regional significance.	Medium
LCA09	**Tsim Sha Tsui Late 20C / Early 21C Commercial / Residential Complex Landscape** The approximate size of this LCA is 18.38ha. This area includes the Elements mall and the Victoria Towers. It is dominated with mixed residential / commercial use. This comprises a mix of high rise buildings for residential use, typically with landscape area on the podium containing retail uses and parking. The streets are utilitarian with few soft landscape treatments. The result is an enclosed and colourful urban landscape defined by its built form and the spaces they created without much landscape treatment in ground level. This LCA has no district or regional significance.	Medium
LCA10	**Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) Terminus Construction Site and Austin Station** The approximate size of this LCA is 17.85ha. The XRL is part of the strategic national express rail network that connects Hong Kong to the major cities in the Mainland China. It is an important public transport interchange. The terminus with an area of about 11 ha will be located between Austin Station and Kowloon Station. The terminal will provide a large extent of public green space linking to the WKCD. The area is currently under construction and completion of the terminus is expected to be in 2015. This LCA has no district or regional significance.	Low
LCA11	**Kowloon Park Urban Landscape** The approximate size of this LCA is 13.26ha. This area is a major green area in the district large enough to form landscape in its own right. The green area covers more than 13.3 ha. There are approximately 1,500 trees with more than 90 tree species. There are a total of 51 Old and Valuable Trees (OVT) of high amenity value located in Kowloon Park. The park offers a full range of active and passive recreational sports facilitates to the public. This LCA has a moderate district significance and minor regional significance.	High

Ref. No.	Baseline Landscape Character Areas	Sensitivity (Low, Medium, High)
LCA12	**Jordan Mixed Urban Landscape** The approximate size of this LCA is 20.97ha. This is an area of mainly residential use. This comprises of a mix of low to medium rise buildings. The streetscape is characterised with no or few soft landscape treatments. The King George V Memorial Park is the major green space for the local residents. This LCA has no district or regional significance.	Medium
LCA13	**Tsim Sha Tsui Organic Mixed Urban Development Landscape** The approximate size of this LCA is 4.85ha. This is an area of mixed residential, commercial and retails land uses. This comprises mainly medium rise buildings of mixed retail / residential uses and high rise buildings for commercial / retail uses. Apart from the historical *Ficus microcarpa* along the Park Lane Shopper's Boulevard, the streetscape is characterised with few soft landscape treatments. This LCA has a minor district and regional significance.	Medium
LCA14	**Tsim Sha Tsui Commercial / Retail Complex Landscape** The approximate size of this LCA is 12.31ha. This is an area predominantly of commercial and retail land uses and comprises mainly high rise buildings. The streets are utilitarian with no or few soft landscape treatments. Landscape treatments are found in roof top gardens which combine with commercial or retail functions. This LCA has minor district and regional significance.	Medium

14.10.4.5 Baseline Visual Resources and Visually Sensitive Receivers

Visual Envelope

The baseline for the Visual Impact Assessment is an understanding of the existing visual qualities within an area that could be affected by the WKCD development. This area refers to the Visual Envelope.

The Visual Envelope (i.e. Primary Zone of Visual Influence) of the Project is illustrated in **Figure 14.10.8**. It is defined by the area in proximity and is visually affected by the Project. It includes the first row of street blocks/ buildings facing towards the site, such as the office towers located to the southwest of Canton Road along Gateway Boulevard, and the residential/and commercial buildings located to the north and northeast of the site.

Given that only the above ground structures associated with the Project (i.e. temporary ventilation shafts associated with underpass road) will be seen, the visual assessment of the Project only focuses on the compatibility of the associated above ground structures with the surrounding areas.

Since the site is located in the eastern part of the WKCD site, the Visual Envelope of the Project shares part of the Visual Envelope of the WKCD development. A plan show showing the Primary Zone of Visual Influence (PZVI), its zoning and the VSRs located within the PZVI is provided in **Figure 14.10.8**.

Visual Resources

Natural Ridgelines

The ridgeline of Lion Rock located to the north of West Kowloon provides a natural backdrop to the high-rise urban areas of West Kowloon. It is a natural visual resource forming part of the Visual Envelope of the WKCD site. It is also one of the major visual resources of the Project.

Victoria Harbour

Victoria Harbour is a unique natural asset of Hong Kong, providing an open sea view to the areas along the northern coast of Hong Kong Island and the southern coast of Kowloon Peninsula. It is also a valuable visual resource and a visually dominant natural feature to the WKCD, providing a magnificent sea view as the backdrop. Hence, any changes to the existing views to Victoria Harbour from the selected VSRs are important considerations for the assessment of visual impacts.

Visually Sensitive Receivers (VSRs)

23 VSRs located within the Visual Envelope (i.e. the Primary Zone of Visual Influence) have been identified and shown in **Figures 14.10.8**. They are considered to be visually most affected by the Project.

As the site is located within the WKCD site, the Project shares part of the Visual Envelope of the proposed WKCD development. Therefore, most of the selected VSRs of the Project are also the VSRs of the proposed WKCD development.

The selected VSRs are not limited to the existing VSRs located within the Visual Envelope but also committed developments located immediately adjacent to the site. There are 6 types of existing VSRs and 3 types of committed VSRs identified within the Primary Zone of Visual Influence, which are listed in **Table 14.10.6.**

The WKCD development will be implemented in phases, and two WKCD facilities including Phase 1A of the Park and Phase 1 of Xiqu Centre will be operational prior to the completion of the underpass road, so they are considered as two committed VSRs of the Project. Whilst the completion date for Phase 1A of the Park is in late December 2014, the completion date for Xiqu Centre is in late December 2015. Please refer to **Appendix 2.4** (Construction Zone) regarding Phase A (Zone A) of the Park.

As completion date for basement associated with underpass road is in late February 2016, Xiqu Centre will be completed 2 months before the completion of the underpass road. It is anticipated that the underpass road will be close to its construction completion in January and February 2016, therefore the future VSRs at Xiqu Centre may not have direct view over the underpass road during construction phase. It is also unlikely that performances will be staged at Xiqu Centre immediately after its construction completion. Hence, the assessment of visual impacts on Xiqu Centre during construction phase could not be provided.

Brief descriptions of the VSRs and the existing views are provided in **Table 14.10.7.** Photos of the existing VSRs within the Primary Zone of Visual Influence are illustrated shown in **Figure 14.10.9a** to **Figure 14.10.9e**. Baseline viewpoint illustrating the quality of existing views viewed by selective VSR (i.e. VSR 14) is shown in **Figure 14.10.13a**.

Table 14.10.6: Types of VSRs

Existing VSRs	
1. Residential VSRs	VSR 3 The Harbourside, VSR 4 The Arch, VSR 10 Wai Hang Building & VSR 11 Victoria Tower
2. Commercial VSRs (e.g. offices and hotels)	VSR 1 ICC, VSR 2 The Elements, VSR 12 China Hong Kong City, VSR 13 Royal Pacific Hotel & Towers & VSR 14 The Gateway Towers
3. Institutional VSRs	VSR 16 Lai Chack Middle School,

Existing VSRs	
	VSR 17 Canton Road Government Primary School & VSR 21 Tsim Sha Tsui Fire Station
4. Transportation VSRs	VSR 7 Austin Station & VSR 15 Hong Kong China Ferry Terminal
5. Open Space/ Recreational VSR	VSR 18 King George V Memorial Park, Kowloon
6. Transient VSRs	VSR 9 Traveller Arriving Western Harbour Crossing Toll Plaza, VSR 19 Travellers along Austin Road West & VSR 20 Travellers along Canton Road
Committed VSRs	
1.Commercial VSR	VSR 6 Planned CDA development above West Kowloon Terminus
2. Transportation VSR	VSR 5 West Kowloon Terminus
3. Residential VSR	VSR 8 Planned residential development above Austin Station
4. Recreational VSR	VSR 22 Phase 1A of the Park
5. Arts and Cultural VSR	VSR 23 Phase 1 of Xiqu Centre

Table 14.10.7: Brief Descriptions of the VSRs and the Existing Views

Key VSRs		Brief Descriptions of the VSRs and the existing views
Commercial/ Residential/Transportation VSRs Located Immediately to the North of the WKCD Site		
VSR 1	International Commerce Centre (ICC)	■ Standing above Kowloon Station and the Elements shopping mall, ICC rises to 490 metres above sea level and is the tallest building in Hong Kong. ■ Open and close view of the site can be seen. ■ Due to the orientation of the building block, only the views from the southern and south eastern facing offices would be affected.
VSR 2	The Elements	■ At the base of the ICC tower and 5 high rise residential developments (ie. the Harbourside, the Arch, the Waterfront, Sorrento Towers and the Cullinan), the Elements shopping mall comprises of 4 floors of retail shops, including ground, first, second and roof floors (ie. podium level). ■ Close view of the site can be seen. ■ On the ground floor level, most of the areas are occupied by the transportation facilities, including public transport interchange, concourse of Kowloon Station, Airport Express in Town check in hall, coach terminus and parking etc. Most of these areas are enclosed. Only an ice rink facing the intersection of Austin Road West and Lin Cheung Road and particular locations of the mall facing Austin Road West have a close view of the WKCD site. ■ Due to the orientation of the building block, only the views from the southern facing areas of the mall and its podium would be affected.
VSR 3	The Harbourside	■ Comprising of 3 residential towers, the Harbourside is one of the high rise residential developments located to the north of the Austin Road West and directly faces the site. ■ Views from the lower floors of the buildings would be significantly affected by the Project. . ■ Due to the orientation of the building blocks, only the views from the southern facing units would be affected.
VSR 4	The Arch	■ Located close to the junction of Austin Road West and Lin Cheung Road, the Arch comprises of 4 residential towers. ■ It is one of the high rise residential developments located to the north of the Austin Road West directly facing the site ■ Views from the lower floors of the buildings would be significantly affected by the

Key VSRs		Brief Descriptions of the VSRs and the existing views
		project. ■ Due to the orientation of the building blocks, only the views from the southern facing units would be affected. ■ Cumulated visual impacts derived by the Project, the proposed WKCD development, committed developments at West Kowloon Terminus and Austin Station would be experienced by the residents living at the Arch.
VSR 5	West Kowloon Terminus	■ The West Kowloon Terminus site is currently under construction. ■ Travellers arriving at the Terminus will have a close view of the site.
VSR 6	Planned CDA Development above West Kowloon Terminus	■ The West Kowloon Terminus site is currently under construction. ■ Due to the orientation of the building blocks, views from the southern facing units at the lower floors would be blocked by the Project.
VSR 7	Austin Station	■ There are two station buildings for Austin Station, one is bounded by Jordon Road to the north and Wui Cheng Road to the south, another is bounded by Wui Cheng Road to the north and Austin Road West to the south. ■ The southern station building has partial view of the site, while the views to the WKCD site from northern station building would be mostly blocked by the West Kowloon Terminus and the southern station building.
VSR 8	Planned Residential Development above Austin Station	■ The planned residential development above Austin Station is currently under construction. ■ Due to the orientation of the building blocks, views from the southern and western facing units at the lower floors to Victoria Harbour would be affected.
VSR 9 *	Traveller Arriving Western Harbour Crossing Toll Plaza	■ Existing views to the western part of the site and Victoria Harbour are partially blocked by dense planting at the entrance of WHC and the administration building.
VSR 10*	Wai Hang Building	■ Residential building located to the east of Canton Road and the north of Austin Road West. ■ Partial view to the site can be viewed. ■ Due to the orientation of the building blocks, views from the western facing units would be affected. ■ Cumulated visual impacts derived by the Project, the proposed WKCD development, committed developments at West Kowloon Terminus and Austin Station would be experienced.
VSR 11	Victoria Tower	■ It is a high rise residential development located to the east of Canton Road and south of Austin Road West. ■ Close and open view to the site can be seen. ■ Due to the orientation of the building blocks, views from the western facing units would be affected. ■ Cumulated visual impacts derived by the Project, the proposed WKCD development, committed developments at West Kowloon Terminus and Austin Station would be experienced.
Commercial VSRs Located to the Southeast of the WKCD Site		
VSR 12	China Hong Kong City	■ Open view of the site can be seen in a short distance. ■ Due to the orientation of the building block, only western and northern facing units would be affected.
VSR 13	Royal Pacific Hotel and Towers	■ Due to the orientation of the building block, only some of the northern facing units at upper levels and western facing units would be affected. ■ Part of the views to the site are blocked by China Hong Kong City.
VSR 14	The Gateway Towers	■ Gateway Hong Kong is part of Harbour City, comprising of office buildings with shopping arcade at lower level in Tsim Sha Tsui. ■ Open view of the site can be seen in a short distance at upper levels.

Key VSRs		Brief Descriptions of the VSRs and the existing views
		■ Due to the orientation of the building blocks, only western and northern facing units would be affected
VSR 15	Hong Kong China Ferry Terminal	■ Open view of the site can be seen in a short distance. ■ Due to the orientation of the building block, northern facing units would be affected
Institutional VSRs Located to the East of Canton Road		
VSR 16	Lai Chack Middle School	■ Located opposite Tsim Sha Tsui fire station, view to the site from Lai Chack Middle School is blocked by the China Hong Kong City buildings and Tsim Sha Tsui Fire Station. However, part of the site could be viewed after the fire station is relocated. ■ Due to the orientation of the building block, only western facing units would be affected.
VSR 17	Canton Road Government Primary School	■ Located opposite the China Hong Kong City, view to the site from Canton Road Government Primary School is blocked by the China Hong Kong City buildings and Tsim Sha Tsui fire station. ■ However, part of the site could be viewed if the fire station was relocated. ■ Due to the orientation of the building block, only western facing units would be affected.
Open Space/Recreational VSR		
VSR 18	King George V Memorial Park, Kowloon	■ Located immediately to the east of Austin Station, views to the site at ground level are largely blocked by Austin Station. ■ Visitors would mostly experience the visual impacts derived by the committed developments at Austin Station.
Transient VSRs		
VSR 19	Travellers along Austin Road West	■ Varying views depending on locations along Austin Road West. ■ Close and open view to the site can be seen. ■ Travellers travelling along the road section between Lin Cheung Road and Canton Road would experience cumulative impacts derived by the Project, the proposed WKCD development, and the committed developments at Austin Station and West Kowloon Terminus.
VSR 20	Travellers along Canton Road (Will be relocated in Operation Phase)	■ Varying views depending on locations along Canton Road. . ■ Travellers along the section of Canton Road between Jordon Road and China Hong Kong City would experience cumulative impacts derived by the Project, the proposed WKCD development, and the committed developments at Austin Station and West Kowloon Terminus.
VSR Located within the WKCD Site (Will be Relocated in Operation Phase)		
VSR 21	Tsim Sha Tsui Fire Station	■ Located within the WKCD site, Tsim Sha Tsui fire station has close and open view of the eastern part of the site. ■ During construction phase, eastern facing units would experience cumulative impacts derived by the Project, the proposed WKCD development and committed development at West Kowloon Terminus, while northern facing unit would experience cumulative impacts derived by the project, the proposed WKCD development, and committed developments at West Kowloon Terminus and Austin Station.
VSR 22	Phase 1A of the Park	■ Except the southern part of the waterfront promenade, the site of Phase 1A of the Park currently has been left vacant, ■ The MTR ventilation building is located within the site of Phase 1A of the Park. ■ It is located in the southern part of the headland of the Park and the visitors to Phase 1A of the Park are hardly able to see the site.
VSR 23	Phase 1 of Xiqu Centre	■ The site of the Xiqu Centre is located adjacent to the intersection of Canton Road and Austin Road West. ■ It is located to the east of the access point of the underpass road at Austin Road West and to the north of its access point at Canton Road. The visitors to Phase 1 of Xiqu Centre are hardly able to see the site.

Key VSRs	Brief Descriptions of the VSRs and the existing views
	■ Due to the delayed relocation of the Tsim Sha Tsui Fire Station, the access point at Canton Road will not be constructed until after relocation of the Fire Station during construction phase. ■ XIqu Centre will be completed 2 months before the completion of the underpass road.

Sensitivity of VSRs

The sensitivity of the VSRs depends on the location of VSRs, the distance from the site, the degree of visibility, and the type of VSR which determines the duration and frequency of views.

The sensitivity of residential VSRs nearby is considered to be high, since they will have direct and frequent views towards the site. The sensitivity of commercial and institutional VSRs is generally considered to be medium, as their views to the site are shorter in duration and less in frequency. Open space VSRs generally have low sensitivity because of medium duration and occasional frequency of their stay. Travellers travelling on the roads in the periphery of the WKCD such as Austin Road West and Canton Road have low sensitivity, because their views are transient in nature.

The baseline assessment of the existing VSRs and the planned VSRs within the Visual Envelope is shown in **Table 14.10.8**.

Table 14.10.8: Sensitivity of the VSRs

Type of VSRs	VSRs	Name of VSRs	Viewing Distance (m) (approx.)	Estimated Number of Individuals/ Receiver Population (Many /Medium /Few)	Type of VSRs	Quality of Existing View	Availability of Alternative Views	Degree of Visibility	Duration (Long/ Medium/ Short) and Frequency of View (Frequent/ Occasional/Rare)	Sensitivity (Low/ Medium/ High)
CDA	VSR 1	International Commerce Centre (ICC)	90m	Many	View from commercial development (ie. offices and hotel) (workers/ hotel guests)	Good	Medium availability	Open view	Long/ Occasional	Medium to High
CDA	VSR 2	The Elements	65m	Many	View from commercial development (ie. shopping mall) (workers/ visitors)	Good	Limited availability	Open view	Short/Occasional	Medium to High
CDA	VSR 3	The Harbourside	80m	Many	View from residential development (Residents)	Good	Limited availability	Open view	Long/ Frequent	High
CDA	VSR 4	The Arch	95m	Many	View from residential development (Residents)	Good	Limited availability	Open view	Long/ Frequent	High
CDA	VSR 5	West Kowloon Terminus	30m	Many	View from transportation facility (Travellers)	Medium	Medium availability	Partial view	Short/Occasional	Medium
CDA	VSR 6	Planned CDA Development above West Kowloon Terminus	30m	Many	View from commercial development (ie. offices) (workers)	Good	Limited availability	Partial view	Long/ Occasional	Medium
T	VSR 7	Austin Station	75m	Many	View from transportation facility (Workers and travellers arriving Austin Station)	Medium	Medium availability	Partial view	Short/Occasional	Medium
R	VSR 8	Planned Residential Development above Austin Station	75m	Many	View from residential development (Residents)	Good	Limited availability	Partial view	Long/ Frequent	High
T	VSR 9	Travellers arriving Western Harbour	140m	Many	Travellers arriving the Toll Plaza	Good	Limited availability	Partial/ No view	Short/Frequent	Low

Type of VSRs	VSRs	Name of VSRs	Viewing Distance (m) (approx.)	Estimated Number of Individuals/ Receiver Population (Many /Medium /Few)	Type of VSRs	Quality of Existing View	Availability of Alternative Views	Degree of Visibility	Duration (Long/ Medium/ Short) and Frequency of View (Frequent/ Occasional/Rare)	Sensitivity (Low/ Medium/ High)
		Crossing Toll Plaza								
R	VSR 10	Wai Hang Building	80m	Many	View from residential development (Residents)	Medium	Medium availability	Partial view	Long/ Frequent	Medium to High
R	VSR 11	The Victoria Tower	40m	Many	View from residential development (Residents)	Good	Limited availability	Open view	Long/ Frequent	High
C	VSR 12	China Hong Kong City	40m	Many	View from commercial development (ie.shopping mall and transportation facility) (Visitors and Workers)	Good	Medium availability	Open view	Long (Staff)/ Short (Visitors) Occasional	Medium to High
C	VSR 13	Royal Pacific Hotel and Towers	130m	Many	View from commercial development (ie. hotel) (Workers/ Hotel Guests)	Medium	Medium availability	Partial view	Long/Occasional	Medium to High
C	VSR 14	Gateway Hong Kong	250m	Many	View from commercial development (ie. offices) (Workers)	Good	Medium availability	Partial view	Long (Staff)/ Short (Visitors) Occasional	Medium to High
OU	VSR 15	Hong Kong China Ferry Terminal	220m	Many	View from transportation facility (Workers/ Visitors)	Good	Medium availability	Open view	Long (Staff)/ Short (Visitors) Frequent	Medium
GIC	VSR 16	Lai Chack Middle School	35m	Medium	View from GIC facility (Students and Workers)	Fair	Good availability	No view (before Tsim Sha Tsui fire station is relocated)	Medium/ Occasional	Low
GIC	VSR 17	Canton Road	35m	Medium	View from GIC facility	Fair	Good	No view	Medium	Low

Type of VSRs	VSRs	Name of VSRs	Viewing Distance (m) (approx.)	Estimated Number of Individuals/ Receiver Population (Many /Medium /Few)	Type of VSRs	Quality of Existing View	Availability of Alternative Views	Degree of Visibility	Duration (Long/ Medium/ Short) and Frequency of View (Frequent/ Occasional/Rare)	Sensitivity (Low/ Medium/ High)
		Government Primary School			(Students and Workers)		availability	(before Tsim Sha Tsui fire station is relocated)	/Occasional	
O	VSR 18	King George V Memorial Park, Kowloon	155m	Medium	View from open space (Visitors and Pedestrians)	Fair	Good availability	Partial view	Medium /Occasional	Low
T	VSR 19	Travellers along Austin Road West	Varies	Medium	View from transient VSRs (Passengers/ Pedestrians and other Road Users)	Medium	Medium availability	Glimpse view	Short/Occasional	Low
T	VSR 20	Travellers along Canton Road	Varies	Many	View from Transient VSRs (Passengers/ Pedestrians and other Road Users)	Fair	Good availability	Glimpse view	Short/Occasional	Low
OU	VSR 21	Tsim Sha Tsui Fire Station	N/A	Medium	View from GIC facility (Workers)	Good	Limited availability	Open view	Medium/ Occasional	Medium
O	VSR 22	Phase 1A of the Park	325m	Medium	View from open space (Visitors and Pedestrians)	Fair	Good Availability	Partial view	Medium /Occasional	Low
OU	VSR 23	Phase 1 of Xiqu Centre	75m	Medium	View from arts and cultural facility (Visitors and Workers)	Fair	Good Availability (view to the intersection of Canton Road and Austin Road West	Partial View Open view	Medium /Occasional	Low to Medium

Type of VSRs	VSRs	Name of VSRs	Viewing Distance (m) (approx.)	Estimated Number of Individuals/ Receiver Population (Many /Medium /Few)	Type of VSRs	Quality of Existing View	Availability of Alternative Views	Degree of Visibility	Duration (Long/ Medium/ Short) and Frequency of View (Frequent/ Occasional/Rare)	Sensitivity (Low/ Medium/ High)
							Limited availability (view to the Victoria Harbour)			

Notes: Type of VSRs - R: residential, C: commercial; CDA: Comprehensive Development Area; GIC: Government, Institution or Community; O: open space; OU; other specified uses; T: transient.

14.10.5 Evaluation and Assessment of Landscape and Visual Impacts

14.10.5.1 Landscape Impact Assessment

Source of Landscape Impacts

Landscape impacts arise due to the construction of the proposed underpass road. During construction phase, removal and disturbance of existing trees, excavation works, disposition of the excavated materials and the associated construction activities with the underpass road are the main sources of the impact, while the operation of the proposed underpass road is the main concerns during operation phase.

Potential sources of impacts on LRs and LCAs during construction and operation phase are summarized in **Table 14.10.9**:

Table 14.10.9: Source of impacts during construction and operation phase

Landscape Impacts	
Construction Phase (Direct Impacts)	
LC1-1	Construction of the underpass road and associated works
LC1-2	Removal and disturbance of existing trees
LC1-3	Relocation of Tsim Sha Tsui Fire Station
Construction Phase (Indirect Impacts)	
LC1-4	Construction traffic
LC1-5	The laying down of utilities, including water, drainage and power,
LC1-6	Temporary site access, site cabins, material storage and heavy machinery,
Operation Phase Impacts	
LO1-1	Operation of the new underpass road

Magnitude of Change of LRs and LCAs

The magnitude of change, before implementation of mitigation measures, on landscape resources and landscape character areas that would occur in the construction and operation phase are summarized in **Table 14.10.10** and **Table 14.10.11** respectively.

Note that only the landscape resources (Open Space: LR1.7; Amenity Planting: LR2.9 and LR2.36) and landscape characters area (LCA01 to LCA03, LCA10 and LCA14) which are affected by proposed underpass road will be assessed with magnitude of changes. Some landscape resources (Open Space: LR1.1, LR1.4 to LR1.6, LR1.8 and LR1.15; Amenity Planting: LR2.1 to LR2.3, LR2.5 to LR2.8, LR2.10 to LR2.11, LR2.13 to LR2.17, LR2.27 to LR2.35; LR2.37 and LR2.38; Water Body: LR3.1; Human Landscape Resources – Cultural Heritage and Historical Features: LR4.1 to LR4.4) and landscape character area (LCA04 to LCA13), which are not affected by proposed underpass road, are omitted in the assessment since they are insubstantially impacted and have no source of impact.

Table 14.10.10: Impacts on landscape resources during construction and operation phase

LR No.	Landscape Resources	Compatibility of the project with the surrounding landscape (Low/ Medium/ High)	Reversibility (Low/ Medium/ High)	Scale of Development (Small / Medium / Large)	Source of Impact		Description of Impacts	Duration of Impact under construction and operation phases (Short/ Long)	Magnitude of change (Negligible, Small, Intermediate, Large)	
					Construction Phase	Operation Phase			Construction Phase	Operation Phase
LR1: Open Space										
LR1.7	Temporary open space along the waterfront promenade within the site boundary	Medium	Medium	Small	LC1-1, LC1-2, LC1-4 to, LC1-6	LO1-1	Due to the construction works, excavation works and interim works of the underpass road, there will be loss of approximately 0.03ha temporary open space to the public in the construction stage. Affected area consists of parts of the road and cycling track with associated street planting leading towards the temporary waterfront promenade. In the operation phase, affected area of the landscape resource will be reinstated as part of the Park with the provision of open space for public enjoyment above ground and become part of the underpass road underneath.	Short	Small	Small
LR2: Amenity Planting										
LR2.9	Roadside Plantation in front of Tsim Sha Tsui Fire Station	Medium	Medium	Medium	LC1-1 to LC1-6	LO1-1	There are 15 roadside trees will be affected due to the construction of underpass road before 2025 for the relocation of Tsim Sha Tsui Fire Station. 12 trees, with poor form/ health or weed species, are proposed to be felled while 3 trees are proposed to be transplanted. Also, all trees may be affected by the construction of other WKCD facilities before the LC1-3, tree preservation works for all these trees (15 nos) will be carried out. In the operation	Long	Intermediate	Intermediate

LR No.	Landscape Resources	Compatibility of the project with the surrounding landscape (Low/ Medium/ High)	Reversibility (Low/ Medium/ High)	Scale of Development (Small / Medium / Large)	Source of Impact		Description of Impacts	Duration of Impact under construction and operation phases (Short/ Long)	Magnitude of change (Negligible, Small, Intermediate, Large)	
					Construction Phase	Operation Phase			Construction Phase	Operation Phase
							phase, this LR will become one of the main entrance and pedestrian walkway to the WKCD and become one of the entrance of underpass road underneath.			
LR2.36*	Tree Cluster in the Eastern Part within the Boundary Area	Low	Low	Medium	LC1-1, LC1-2, LC1-4 to, LC1-6	LO1-1	Although there are 372 trees in this LR, only 30 trees with grassland (~0.08 ha) will be affected. 30 trees will be felled and grassland (~0.8ha) will be removed from the site. Other 342 trees in this LR with no direct conflict with construction of underpass road will be retained in situ. All felled trees are ubiquitous species and can be easily replaceable by new planting with better quality or weed species. During operation phase, this LR will become part of the Park and Avenue and become part of the underpass road underneath.	Long	Intermediate	Intermediate

*Note that some trees located in LR2.36 are currently being relocated to areas around LR2.31 by LCSD, hence the actual tree numbers are subject to futher changes.

Table 14.10.11: Impacts on landscape character areas during construction and operation phase

LCA. No.	Landscape Resources	Compatibility of the project with the surrounding landscape (Low/ Medium/High)	Reversibility (Low/ Medium/High)	Scale of Development (Small / Medium/ Large)	Source of Impact		Description of Impacts	Duration of Impact under construction and operation phases (Short/Long)	Magnitude of change (Negligible, Small, Intermediate, Large)	
					Construction Phase	Operation Phase			Construction Phase	Operation Phase
LCA01	West	Medium	Medium	Medium	LC1-1, LC-	LO1-1,	Approximately 0.39ha of this LCA will	Long	Intermed-	Intermed-

LCA. No.	Landscape Resources	Compatibil-ity of the project with the surrounding landscape (Low/ Medium/High)	Reversibil-ity (Low/ Medium/High)	Scale of Develop-ment (Small / Medium/ Large)	Source of Impact		Description of Impacts	Duration of Impact under construction and operation phases (Short/Long)	Magnitude of change (Negligible, Small, Intermediate, Large)	
					Construct-ion Phase	Operatio n Phase			Construct-ion Phase	Operation Phase
	Kowloon Cultural District Landscape Character Area				1-2, LR1-4 to LC1-6		be affected by the construction works, excavation works and interim works for the underpass road, which will result in existing trees to be felled and incompatibility to LCA. There are total 100 trees (in LR2.36) in this LCA, of which 10 trees with grassland (~0.03ha) affected by the construction of underpass road will be felled, other 90 trees with no direct conflicts with the construction of underpass road will be retained in situe.		iate	iate
LCA02	West Kowloon Cultural District Construction Area	Medium	Medium	Large	LC1-1, LC-1-2, LR1-4 to LC1-6	NA	Approximately 3.65ha of this LCA will be affected by the construction works, excavation works and interim works for the underpass road will result in existing tree to be felled and incompatibility to the LCA. There are total 272 trees (in LR2.36) in this LCA, of which 20 trees with grassland (~0.05ha) will be felled and 252 trees with no direct conflicts with the construction of underpass road will be retained in situ.	Long	Intermed-iate	Intermediat e
LCA03	West Kowloon Cultural District Temporary Waterfront	Medium	Medium	Small	LC1-1 to LC1-2, LR1-4 to LC1-6	NA	Approximately 0.03ha of this LCA will be affected by the construction works, excavation works and interim works for the underpass road will result in loss of small portion of (~0.03ha) temporary open space in LR 1.7 to the public in the construction stage and incompatibility to the LCA.	Short	Small	Small
LCA10	Guangzhou-Shenzhen-	Medium	Medium	Small	LC1-1, LR1-4 to	LO1-1,	Approximately 0.06ha of this LCA will be affected by the construction works,	Small	Small	Small

LCA. No.	Landscape Resources	Compatibil-ity of the project with the surrounding landscape (Low/ Medium/High)	Reversibil-ity (Low/ Medium/High)	Scale of Develop-ment (Small / Medium/ Large)	Source of Impact		Description of Impacts	Duration of Impact under construction and operation phases (Short/Long)	Magnitude of change (Negligible, Small, Intermediate, Large)	
					Construct-ion Phase	Operatio n Phase			Construct-ion Phase	Operation Phase
	Hong Kong Express Rail Link (XRL) Terminus Construction Site and Austin Station				LC1-6		excavation works and interim works for the underpass road will result incompatibility to the LCA.			
LCA14	Tsim Sha Tsui Commercial/ Retail Complex Landscape	Medium	Medium	Medium	LC1-1 to LR1-6	LO1-1	Approximately 0.24 ha of this LCA will be affected by the construction works, excavation works and interim works for the underpass road will result existing trees to be felled (12 nos.) and to be transplated (3 nos.) in LR2.9 (total 15 trees) and incompatibility to the LCA. Also, all trees may be affected by the construction of other WKCD facilities before LC1-3, tree preservation works for all trees will be carried out.	Long	Intermed-iate	Intermed-iate

Landscape Impacts to LRs during Construction and Operation Phase (Before Mitigaiton)

The significance of landscape impact is a function of the sensitivity of the affected landscape receptors and the magnitude of change that they will experience. The major landscape impact that will arise from the proposed development is the existing trees would be felled within WKCD site boundary during construction phase.

In summary, it is anticipated that affected Landscape Resources during construction and operation phase are LR1.7, LR2.9, LR2.36. Those LRs with insubstantial impact are not elaborated in details.

The significant of landscape impacts, before implementation of mitigation measures, to Landscape Resources, in the construction and operation phase are assessed and presented in **Table 14.10.19**. The significance of unmitigated impacts on landscape resources would vary from *slight adverse* to *moderate adverse*.

Impact on LR1 Open Space

LR 1.7 – Temporary open space along the waterfront promenade within the site boundary

It is a temporary open space with *medium sensitivity*. During construction phase, excavation works and interim works of the underpass road will result the temporary loss of public open space (~0.03ha). Affected area consists of parts of the road and cycling track with associated street planting leading towards the temporary waterfront promenade. However, as the affected area is relatively small (~0.03ha), which magnitude of change due to construction of underpass road is considered as *small* and the resultant unmitigated impact during construction and operation phase is *slight adverse*.

Impact on LR2 Amenity Planting

LR2.9 – Roadside Plantation in front of Tsim Sha Tsui Fire Station

15 roadside trees are the key resources of this LR. Trees found are common species with medium amenity value and fair condition. The sensitivity of this LR is *medium*. During construction phase, excavation works and interim works of the underpass road will result the which 12 trees will be felled, including 1 large tree *Ficus microcarpa,* and 3 trees will be transplanted before 2025 for the relocation of Tsim Sha Tsui Fire Station. Tree species to be affected include *Acacia confusa*, *Aleruites moluccana*, *Ficus elastica, Ficus microcarpa*, *Macaranga tanarius*, *Litsea glutinosa*, *Clausema lansium* and *Morus alba*. Magnitude of change due to the construction of underpass road is considered as *intermediate* and the resultant unmitigated impact during construction and operation phase is *moderate adverse*.

LR2.36 – Tree Cluster in the Eastern Part within the Boundary Area

Tree cluster (372 nos.), with medium amenity value and poor to fair condition, and grassland are found scattered in the eastern part within the boundary area. Their sensitivity is considered as *medium*. Although there are 372 trees in this LR, only 30 trees with grassland (~0.08 ha) will be affected. These 30 trees will be felled and grassland (~0.08ha) will be removed from site. Other 342 trees in this LR, with no direct conflict with construction of underpass road, will be retained in situ. All felled trees are ubiquitous species and can be easily replaceable by new planting with better quality or weed species, magnitude of change is

considered as *intermediate* and the resultant unmitigated impact during construction and operation phase is *moderate adverse*.

Impact on Existing Tree

For LRs, approximately 387 trees (15 trees in LR2.9 and 372 trees in LR2.36) will be affected within the site boundary due to the construction of underpass road, of which 42 trees (12 trees in LR2.9 and 30 trees in LR2.36) with self-seed species and/or poor health and tree form are proposed to be felled, 3 trees (in LR2.9) with fair health condition and tree form and medium amenity value, are proposed to be transplanted within the site and 342 trees (in LR2.36), with no direct conflicts with the construction of underpass road, are proposed to be retain in situ.

Affected tree species include *Acacia auriculiformis, Acacia confusa, Aleurities moluccana, Casuarina equisetifolia, Celtis sinensis, Clausena lansium, Ficus microcarpa, Ficus elastica, Ficus virens, Hibiscus tiliaceus, Leucaena leucocephala, Litsea glutinosa, Macaranga tanarius, Melia azedarach* and *Morus alba*. The majority of tree species affected is self-seeded weed *Leucaena leucocephala*. The condition of the tree range from poor to fair. Amenity value range from low to medium.

Landscape Impacts to LCAs during Construction and Operation Phase (Before Mitigation)

In summary, it is anticipated that affected Landscape Character Area (~4.37ha) during construction and operation phase of the underpass road are LCA01 to LCA03, LCA10 and LCA14. The major landscape impacts to the affected LCAs(LCA-1 to LCA03, LCA10 and LCA14) are the existing trees would be felled and the incompatibility of construction works of underpass road to the LCAs.

The significant of landscape impact, before implementation of mitigation measures, to Landscape Character Area, in the construction and operation phases are assessed and presented in Table 14.10.20. The significant of unmitigated impacts on landscape character area would value from *slight adverse* to *moderate adverse*.

LCA01 West Kowloon Cultural District Landscape Character Area

This LCA is still a vacant land reserved for WKCD development, which has no direct or regional significance. The sensitivity of this LCA is *low* during construction and operation phase of the underpass road. Approximately 0.39ha of this LCA will be affected by the construction works, excavation works and interim works for the underpass road, which will result in existing trees will be felled and incompatibility to the LCA. There are total 100 trees (in LR2.36) in this LCA, of which 10 trees with grassland (~0.03ha) will be felled and 90 trees with no direct conflicts with the construction of underpass road will be retained in situ. Magnitude of change to this LCA is considered as *intermediate* and the resultant unmitigated impact during construction and operation phase is *moderate adverse*.

LCA02 West Kowloon Cultural District Construction Area

This area is currently under site formation and underground struction works, which has no district or regional significance. The sensitivity of the LCA is *low*. 3.65 ha of this LCA will be affected by the construction of underpass road, which will result to the existing trees will be felled and incompatibility to the LCA. There are total 272 trees (in LR2.36) in this LCA, of which 20 trees will be felled with grassland (~0.05ha) and 252 trees with no direct conflicts with the construction of underpass road will be retained in

situ. The magnitude of change to this LCA is considered as *intermediate* and the resultant unmitigated impact during construction and operation phase is *moderate adverse*.

LCA03 West Kowloon Cultural District Temporary Waterfront Promenade

This area is currently a temporary open space opened to the public and allow activities along the waterfront, as this LCA is temporary, which has no district or regional significance, the sensitivity of the LCA is considered as low. Approximately 0.03ha of this LCA will be affected by the construction works, excavation works and interim works for the underpass road will result in loss of small portion of (~0.03ha) temporary open space in LR 1.7 to the public in the construction stage and incompatibility to the LCA.. As the extent of the affected area by the construction of underpass road is relatively small, magnitude of change to this LCA is considered as *small* and the resultant unmitigated impact during construction and operation phase is *slight adverse*.

LCA10 Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) Terminus Construction Site and Austin Station

This LCA is an important public transport interchange and will provide a large extent of public green space linking to the WKCD. This LCA is currently under construction of the XRL terminus, which has no distict or regional significance, the sensitivity is considered as low. Approximately 0.06ha of this LCA will be affected by the construction works, excavation works and interim works for the underpass road will result incompatibility to the LCA.. As the extent of the affected area by the construction of underpass road is relatively small, magnitude of change to this LCA is considered as *small* and the resultant unmitigated impact during construction and operation phase is *slight adverse*.

LCA14 Tsim Sha Tsui Commercial/ Retail Complex Landscape

This LCA is predominantly of commercial and retail land uses and comprises mainly high rise buildings, which minor district and regional significance, the sensitivity of this LCA is *medium*. Approximately 0.24 ha of this LCA will be affected by the construction works, excavation works and interim works for the underpass road will result existing tree to be felled (12 nos.) and to be transplanted (3 nos.) in LR2.9 (total 15) and incompatibility to the LCA. Also, all trees may be affected by the construction of other WKCD facilities before LC1-3, tree preservation works for all trees will be carried out. Magnitude of change to this LCA is considered as *intermediate*. The unmitigated landscape impact to this LCA is *moderate adverse*.

14.10.5.2 Visual Impact Assessment

The assessment of the significance of visual impacts is based on a combination of factors, including the sensitivity of the VSRs, their magnitude of change and whether impacts are beneficial or adverse, short term or long term, reversible or irreversible and direct or indirect. The future outlook of the area, visual compatibility of the associated structures of the underpass road project with the surroundings, and its obstruction and interference with key views of the VSRs are important considerations for the visual impact assessment.

Sources of Visual Impacts during Construction Phase

Major impacts including degrading of visual quality of existing views, and visual incompatibility of the works and the associated above ground external structures with the surrounding visual context, will be resulted from the following activities during construction phase (shown in **Table 14.10.12**). In addition to the

construction activities mentioned above, night time lighting provided for the construction activities could be one of the sources of visual impacts during construction phase. However, the visual impacts derived by these sources are mostly temporary.

Table 14.10.12: Sources of Visual Impacts during Construction Phase

Sources of Direct Visual Impacts	
DVIC1	Construction of underground roads and associated various above-ground external structures such as ventilation shafts
DVIC2	Night time lighting for the construction activities.
Sources of Indirect Visual Impacts	
IVIC1	Construction traffic
IVIC2	Various construction activities including operation of PME, excavations and road diversions etc.
IVIC3	Site cabins and heavy machinery
IVIC4	Dust during dry weather

Sources of Visual Impacts during Operation Phase

The impacts during operation phase depend on visual compatibility of the associated structures to the surrounding landscape due to the operation of underpass roads serving the proposed WKCD development.

As the temporary ventilation shafts associated with the underpass road will still be present upon the completion of the underpass road, these structures will be the major source of visual impacts during operation phase (day 1).

However, during operation phase (year 10), these ventilation shafts will be integrated with the WKCD development and it will not be visible as individual structures. The WKCD buildings will be well designed to visually hide the ventilation shafts. Accordingly, the operation of roads and traffic generated is the major source of the visual impacts during operation phase (year 10).

In addition to erection of ventilation buildings and structures, operation of roads and traffic generated, night time lighting provided for illumination of the underpass roads and its structures could be one of the sources of visual impacts during operation phase. Sources of the visual impacts during operation phase are listed in **Table 14.10.13**.

Table 14.10.13: Sources of Visual Impacts during Operation Phase (Day 1 and Year 10)

Sources of Direct Visual Impacts	
DVIO1	Erection of temporary standalone ventilation shafts associated with the underpass road during operation phase (Day 1)
DVIO2	Operation of roads during operation phase (day 1 & year 10)
DVIO3	Night time lighting for illumination of the underpass roads and its structures (during operation phase (day 1 & yar 10)
Sources of Indirect Visual Impacts	
IVIO1	Traffic generated during operation phase (day 1 & year 10)

Magnitude of Change of the VSRs

The factors determining the magnitude of impacts include scale of development, compatibility of the project with the surrounding landscape, reversibility of change, viewing distance, potential blocking of view, duration of impacts under construction and operation phases. The magnitude of impact/change, before the implementation of mitigation measures, on the VSRs during construction and operation phases are shown in **Table 14.10.14**.

Given that the duration of impacts is relatively short during construction phase, the magnitude of change of the VSRs mainly depends on the viewing distance and potential blocking of view by the Project. Since there will be a number of construction activities within the WKCD site during construction phase, the construction activities of the Project will appear part of the construction activities of the WKCD. The magnitude of change of many of the VSRs such as the residential developments located to the north and the west of the site is considered to be moderate during construction phase.

The magnitude of change of all VSRs ranges from negligible to small during operation phase.

During operation phase (day 1), temporary ventilation shafts associated with the underpass road will be the major source of visual impact. However, these structures will be only present temporarily. Due to the short duration of impacts, small structures, high reversibility of change and low potential blocksage of the view, it is considered that the magnitude of change of the VSRs range from negligible to small during operation phase.

During operation phase (year 10), the ventilation shafts associated with the underpass road will be integrated with the entire development and form part of the physical buildings of the WKCD development. The WKCD buildings will be well designed to visually hide the ventilation shafts and they will no longer be visible as individual structures. In addition to the hidden location of these ventilation shafts, well designed louvre system / ventilated facade will be used for screening these ventilation shafts. Accordingly, the magnitude of change of the VSRs is generally small or even negligible. The location and sections of notional louvres within the buildings at the WKCD is shown in **Figures 14.10.12**.

Since views to the site from VSR 16 Lai Chack Middle School and VSR 17 Canton Road Government Primary School are largely blocked by Tsim Sha Tsui fire station before it is removed, the magnitude of change of VSR 16 and VSR 17 is negligible during construction phase. After the removal of Tsim Sha Tsui fire station, it is considered that magnitude of change of VSR 16 and VSR 17 during operation phase is small, due to the project is highly compatible with surrounding landscape

Table 14.10.14: Magnitude of Change of the VSRs

VSRs		Viewing distance (m) approx.	Potential blocking of view (Full/Partial/ Slight/None)	Reversibility (Yes/No)	Compatibility of the proposed project with the surrounding landscape During construction/ operation phases (High/Medium/Low)	Scale of the proposed development (large/small)	Duration of impacts during construction/ operation phases	Magnitude of change	
								During construction phase	During operation phase
VSR 1	International Commerce Centre (ICC)	90m	Slight	Yes	Medium/ High	Small	Short/ Permanent	Moderate	Small
VSR 2	The Elements	65m	Partial to Full	Yes	Medium/ High	Small	Short/ Permanent	Moderate to Large	Small
VSR 3	The Harbourside	80m	Slight	Yes	Medium/ High	Small	Short/ Permanent	Moderate	Small
VSR 4	The Arch	95m	Slight	Yes	Medium/ High	Small	Short/ Permanent	Moderate	Small
VSR 5	West Kowloon Terminus	30m	Partial	Yes	Medium/ High	Small	Short/ Permanent	Moderate	Small
VSR 6	Planned CDA Development above West Kowloon Terminus	30m	Slight	Yes	Medium/ High	Small	Short/ Permanent	Moderate	Small
VSR 7	Austin Station	75m	Partial	Yes	Medium/ High	Small	Short/ Permanent	Moderate	Small
VSR 8	Planned Residential Development above Austin Station	75m	Slight	Yes	Medium/ High	Small	Short/ Permanent	Moderate	Small
VSR 9	Travellers arriving Western Harbour Crossing Toll Plaza	140m	None	Yes	Medium/ High	Small	Short/ Permanent	Negligible	Negligible
VSR 10	Wai Hang Building	80m	Partial	Yes	Medium/ High	Small	Short/ Permanent	Moderate	Small
VSR 11	The Victoria Tower	40m	Partial	Yes	Medium/ High	Small	Short/ Permanent	Moderate	Small
VSR 12	China Hong Kong City	40m	Slight	Yes	Medium/ High	Small	Short/ Permanent	Small	Negligible

VSRs		Viewing distance (m) approx.	Potential blocking of view (Full/Partial/ Slight/None)	Reversibility (Yes/No)	Compatibility of the proposed project with the surrounding landscape During construction/ operation phases (High/Medium/Low)	Scale of the proposed development (large/small)	Duration of impacts during construction/ operation phases	Magnitude of change	
								During construction phase	During operation phase
VSR 13	Gateway Hong Kong	250m	Slight	Yes	Medium/ High	Small	Short/ Permanent	Small	Negligible
VSR 14	Harbour City and Ocean Centre	645m	Slight	Yes	Medium/ High	Small	Short/ Permanent	Small	Negligible
VSR 15	Hong Kong China Ferry Terminal	220m	Slight	Yes	Medium/ High	Small	Short/ Permanent	Small	Negligible
VSR 16	Lai Chack Middle School	135m	None	Yes	Medium/ High	Small	Short/ Permanent	Negligible	Small
VSR 17	Canton Road Government Primary School	135m	None	Yes	Medium/ High	Small	Short/ Permanent	Negligible	Small
VSR 18	King George V Memorial Park, Kowloon	155m	None	Yes	Medium/ High	Small	Short/ Permanent	Negligible	Negligible
VSR 19	Travellers along Austin Road West	Varies	Partial	Yes	Medium/ High	Small	Short/ Permanent	Moderate	Small
VSR 20	Travellers along Canton Road	Varies	Partial	Yes	Medium/ High	Small	Short/ Permanent	Moderate	Small
VSR 21	Tsim Sha Tsui Fire Station	N/A	Partial to Full	Yes	Medium/ High	Small	Short/ N/A	Moderate to Large	N/A
VSR 22	Phase 1A of the Park	325m	None	Yes	Medium/ High	Small	Short/ Permanent	Negligible	Negligible

VSRs		Viewing distance (m) approx.	Potential blocking of view (Full/Partial/ Slight/None)	Reversibility (Yes/No)	Compatibility of the proposed project with the surrounding landscape During construction/ operation phases (High/Medium/Low)	Scale of the proposed development (large/small)	Duration of impacts during construction/ operation phases	Magnitude of change	
								During construction phase	During operation phase
VSR 23	Phase 1 of Xiqu Centre	75m	Partial to Full	Yes	Medium/ High	Small	Short/ Permanent	N/A*	Small

*Notes: As completion date for basement associated with underpass road is in late February 2016, Xiqu Centre will be completed 2 months before the completion of the underpass road. It is anticipated that the future VSRs at Xiqu Centre may not have direct viewover the underpass road during construction phase. Hence, the assessment of visual impacts on Xiqu Centre during construction phase could not be provided.

Prediction and Evaluation of Visual Impacts

Visual Impacts during Construction Phase (Before Mitigation)

During construction phase, the unmitigated visual impacts are adverse in nature and mainly include visual incompatibility of the construction works with the surroundings and degrading of visual quality of existing views.

During construction phase, the visual impacts will be generally derived by some construction activities and the above ground external ancillary structures (e.g. ventilation shafts) within the site. There will be 22 ventilation shafts for the basement associated with the underpass road located within the site, and their height is ranged from 7 to 15m, which are about 2 to 4 storeys high. Section of the stand alone ventilation shafts for the underpass road and other completed buildings located within the WKCD site during transition period is provided in **Figure 14.10.11**, showing the number and the location of the ventilation shafts that will be seen from the south of the site during construction phase.

Comparing to the scale of the proposed WKCD development, the scale of the Project is small. The construction activities of the Project mainly would pose visual impact on the VSRs at ground and lower levels. Since the sensitivity of the residential developments located to the north and the east of the site is high, the visual impacts posed on these residential VSRs are generally moderate to high before mitigation. However, the visual impacts posed on the commercial developments located to the southeast of the site are generally slight to moderate due to its medium sensitivity.

Visual Impacts during Operation Phase (Before Mitigation)

As the underpass road will be completed before most of the other future developments within the WKCD are completed, the 22 ventilation shafts associated with the underpass road will be still present during operation phase (day 1). Major unmitigated visual impacts during operation phase (day 1) are visual incompatibility of these temporary ventilation shafts with the surroundings. However, it is temporary. Since the scale of the Project is localised, VSRs to be affected will be confined to those in the surroundings of the Project and the visual impacts derived by these ventilation shafts are generally slight.

During operation phase (year 10), the ventilation shafts will be integrated with the entire WKCD development and form part of the physical buildings of the WKCD development. The CACF buildings will be well designed to visually hide the ventilation shafts associated with the underpass road and they will no longer be visible as individual structures. In addition to the hidden location of these ventilation shafts, well designed louvre system / ventilated facade will be used for screening the ventilation shafts. The notional louvre locations and the sections of the WKT and WKCD louvres within the building are provided in **Figure 14.10.12**.

As the Project mostly consisted of underground structures and all of the ventilation shafts will no longer be visible as individual structures during operation phase (year 10), the potential visual impacts derived by the Project on most of the VSRs are considered to be slight.

However, some VSRs abutting the entrance of the underground roads such as VSR 2 (The Elements) and VSR 7 (Austin Station) will have slight to moderate visual impacts during operation phase (both day 1 and year 10).

The visual impacts identified for each VSR are shown at **Table 14.10.15 and 14.10.16**. The mitigation measures proposed to lessen the visual impacts derived by the sources mentioned above during construction phase and operation phase (day 1 and year 10) are described in **Section 14.10.6**.

Night Time Visual Impacts due to the Project

In addition to the sources of the visual impacts mentioned above, night time lighting is also one of the sources of the visual impacts.

Major considerations for the night time visual impacts are the scope of the Project, the light sources in the surrounding areas of the site, distance between the VSRs and the site, sensitivity of the VSRs and the blockage of light by any buildings and structures.

As the underpass road is located mainly on the WKCD Basement Level 1 (between 0.6mPD and 1.65 mPD), except at the vehicular access points where the underpass road connects to existing ground level roads adjacent to the WKCD site, it is considered that the night time visual impacts arising from the Project during construction and operation phases are insignificant to the VSRs located to the south and to the west of the WKCD Site.

Due to the existing night time illumination already prevalent in the West Kowloon urban area, the night time lighting from the Project will be compatible with the existing urban setting. It is also expected that the night time illumination for WKCD development is even more prevalent than that for the Project during operation phase (year 10). Accordingly, it is considered that the night time visual impacts arising from the Project during construction and operation phases are acceptable to the residential VSRs to the north and to the east of the project site and other VSRs nearby.

The visual impacts derived from night time light could be reduced by mitigation measures such as avoidance of lighting from spilling onto nearby residential developments, and this will be discussed in **Section 14.10.6.3**.

Table 14.10.15: Significance Threshold of Visual Impact Before and After Mitigation Measures (Construction Phase)

VSRs	Name of VSRs	Location of VSRs	Type & Approximate Number of VSRs	Description of Existing View & Degree of Visibility of DP	Receiver's Sensitivity	Source of Impact	Minimum Viewing Distance of VSRs	Magnitude of Change	Significance Threshold of Potential Visual Impact (Before Mitigation)	Mitigation Measures	Significance Threshold of Residual Impact (Upon Mitigation) Construction Phase
VSR 1	International Commerce Centre (ICC)	Located immediately to the north of the site	■ Commercial ■ Many	■ Existing view comprises the dense vegetation at the entrance of the WHC and the construction site of the WKCD. ■ Open and close view of the site can be seen.	Medium to High	DVIC1, DVIC2, IVIC1, IVIC2, IVIC3	90m	Moderate	Moderate to High	MMC1, MMC2, MMC3, MMC4, MMC5.	Moderate
VSR 2	The Elements	Located immediately to the north of the site	■ Commercial ■ Many	■ Existing view comprises the construction site of the WKCD. ■ Open and close view of the site can be seen.	Medium to High	DVIC1, DVIC2, IVIC1, IVIC2, IVIC3, IVIC4	65m	Moderate to Large	Moderate to High	MMC1, MMC2 MMC3, MMC4, MMC5.	Moderate
VSR 3	The Harbourside	Located immediately to the north of the site	■ Residential ■ Many	■ Existing view comprises the construction site of the WKCD. ■ Open and close view of the site can be seen.	High	DVIC1, DVIC2, IVIC1, IVIC2, IVIC3	80m	Moderate	Moderate to High	MMC1, MMC2, MMC3, MMC4, MMC5.	Moderate
VSR 4	The Arch	Located immediately to the north of the site and to the west of the junction of Austin Road West and Lin Cheung Road	■ Residential ■ Many	■ Existing view comprises the construction site of the WKCD and the West Kowloon Terminus. ■ Open and close view of the site and the West Kowloon Terminus can be seen.	High	DVIC1, DVIC2, IVIC1, IVIC2, IVIC3	95m	Moderate	Moderate to High	MMC1, MMC2, MMC3, MMC4, MMC5.	Moderate
VSR 5	West Kowloon Terminus	Located to the north of the WKCD site, bounded by Lin Cheung Road to the west, Jordon Road to the north and Austin Road West to the south.	■ Transportation Facility ■ Many	■ Existing view comprises the construction site of the WKCD with Victoria Harbour and the high rise developments along the northern side of Hong Kong Island in the backdrop. ■ Has a close view of the site.	Medium	DVIC1, IVIC1, IVIC2, IVIC3, IVIC4	30m	Moderate	Moderate	MMC1, MMC2, MMC3	Slight to Moderate
VSR 6	Planned CDA Development above West Kowloon Terminus	Located to the north of the WKCD site, bounded by Lin Cheung Road to the west, Jordon Road to the north and Austin Road West to the south.	■ Commercial ■ Many	■ Existing view comprises the construction site of the WKCD in the foreground with Victoria Harbour and the high rise developments along the northern side of Hong Kong Island. ■ Has a close view of the site.	Medium	DVIC1, DVIC2, IVIC1, IVIC2, IVIC3	30m	Moderate	Moderate	MMC1, MMC2, MMC3, MMC4, MMC5.	Moderate
VSR 7	Austin Station	Located to the northeast of the WKCD site, bounded by Wui Man Road to the west, Jordon Road to the north and Austin Road West to the south.	■ Transportation Facility ■ Many	■ Existing view comprises the construction sites of the WKCD and West Kowloon Terminus with Victoria Harbour and the high rise developments along the northern side of Hong Kong Island in the backdrop. ■ Has a close view of the site.	Medium	DVIC1, IVIC1, IVIC2, IVIC3, IVIC4	75m	Moderate	Moderate	MMC1,, MCC2, MMC3.	Slight to Moderate
VSR 8	Planned Residential Development above Austin Station	Located to the northeast of the WKCD site, bounded by Wui Man Road to the west, Jordon Road to the north and Austin Road West to the south.	■ Residential ■ Many	■ Existing view comprises the construction sites of the WKCD and West Kowloon terminus with Victoria Harbour and the high rise developments along the northern side of Hong Kong Island in the backdrop. ■ Has a close view of the site.	High	DVIC1, DVIC2, IVIC1, IVIC2, IVIC3	75m	Moderate	Moderate	MMC1, MMC2, MMC3, MMC4, MMC5.	Moderate

VSRs	Name of VSRs	Location of VSRs	Type & Approximate Number of VSRs	Description of Existing View & Degree of Visibility of DP	Receiver's Sensitivity	Source of Impact	Minimum Viewing Distance of VSRs	Magnitude of Change	Significance Threshold of Potential Visual Impact (Before Mitigation)	Mitigation Measures	Significance Threshold of Residual Impact (Upon Mitigation) Construction Phase
VSR 9	Western Harbour Crossing Toll Plaza	Located to the northwest of the site	■ Transportation Facility ■ Many	■ Only western part of the WKCD site can be viewed. ■ Views to Victoria Harbour are currently partially blocked by the dense vegetation, the administration building and the WHC ventilation building.	Low	DVIC1	140m	Negligible	Negligible	MMC1	Negligible
VSR 10	Wai Hang Building	Located to the north of the intersection of Canton Road and Austin Road West	■ Residential ■ Many	■ Existing view comprises the construction site of the WKCD and Austin Station with Victoria Harbour and the high rise developments along the northern side of Hong Kong Island in the backdrop. ■ Has a close and partial view of the site	Medium to High	DVIC1, DVIC2, IVIC1, IVIC2, IVIC3, IVIC4	80m	Moderate	Moderate	MMC1, MMC2, MMC3, MMC4, MMC5.	Moderate
VSR 11	The Victoria Tower	Located to the south of the intersection of Canton Road and Austin Road West	■ Residential ■ Many	■ Existing view comprises the construction site of the WKCD and West Kowloon Terminus with Victoria Harbour and the high rise developments along the northern side of Hong Kong Island in the backdrop. ■ Has a close and partial view of the site	High	DVIC1, DVIC2, IVIC1, IVIC2, IVIC3, IVIC4.	40m	Moderate	Moderate to High	MMC1, MMC2, MMC3, MMC4, MMC5.	Moderate
VSR 12	China Hong Kong City	Located to the southeast of the site in Tsim Sha Tsui	■ Commercial ■ Many	■ Existing view comprises the WKCD site and Victoria Harbour in the foreground with high rise developments and the construction site of West Kowloon Terminus in the backdrop. ■ Open view of the site can be seen in a short distance.	Medium to High	DVIC1, IVIC2, IVIC3, IVIC4.	40m	Small	Slight to Moderate	MMC1, MMC2, MMC3, MMC4	Slight to Moderate
VSR 13	Gateway Hong Kong	Located to the southeast of the site in Tsim Sha Tsui	■ Commercial ■ Many	■ Existing view comprises the Pacific Club and the WKCD site in the foreground with high rise developments located to the north of the site in the backdrop. ■ Open view of the site can be seen in a short distance at upper levels.	Medium to High	DVIC1, IVIC2, IVIC3.	250m	Small	Slight to Moderate	MMC1, MMC2, MMC3, MMC4.	Slight to Moderate
VSR 14	Harbour City and Ocean Centre	Located to the southeast of the site in Tsim Sha Tsui	■ Commercial ■ Many	■ Existing view comprises the Pacific Club and the WKCD site in the foreground with high rise developments located to the north of the site in the backdrop. ■ Partial view of the site can be seen in a short distance at upper levels.	Medium to High	DVIC1, IVIC2, IVIC3.	645m	Small	Slight to Moderate	MMC1, MMC2, MMC3, MMC4.	Slight to Moderate
VSR 15	Hong Kong China Ferry Terminal	Located to the southeast of the site in Tsim Sha Tsui	■ Transportation Facility ■ Many	■ Existing view comprises the WKCD site and Victoria Harbour in the foreground with high rise developments and the construction site of West Kowloon Terminus in the backdrop. ■ Open view of the site can be seen in a short distance	Medium	DVIC1, IVIC2, IVIC3.	220m	Small	Slight to Moderate	MMC1, MMC2, MMC3, MMC4.	Slight to Moderate
VSR 16	Lai Chack Middle School	Located to the east of the site, opposite Tsim Sha Tsui fire station, to the west of Canton Road	■ GIC Facility ■ Medium	■ Views from to the site are blocked by the China Hong Kong City buildings and Tsim Sha Tsui Fire Station. ■ No view of the site can be seen. ■ However, part of the site could be viewed after the fire station is relocated.	Low	IVIC1, IVIC2.	135m	Negligible	Negligible	MMC1, MMC3.	Negligible
VSR 17	Canton Road Government Primary School	Located to the east of the site, opposite Tsim Sha Tsui fire station, to the east of Canton Road	■ GIC Facility ■ Medium	■ Views to the site are blocked by the China Hong Kong City buildings and Tsim Sha Tsui Fire Station. ■ However, part of the site could be viewed after the fire station is relocated.	Low	IVIC1, IVIC2	135m	Negligible	Negligible	MMC1, MMC3.	Negligible

VSRs	Name of VSRs	Location of VSRs	Type & Approximate Number of VSRs	Description of Existing View & Degree of Visibility of DP	Receiver's Sensitivity	Source of Impact	Minimum Viewing Distance of VSRs	Magnitude of Change	Significance Threshold of Potential Visual Impact (Before Mitigation)	Mitigation Measures	Significance Threshold of Residual Impact (Upon Mitigation) Construction Phase
VSR 18	King George V Memorial Park, Kowloon	Located to the north of the site, to the east of Austin Station	■ Recreation/ Open Space ■ Medium	■ Existing view comprises Austin Station in the foreground with high rise developments in the backdrop. ■ Views to the site at ground level are mostly blocked by Austin Station.	Low	IVIC1	155m	Negligible	Negligible	MMC1, MMC3.	Negligible
VSR 19	Travellers along Austin Road West	Located immediately to the north of the site (Various Location)	■ Transient ■ Many	■ Varying views depending on locations along Austin Road West. ■ Existing view comprises the WKCD site in the foreground with Victoria Harbour and high rise buildings along Hong Kong Island in the backdrop. ■ Close and open view of the site.	Low	DVIC1, IVIC1, IVIC2, IVIC3, IVIC4.	Varies	Moderate	Slight to Moderate	MMC1, MMC2, MMC3, MMC4.	Slight
VSR 20	Travellers along Canton Road	Located immediately to the east of the site (various locations)	■ Transient ■ Many	■ Varying views depending on locations along Canton Road. ■ Existing view comprises the WKCD site in the foreground with Victoria Harbour and high rise buildings along Hong Kong Island in the backdrop. ■ Close and open view of the site.	Low	DVIC1, IVIC1, IVIC2, IVIC3, IVIC4.	Varies	Moderate	Slight to Moderate	MMC1, MMC2, MMC3, MMC4.	Slight
VSR 21	Tsim Sha Tsui Fire Station	Located within the site (at the southeast corner)	■ GIC Facility ■ Few	■ Existing view comprises the WKCD site in the foreground with Victoria Harbour and high rise buildings along Hong Kong Island in the backdrop. ■ Has close and open view of the eastern part of the site.	Medium	DVIC1, IVIC1, IVIC2, IVIC3, IVIC4	N/A	Moderate to Large	Moderate	MMC1, MMC2, MMC3, MMC4.	Moderate
	Phase 1A of the Park	Located within the WKCD site, in the southern part of the headland of future the Park (Located to the west of the site)	■ Recreation/ Open Space ■ Medium	■ Existing view comprises the site of the Park (Phase B*) in the foreground and high rise buildings located to the north of the site in the backdrop. ■ Views to the site at ground level are partly blocked by trees in the foreground.	Low	DVIC1, DVIC2, IVIC2, IVIC3, IVIC4.	325m	Negligible	Negligible	MMC1, MMC2, MMC3.	Negligible
	Phase 1 of Xiqu Centre	Located within the WKCD site, close to the intersection of Canton Road and Austin Road West (Located to the west of the site)	■ Arts and Cultural Facility ■ Medium	■ Existing view to the northeast of Xiqu Centre comprises the intersection of Canton Road and Austin Road West in the foreground. Only a partial view of the underpass road can be seen. ■ Existing view to the south and to the west of Xiqu Centre comprises the site in the foreground. Open view of the eastern part of the site can be seen.	Medium	N/A**	75m	N/A**	N/A**	N/A**	N/A**

Notes: * Please refer to Appendix 2.4 (Construction Zone) regarding Phase B (Zone B) of the Park.

** As completion date for basement associated with underpass road is in late February 2016, Xiqu Centre will be completed 2 months before the completion of the underpass road. It is anticipated that the future VSRs at Xiqu Centre may not have direct view over the underpass road during construction phase. Hence, the assessment of visual impacts on Xiqu Centre during construction phase could not be provided.

Table.14.10.16: Significance Threshold of Visual Impact Before and After Mitigation Measures (Operation Phase)

VSRs	Name of VSRs	Location of VSRs	Type & Approximate Number of VSRs	Description of Existing View & Degree of Visibility of DP	Receiver's Sensitivity	Source of Impact	Minimum Viewing Distance of VSRs	Magnitude of Change	Significance Threshold of Potential Visual Impact (Before Mitigation)	Mitigation Measures	Significance Threshold of Residual Impact	
											Operation Phase (Day 1)	Operation Phase (Year 10)
VSR 1	International Commerce Centre (ICC)	Located immediately to the north of the site	■ Commercial ■ Many	■ Existing view comprises the dense vegetation at the entrance of the WHC and the construction site of the WKCD. ■ Open and close view of the site can be seen.	Medium to High	DVIO1, DVIO2, DVI03 IVIO1.	90m	Small	Slight to Moderate	MMO1, MMO2, MMO3, MM04, MM05, MM06	Slight	Insubstantial
VSR 2	The Elements	Located immediately to the north of the site	■ Commercial ■ Many	■ Existing view comprises the construction site of the WKCD. ■ Open and close view of the site can be seen.	Medium to High	DVIO1, DVIO2. DVI03 IVIO1.	65m	Small	Slight to Moderate	MMO1, MMO2, MM03, MM04, MM05, MM06.	Slight	Insubstantial
VSR 3	The Harbourside	Located immediately to the north of the site	■ Residential ■ Many	■ Existing view comprises the construction site of the WKCD. ■ Open and close view of the site can be seen.	High	DVIO1, DVIO2, DVIO3, IVIO1.	80m	Small	Slight to Moderate	MMO1, MMO2, MMO3, MM04, MM05, MM06.	Slight	Insubstantial
VSR 4	The Arch	Located immediately to the north of the site and to the west of the junction of Austin Road West and Lin Cheung Road	■ Residential ■ Many	■ Existing view comprises the construction site of the WKCD and the West Kowloon Terminus. ■ Open and close view of the site and the West Kowloon Terminus can be seen.	High	DVIO1, DVIO2, DVIO3, IVIO1.	95m	Small	Slight to Moderate	MMO1, MMO2 MMO3, MM04, MM05, MM06.	Slight	Insubstantial
VSR 5	West Kowloon Terminus	Located to the north of the WKCD site, bounded by Lin Cheung Road to the west, Jordon Road to the north and Austin Road West to the south.	■ Transportation Facility ■ Many	■ Existing view comprises the construction site of the WKCD with Victoria Harbour and the high rise developments along the northern side of Hong Kong Island in the backdrop. ■ Has a close view of the site.	Medium	DVIO1, DVIO2, DVI03, IVIO1.	30m	Small	Slight	MMO1, MMO3, MM04, MM05, MM06.	Insubstantial	Insubstantial
VSR 6	Planned CDA Development above West Kowloon Terminus	Located to the north of the WKCD site, bounded by Lin Cheung Road to the west, Jordon Road to the north and Austin Road West to the south.	■ Commercial ■ Many	■ Existing view comprises the construction site of the WKCD in the foreground with Victoria Harbour and the high rise developments along the northern side of Hong Kong Island. ■ Has a close view of the site.	Medium	DVIO1, DVIO2 DVIO3, IVIO1.	30m	Small	Slight to Moderate	MMO1, MMO2, MMO3, MM04, MM05, MM06.	Slight	Insubstantial
VSR 7	Austin Station	Located to the northeast of the WKCD site, bounded by Wui Man Road to the west, Jordon Road to the north and Austin Road West to the south.	■ Transportation Facility ■ Many	■ Existing view comprises the construction sites of the WKCD and West Kowloon Terminus with Victoria Harbour and the high rise developments along the northern side of Hong Kong Island in the backdrop.. ■ Has a close view of the site.	Medium	DVIO1, DVIO2, DVI03 IVIO1.	75m	Small	Slight to Moderate	MMO1, MMO3, MM04, MM05, MM06.	Slight	Insubstantial
VSR 8	Planned Residential Development above Austin Station	Located to the northeast of the WKCD site, bounded by Wui Man Road to the west, Jordon Road to the north and Austin Road West to the south.	■ Residential ■ Many	■ Existing view comprises the construction sites of the WKCD and West Kowloon terminus with Victoria Harbour and the high rise developments along the northern side of Hong Kong Island in the backdrop. ■ Has a close view of the site.	High	DVIO1, DVIO2 DVIO3, IVIO1.	75m	Small	Slight to Moderate	MMO1, MMO2, MMO3, MM04, MM05, MM06.	Slight	Insubstantial

VSRs	Name of VSRs	Location of VSRs	Type & Approximate Number of VSRs	Description of Existing View & Degree of Visibility of DP	Receiver's Sensitivity	Source of Impact	Minimum Viewing Distance of VSRs	Magnitude of Change	Significance Threshold of Potential Visual Impact (Before Mitigation)	Mitigation Measures	Significance Threshold of Residual Impact	
											Operation Phase (Day 1)	Operation Phase (Year 10)
VSR 9	Western Harbour Crossing Toll Plaza	Located to the northwest of the site	■ Transportation Facility ■ Many	■ Only western part of the WKCD site can be viewed. ■ Views to Victoria Harbour are currently partially blocked by the dense vegetation, the administration building and the WHC ventilation building.	Low	DVIO3	140m	Negligible	Insubstantial	MMO3, MMO6.	Insubstantial	Insubstantial
VSR 10	Wai Hang Building	Located to the north of the intersection of Canton Road and Austin Road West	■ Residential ■ Many	■ Existing view comprises the construction site of the WKCD and Austin Station with Victoria Harbour and the high rise developments along the northern side of Hong Kong Island in the backdrop. ■ Has a close and partial view of the site.	Medium to High	DVIO1, DVIO2 DVIO3, IVIO1.	80m	Small	Slight to Moderate	MMO1, MMO2, MMO3, MM04, MM05, MM06.	Slight	Insubstantial
VSR 11	The Victoria Tower	Located to the south of the intersection of Canton Road and Austin Road West	■ Residential ■ Many	■ Existing view comprises the construction site of the WKCD and West Kowloon Terminus with Victoria Harbour and the high rise developments along the northern side of Hong Kong Island in the backdrop. ■ Has a close and partial view of the site.	High	DVIO1, DVIO2, DVIO3 IVIO1.	40m	Small	Slight to Moderate	MMO1, MMO2, MMO3, MM04, MM05, MM06.	Slight	Insubstantial
VSR 12	China Hong Kong City	Located to the southeast of the site in Tsim Sha Tsui	■ Commercial ■ Many	■ Existing view comprises the WKCD site and Victoria Harbour in the foreground with high rise developments and the construction site of West Kowloon Terminus in the backdrop. ■ Open view of the site can be seen in a short distance.	Medium to High	DVIO1	40m	Negligible	Slight	MMO1, MMO2, MM03, MM04.	Insubstantial	Insubstantial
VSR 13	Gateway Hong Kong	Located to the southeast of the site in Tsim Sha Tsui	■ Commercial ■ Many	■ Existing view comprises the Pacific Club and the WKCD site in the foreground with high rise developments located to the north of the site in the backdrop. ■ Open view of the site can be seen in a short distance at upper levels.	Medium to High	DVIO1	250m	Negligible	Slight	MMO1, MMO2, MM03, MM04.	Insubstantial	Insubstantial
VSR 14	Harbour City and Ocean Centre	Located to the southeast of the site in Tsim Sha Tsui	■ Commercial ■ Many	■ Existing view comprises the Pacific Club and the WKCD site in the foreground with high rise developments located to the north of the site in the backdrop. ■ Partial view of the site can be seen in a short distance at upper levels.	Medium to High	DVIO1	645m	Negligible	Slight	MMO1, MMO2, MM03, MM04.	Insubstantial	Insubstantial
VSR 15	Hong Kong China Ferry Terminal	Located to the southeast of the site in Tsim Sha Tsui	■ Transportation Facility ■ Many	■ Existing view comprises the WKCD site and Victoria Harbour in the foreground with high rise developments and the construction site of West Kowloon Terminus in the backdrop. ■ Open view of the site can be seen in a short distance	Medium	DVIO1	220m	Negligible	Slight	MMO1, MMO2, MM03, MM04, MM05.	Insubstantial	Insubstantial
VSR 16	Lai Chack Middle School	Located to the east of the site, opposite Tsim Sha Tsui fire station, to the west of Canton Road	■ GIC Facility ■ Medium	■ Views from to the site are blocked by the China Hong Kong City buildings and Tsim Sha Tsui Fire Station. ■ No view of the site can be seen. ■ However, part of the site could be viewed after the fire station is relocated.	Low	DVI02, IVIO1.	135m	Small	Slight	MMO1, MMO3, MM04, MM05.	Insubstantial	Insubstantial
VSR 17	Canton Road Government Primary School	Located to the east of the site, opposite Tsim Sha Tsui fire station, to the east of Canton Road	■ GIC Facility ■ Medium	■ Views to the site are blocked by the China Hong Kong City buildings and Tsim Sha Tsui Fire Station. ■ However, part of the site could be viewed after the fire station is relocated.	Low	DVI02, IVIO1.	135m	Small	Slight	MMO1, MMO3, MM04, MM05.	Insubstantial	Insubstantial

VSRs	Name of VSRs	Location of VSRs	Type & Approximate Number of VSRs	Description of Existing View & Degree of Visibility of DP	Receiver's Sensitivity	Source of Impact	Minimum Viewing Distance of VSRs	Magnitude of Change	Significance Threshold of Potential Visual Impact (Before Mitigation)	Mitigation Measures	Significance Threshold of Residual Impact	
											Operation Phase (Day 1)	Operation Phase (Year 10)
VSR 18	King George V Memorial Park, Kowloon	Located to the north of the site, to the east of Austin Station	■ Recreation/ Open Space ■ Medium	■ Existing view comprises Austin Station in the foreground with high rise developments in the backdrop. ■ Views to the site at ground level are mostly blocked by Austin Station.	Low	DVIO2, IVIO1	155m	Negligible	Slight	MMO1, MMO3, MM04.	Insubstantial	Insubstantial
VSR 19	Travellers along Austin Road West	Located immediately to the north of the site (Various Location)	■ Transient ■ Many	■ Varying views depending on locations along Austin Road West. ■ Existing view comprises the WKCD site in the foreground with Victoria Harbour and high rise buildings along Hong Kong Island in the backdrop. ■ Close and open view of the site.	Low	DVIO1, DVIO2, IVIO1.	Varies	Small	Slight	MMO1, MMO3, MM04, MM05.	Slight	Insubstantial
VSR 20	Travellers along Canton Road	Located immediately to the east of the site (various locations)	■ Transient ■ Many	■ Varying views depending on locations along Canton Road. ■ Existing view comprises the WKCD site in the foreground with Victoria Harbour and high rise buildings along Hong Kong Island in the backdrop. ■ Close and open view of the site.	Low	DVIO1, DVIO2, IVIO1.	Varies	Small	Slight	MMO1, MMO3, MM04, MM05.	Slight	Insubstantial
VSR 21	Tsim Sha Tsui Fire Station	Located within the site (at the southeast corner)	■ GIC Facility ■ Few	■ Existing view comprises the WKCD site in the foreground with Victoria Harbour and high rise buildings along Hong Kong Island in the backdrop. ■ Has close and open view of the eastern part of the site.	Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A
VSR 22	Phase 1A of the Park	Located within the WKCD site	■ Recreation/ Open Space ■ Medium	■ Existing view comprises the site of the Park (Phase B*) in the foreground and high rise buildings located to the north of the site in the backdrop. ■ Views to the site at ground level are partly blocked by trees in the foreground.	Low	DVIO1	325m	Negligible	Negligible	MMO1, MMO3, MM04.	Insubstantial	Insubstantial
VSR 23	Phase 1 of Xiqu Centre	Located within the WKCD site	■ Arts and Cultural Facility ■ Medium	■ Existing view to the northeast of Xiqu Centre comprises the intersection of Canton Road and Austin Road West in the foreground. Only a partial view of the underpass road can be seen. ■ Existing view to the south and to the west of Xiqu Centre comprises the site in the foreground. Open view of the eastern part of the site can be seen.	Medium	DVIO1, DVIO2, DVI03, IVIO1.	75m	Small	Slight	MMO1, MMO2, MM03, MM04, MM05	Slight	Insubstantial

Considerations of Alternative Options

Alternative options have been considered to compare the advantages and disadvantage of different options. It is considered that underground option is preferred because it minimizes air and noise pollution. It also has beneficial landscape impact and less visual impact during operation phase.

The details of Consideration of Alternative Development Options are provided at **Section 14.2.4**.

14.10.6 Mitigation Measures

14.10.6.1 Landscape Mitigation Measures

The construction works would inevitably create undesired adverse impacts to the landscape resources and landscape character areas.

Design Measures as Mitigation Measures during Detail Design Stage

Design measures will be developed as mitigation measures during detail design stages.

- Transplanting of mature tree in good health and amenity value where appropriate and reinstatement of areas disturbed during construction by compensatory hydro-seeding and planting;
- Maximize coverage of greenery tree, shrub and other vegetation planting to compensate the loss of existing trees and amenity planting area;
- Providing salt tolerant tree species along the planter strips at the waterfront promenade;
- Temporary greening measures, e.g. roadside ornamental planting in removable planters around peripheral of site works area as temporary screening and carry out removal green roof panel/vertical green panel on the roof/facade of site offices during construction works;
- Maximize the opportunity of soft landscape treatments, such as vertical green wall/climber/roof greening, etc, to soften the hard architectural and engineering structures and facilities;
- Landscape design shall be incorporated to architectural and engineering structures in order to provide aesthetically pleasing designs.

Mitigation Measures to be applied during Construction and Operation Phase

To reduce the impact towards the existing landscape resources, mitigation measures are proposed and summarized in **Table 14.10.17** and **Table 14.10.18**. Generally, mitigation measures shall be implemented as early as possible and many of these measures perform multiple functions.

Table 14.10.17: Landscape mitigation measures during construction phase

Ref. No.	Mitigation Measures during Construction Phase	Funding Agency	Implementation Agency	Management/ Maintenance Agency
CM1	Trees should be retained in situ on site as far as possible. Should tree removal be unavoidable due to construction impacts, trees will be transplanted or felled with reference to the stated criteria in the Tree Removal Applications to be submitted to relevant government departments for approval in accordance to ETWB TCW No. 29/2004 and 3/2006.	WKCDA -for work area within WKCD site CEDD - for work areas of external connections Private Developer -for works areas within private land sale lots	Contractor	Appointed landscape contractor

Ref. No.	Mitigation Measures during Construction Phase	Funding Agency	Implementation Agency	Management/ Maintenance Agency
CM2	Compensatory tree planting shall be incorporated to the proposed project and maximize the new tree, shrubs and other vegetation planting to compensate tree felled and vegetation removed. Also, implementation of compensatory planting should be of a ratio not less than 1:1 in terms of quality and quantity within the site.	WKCDA	Contractor	WKCDA or appointed landscape contractor
CM3	Buffer trees for screening purposes to soften the hard architectural and engineering structures and facilities.	WKCDA	Contractor	WKCDA or appointed landscape contractor
CM4	Softscape treatments such as vertical green wall panel / planting of climbing and/or weeping plants, etc, to maximize the green coverage and soften the hard architectural and engineering structures and facilities.	WKCDA	Detailed Design Consultant / Contractor	WKCDA or appointed landscape contractor
CM5	Roof greening by means of intensive and extensive green roof to maximize the green coverage and improve aesthetic appeal and visual quality of the building/structure.	WKCDA	Detailed Design Consultant / Contractor	WKCDA or appointed landscape constractor
CM6	Sensitive streetscape design should be incorporated along all new roads and streets.	WKCDA	Detailed Design Consultant / Contractor	WKCDA or appointed landscape constractor
CM7	Structure, ornamental planting shall be provided along amenity strips to enhance the landscape quality.	WKCDA	Contractor	Appointed landscape contractor
CM8	Landscape design shall be incorporated to architectural and engineering structures in order to provide aesthetically pleasing designs.	WKCDA	Detailed Design Consultant / Contractor	WKCDA or appointed landscape constractor

Table 14.10.18: Landscape mitigation measures during operation phase

Ref. No.	Mitigation Measures during Operation Phase	Funding Agency	Implementation Agency	Management/ Maintenance Agency
OM1	Provide proper planting maintenance on the new planting areas to enhance the aesthetic design degree	WKCDA -for work area within WKCD site CEDD- for work areas of external connections Private Developer -for works areas within priv ate land sale lots	Contractor	LCSD -for public roadside and pedestrian footbridge planting[1] Private Developers -for all landscaping within the private land sale lots WKCDA -for all other areas within WKCD
OM2	Provision of open space in various forms and at different levels on or above ground, including park, waterfront promenade, piazzas and terrace garden and associated green connections for public environment.	WKCDA	Detailed Design Consultant / Contractor	WKCDA or appointed landscape contractor

[1] in accordance with ETWB No. 2/2004

The Landscape Master Plan and general landscape arrangement for the WKCD development is shown in **Figure 14.10.15**. The plan is preliminary and for illustrative purpose only and subject to further amendment in detailed design stage. List of landscape mitigation measures during construction and operation phase are shown in **Figure 14.10.14**. Details of landscape mitigation measures are shown in **Figure 14.10.15 to 14.10.18**.

14.10.6.2 Significance Threshold of Residual Impact (Before and After Mitigation Measures)

The significance threshold of each LR and LCA has been derived through the assessment of sensitivity and magnitude of change associated with the proposed works. **Table 14.10.1** shows the relationship between sensitivity and magnitude of change. The efficiency and success of proposed mitigation measures are taken in consideration when analyzing the significance of the threshold of residual impact after mitigation.The residual impact of each LR and LCA regarding the significance threshold before and after mitigation measures are summarized in the **Table 14.10.19** and **Table 14.10.20**.

Table 14.10.19: Significance of impacts on landscape resources during construction and operation phases

LR No.	Landscape Resources	Sensitivity (Low, Medium, High)		Magnitude of Change (Negligible, Small, Intermediate, Large)		Significance Threshold of impacts before Mitigation (Insubstantial, Slight, Moderate, Substantial)		Recommended Mitigation Measures	Significance Threshold of Residual Impact after Mitigation (Insubstantial, Slight, Moderate, Substantial)		
		Construction Phase	Operation Phase	Construction Phase	Operation Phase	Construction Phase	Operation Phase		Construction Phase	Operation Day 1	Operation Year 10
LR1: Open Space											
LR1.1	Kowloon Park	High	High	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR1.4	Roof top Garden on Hong Kong China Ferry Terminal	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR1.5	Kowloon Park Drive Playground	High	High	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR1.6	Canton Road Playground	High	High	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR1.7	Temporary Open Space along the Waterfront Promenade within the Site Boundary	Medium	Medium	Small	Negligible	Slight (adverse)	Insubstantial	**CM7 to CM8; OM1 and OM2**	Insubstantial	Insubstantial	Slight (beneficial)
LR1.8	King George V Memorial Park	High	High	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR1.15	Public Open Space at the podium of Kowloon Station	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2: Amenity Planting											
LR2.1	Roadside Plantation along Park Lane Shopper's Boulevard	High	High	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.2	Roadside Plantation along Observatory Road	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.3	Amenity Plantation around Tsim Sha Tsui Police Station	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.5	Roadside Trees along Canton Road in front of Lippo Sun Plaza	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.6	Roadside Plantation along Haiphong Road	High	High	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.7	Amenity Planting Strip along Kowloon Park Drive	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.8	Trees along the Canton Road to Kowloon Park Drive	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.9	Roadside Plantation in front of Tsim Sha Tsui Fire Station	High	High	Intermediate	Intermediate	Moderate (adverse)	Moderate (adverse)	**CM1, CM2; OM1**	Slight (adverse)	Insubstantial	Slight (beneficial)
LR2.10	Roadside Trees along Scout Path	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.11	Roadside Trees along Austin Road	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.13	Roadside Plantation along Nathan Road	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.14	Roadside Plantation along Canton Road	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.15	Roadside Plantation along Wui Cheung Road	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.16	Roadside Plantation along Jordan Road	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.17	Roadside Plantation Close to Jordan Road and Ferry Street Carpark	Low	Low	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.27	Amenity Planting within the private development at the Kowloon Station	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.28	Roadside Plantation along Western Harbour Crossing Bus Stop next to Elements	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.29	Roadside Plantation along Austin Road West	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.30	Roadside Plantation next to Western Harbour Tunnel Administration Building	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.31	Trees Buffering Western Harbour Tunnel Entrance	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.32	Roadside Plantation along Western Harbour Crossing Bus Stop next to New Yau Ma Tei Typhoon Shelter	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.33	Trees along New Yau Ma Tei Typhoon Shelter Pier	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.34	Amenity Planting within Salt Water Pumping Station	Low	Low	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.35	Tree Cluster in the Western Part within the Boundary Area	Low	Low	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.36	Tree Cluster in the Eastern Part within the Boundary Area	Medium	Medium	Intermediate	Negligible	Moderate (adverse)	Insubstantial	**CM1 to CM8; OM1**	Slight (adverse)	Insubstantial	Slight (beneficial)
LR2.37	Amenity Planting at the end of Ashley Road	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR2.38	Trees next to Hong Kong Observatory Building	High	High	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial

LR No.	Landscape Resources	Sensitivity (Low, Medium, High)		Magnitude of Change (Negligible, Small, Intermediate, Large)		Significance Threshold of impacts before Mitigation (Insubstantial, Slight, Moderate, Substantial)		Recommended Mitigation Measures	Significance Threshold of Residual Impact after Mitigation (Insubstantial, Slight, Moderate, Substantial)		
		Construction Phase	Operation Phase	Construction Phase	Operation Phase	Construction Phase	Operation Phase		Construction Phase	Operation Day 1	Operation Year 10
LR3: Water Body											
LR3.1	Victoria Harbour	High	High	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR4: Cultural Heritage and Historical Features											
LR4.1	Kowloon Mosque and Islamic Centre	High	High	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR4.2	St. Andrew's Church and Former Kowloon British School	High	High	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR4.3	No. 190 Nathan Road	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial
LR4.4	Built Heritage within Kowloon Park	High	High	Negligible	Negligible	Insubstantial	Insubstantial	-	Insubstantial	Insubstantial	Insubstantial

*Notes: Impact is evaluated base on the assumption that possible piers will be included in the proposed plan.

Table 14.10.20: Significance of impacts on landscape character area during construction and operation phases (all impacts are adverse unless otherwise stated)

ID. No.	Landscape Character Areas	Sensitivity (Low, Medium, High)		Magnitude of Change (Negligible, Small, Intermediate, Large)		Significance Threshold of Impact before Mitigation (Insubstantial, Slight, Moderate, Substantial)		Recommended Mitigation Measures	Significance Threshold of Residual Impact after Mitigation (Insubstantial, Slight, Moderate, Substantial)		
		Construction Phase	Operation Phase	Construction Phase	Operation Phase	Construction Phase	Operation Phase		Construction Phase	Operation Day 1	Operation Year 10
Existing Landscape Character Areas											
LCA01	West Kowloon Cultural District Landscape Character Area	Low	Low	Intermediate	Intermediate	Moderate (adverse)	Moderate (adverse)	**CM1 to CM3, CM5; OM1**	Slight (adverse)	Insubstantial	Slight (beneficial)
LCA02	West Kowloon Cultural District Construction Area	Low	Low	Intermediate	Intermediate	Moderate (adverse)	Moderate (adverse)	**CM1 to CM8 ; OM1**	Slight (adverse)	Insubstantial	Slightly (beneficial)
LCA03	West Kowloon Cultural District Temporary Waterfront Promenade	Low	Low	Small	Small	Slight (adverse)	Slight (adverse)	**CM3 to CM8; OM1 and OM2**	Insubstantial	Insubstantial	Slightly (beneficial)
LCA04	New Yau Ma Tei Typhoon Shelter Landscape	Low	Low	Negligible	Negligible	Insubstantial	Insubstantial	**-**	Insubstantial	Insubstantial	Insubstantial
LCA05	Victoria Harbour Inshore Water Landscape	High	High	Negligible	Negligible	Insubstantial	Insubstantial	**-**	Insubstantial	Insubstantial	Insubstantial
LCA06	Victoria Harbour Strait Landscape	High	High	Negligible	Negligible	Insubstantial	Insubstantial	**-**	Insubstantial	Insubstantial	Insubstantial
LCA07	New Yau Ma Tei Container Terminal Landscape	Low	Low	Negligible	Negligible	Insubstantial	Insubstantial	**-**	Insubstantial	Insubstantial	Insubstantial
LCA08	Western Harbour Crossing Toll Gate Landscape	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	**-**	Insubstantial	Insubstantial	Insubstantial
LCA09	Tsim Sha Tsui Late 20C / early 21C Commercial / Residential Complex Landscape	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	**-**	Insubstantial	Insubstantial	Insubstantial
LCA10	Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) Terminus Construction Site and Austin Station	Low	Low	Small	Small	Slight (adverse)	Slight (adverse)	**CM13 to CM8; OM1**	Insubstantial	Insubstantial	Slightly (beneficial)
LCA11	Kowloon Park Urban Landscape	High	High	Negligible	Negligible	Insubstantial	Insubstantial	**-**	Insubstantial	Insubstantial	Insubstantial
LCA12	Jordan Mixed Urban Landscape	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	**-**	Insubstantial	Insubstantial	Insubstantial
LCA13	Tsim Sha Tsui Organic Mixed Urban Development Landscape	Medium	Medium	Negligible	Negligible	Insubstantial	Insubstantial	**-**	Insubstantial	Insubstantial	Insubstantial
LCA14	Tsim Sha Tsui Commercial / Retail Complex Landscape	Medium	Medium	Intermediate	Intermediate	Moderate (adverse)	Moderate (adverse)	**CM1, CM2; OM1**	Slight (adverse)	Insubstantial	Slightly (beneficial)

14.10.6.3 Visual Mitigation Measures

Representative view from the key VSRs has been selected to illustrate the effectiveness of the proposed mitigation measures. Photomontages of the viewpoint viewed by the selective key VSRs (i.e. VSR 14) is shown in **Figures 14.10.13a to 14.10.13b**.

Visual Mitigation Measures during Construction Phase

The visual impact of the temporary ventilation shafts associated with the underpass road at a prominent location within the WKCD would be dependent on the final design and the manner in which it will be integrated with the future buildings in the WKCD. The scale, location, disposition, design and integration strategies of these ventilation shafts would however be further refined in the detailed design stage such that their visual impacts would be minimal.

In addition to the use of decorative screen hoarding boards, early introduction of landscape treatments and adoption of light colour for the temporary ventilation shaft, control of night time lighting will be used as visual mitigation measure to ensure that the lighting does not split onto other non-related areas that may pose visual impacts to the potential VSRs nearby. There will be temporary landscaped areas with green cover at some of the CACF's site during construction phase prior to completion of the CACF, to help reduce the visual impacts derived by the construction works in the surroundings. A summary of the visual mitigation measures to be implemented during construction phase is shown in **Table 14.10.21**.

Table 14.10.21: Visual Mitigation Measures during Construction Phase

	Mitigation Measures	Target VSRs	Funding Agency	Implementation Agency	Management/ Maintenance Agency
MMC1	Use of decorative screen hoarding/ boards	All of the VSRs	WKCDA – for work area within WKCD site CEDD – for work areas of external connection	Contractor	Contractor
MMC2	During the transition period, the temporary ventilation shafts associated with the underpass road for the basement will adopt light colour	All of the VSRs	WKCDA	Design Architect / Contractor	WKCDA
MMC3	The early introduction of landscape treatments	All of the VSRs	WKCDA	Contractor	Contractor
MMC4	The temporary landscaped areas will help achieve the visual balance.	All of the VSRs	WKCDA	Contractor	WKCDA
MMC5	Control of night time lighting such as avoidance of lighting from spilling onto nearby residential developments	Residential VSR (ie. VSR 3)	WKCDA – for work area within WKCD site	Contractor	Contractor

Visual Mitigation Measures during Operation Phase

During operation phase (day 1), the temporary ventilation shafts associated with the underpass road wll still be present and there are still some construction activities within WKCD site. To reduce the visual impacts derived by these temporary ventilation shafts, mitigation measures such as adoption of light colour for these ventilation shafts, temporary landscaped areas with green cover and portable planters will be adopted.

Since the ventilation shafts associated with the underpass road will be integrated with the entire WKCD development upon the completion of the WKCD development, these ventilation shafts will no longer be visible as individual structures during operation phase (year 10). As most of the structures of the Project are located underground, roadside planting and aesthetic design of roads are the proposed mitigation measures to reduce the visual impacts derived by the underpass road.

Control of night time lighting such as avoidance of lighting from spilling onto nearby residential developments will be used to mitigate the night time visual impacts during operation phase (day 1 and year 10).

A summary of the visual mitigation measures to be implemented during operation phase is shown in **Table 14.10.22**.

Table 14.10.22: Visual mitigation measures during Operation Phase

	Mitigation Measures	Target VSRs	Funding Agency	Implementation Agency	Management/ Maintenance Agency
MMO1	Adoption of light colour for the temporary ventilation shafts associated with the underpass road during operation phase (day 1)	All of the VSRs	WKCDA	Design Architect/ Contractor	WKCDA/ Developer of individual buildings
MMO2	Temporary landscaped area with planters will help achieve the visual balance during operation phase (day 1)	All of the VSRs	WKCDA	Contractor	Contractor
MMO3	Planters and other softscape treatments during operation phase (day 1)	All of the VSRs	WKCDA	Contractor	Contractor
MMO4	Use of decorative screen hoarding / boards during operation phase (day 1)	All of the VSRs	WKCDA – for work area within WKCD site	Contractor	Contractor
MMO5	Aesthetic design of roads and roadside planting during operation phase (year 10)	VSRs abutting the entrance of the underground roads VSR 2 (The Elements(and	WKCDA	Contractor	Contractor

	Mitigation Measures	Target VSRs	Funding Agency	Implementation Agency	Management/ Maintenance Agency
		VSR 7 (Austin Road(			
MMO6	Control of night time lighting such as avoidance of lighting from spilling onto nearby residential developments During operation phase (day 1 and year 10)	Residential VSR (i.e. VSR 3)	WKCDA – for work area within WKCD site	Contractor	Contractor

14.10.6.4 Programme of Implementation of Landscape and Visual Mitigation Measures

The construction phase measures listed in **Table 14.10.17** and **Table 14.10.21** should be adopted from commencement of construction, and shall be in place throughout the entire construction period. The operation phase measures listed in **Table 14.10.18** and **Table 14.10.22** should be adopted during the detailed design stage, and be built as part of the construction, so that they are in place at the date of commissioning of the Project. It should be noted that the soft landscape mitigation measures would not be appreciated for several years.

As the proposed underpass road will be constructed as subdivided zones at different time, it is assumed that the construction of underpass road will occur at the same time as construction of the WKCD facilities. General good site practice will be adopted for all construction activities.

14.10.7 Evaluation of Cumulative and Residual Impacts

14.10.7.1 Cumulative impacts

An assessment of the cumulative landscape and visual impacts of the underpass road and the committed developments in the surrounding areas of the site has been undertaken. This considers changes that will result in conjunction with other existing and foreseeable proposals. The concurrent designated projects include the XRL and WKT, road works at West Kowloon, Road Improvement Works in West Kowloon Reclamation Development - Phase 1 and II and Central Kowloon Route, which pose cumulative impacts together with the underpass road on LRs, LCAs and VSRs.

The sources of impact from concurrent projects during the construction and operation phases are summarised as **Table 14.10.23.**

Table 14.10.23: Potential cumulative landscape and visual impacts from concurrent project

Proposed Development	Construction Phase	Operation Phase
Express Rail Link (and WKT)	Construction of diaphragm wall and foundations, excavation, concreting and backfill works as well as the operation of concrete batching plant and barging points, etc.	Above-ground structures including WKT and ventilation buildings in West Kowloon
Road Works at West Kowloon	Excavation, road/underpasses construction and construction of noise screening structures, etc.	Structures such as noise barriers.

Proposed Development	Construction Phase	Operation Phase
Road Improvement Works in West Kowloon Reclamation Development - Phase 1 and II	Excavation, roads/ underpasses construction and construction of noise screening structures, etc	Structures such as noise barriers
Central Kowloon Route	Construction of a trunk road and tunnel, with administration and ventilation buildings; and associated works.	Structures such as ventilation buildings

Table 14.10.24 shows the summary of the affected LRs and LCAs and VSRs and potential cumulative impacts generated by the concurrent designated projects in the adjacent areas and the proposed WKCD development.

Table 14.10.24: Summary of LRs, LCAs and VSRs affected by concurrent projects

Concurrent Designated Projects	Affected LRs/LCAs	Affected VSRs
Express Rail Link (and WKT)	As construction is in progress, accumulative impacts are minimal.	Construction Phase and Operation Phase VSR 2,VSR 4, VSR 7, VSR 8, VSR 19, VSR 21 and VSR 23
Road works at West Kowloon		Construction Phase and Operation Phase VSR1, VSR 2, VSR3, VSR 4, VSR5, VSR 6, VSR 7, VSR 8, VSR 10, VSR 11,VSR 19 and VSR 23
Road Improvement Works in West Kowloon Reclamation Development - Phase 1 and II		Construction Phase and Operation Phase VSR 10, VSR 11, VSR 16 ,VSR 17, VSR 18, VSR 20 and VSR 23
Central Kowloon Route		N/A

Affected LRs/LCAs

Cumulative Impacts on Landscape Resources during Construction and Operation Phase

The concurrent projects in the surrounding area are concentrated at the northern site boundary. As the construction of the concurrent projects is in progress, accumulative landscape impacts to affected landscape resources are minimal.

Construction activities might cause disturbances to the landscape resources in the surrounding area. For instance, dust and construction noise may deteriorate the value and usage of the surrounding open space. Dust and pollutant emissions due to traffic congestion and excavation works during construction stage of underpass road may affect the health of existing trees. Given the numbers of tree immediately located within the construction area of the underpass road is relatively smaller number, and these indirect impacts are considered to be low.

With the implementation of proposed mitigation landscape measures (including compensatory tree planting) during construction phase, it is considered that there would not have any additional insurmountable landscape impact during construction phase. Tree loss due to the construction of Austin Road Flyover and concurrent project will be compensated in a ratio of 1:1 or more in construction phase. Compensatory tree will be located within the site boundary. It is expected to have a net gain of trees. The residual cumulative impacts on existing trees during operation phase will be slight in Day 1 and insubstantial in Year 10.

Cumulative Impacts on Landscape Character Area during Construction and Operation Phase

It is expected that construction of Underpass Road and other concurrent projects, i.e. XRL Terminus, Residential/CDA development above Austin Station and Road Works at West Kowloon and Central Kowloon Route will affect both LCA09 and LCA10, which LCA 10 is also under a change on ongoing development. As the construction of concurrent projects is in progress, accumulative landscape impacts to affected LCAs are minimal. However, as the construction of the Underpass Road and concurrent projects follow the existing road networks, it will not create any insurmountable cumulative impact on the existing LCAs with the implementation of mitigation measures.

As a whole, cumulative impacts on LCAs will not create additional insurmountable adverse impact with the implementation of mitigation measures.

Affected VSRs during Construction Phase

Hong Kong Section of the Guangzhou – Shenzhen – Hong Kong Express Rail Link

The sources of the visual impacts include construction of above ground structures such as the station, ventilation shafts and buildings. Hence, the affected VSRs are those located along the Express Rail Link and the station of West Kowloon Terminus, including VSR 2 the Elements, VSR 4 The Arch, VSR 7 Austin Station, VSR 8 Planned Residential Development above Austin Station, VSR 19 Travellers along Austin Road West and VSR 21 Tsim Sha Tsui fire station, VSR 23 Phase 1 of Xiqu Centre.

Road works at West Kowloon

Road works at West Kowloon involves the roads D1A, D1, Lin Cheung Road - Austin Road West Underpass and upgrading of Austin Road West. Therefore, all the VSRs located close to the roads mentioned above are the affected VSRs, including VSR1, VSR 2, VSR 3, VSR 4, VSR5, VSR 6, VSR 7, VSR 8, VSR 10, VSR 11, and VSR 19 and VSR 23.

Road Improvement Works in West Kowloon Reclamation Development - Phase I and II

The proposed road improvement works involve construction at West Kowloon Highway, Nga Cheung Road, junctions of Canton Road/ Austin Road, Canton Road/ Wui Cheung Road and Canton Road/ Ferry Street/ Jordan Road. Therefore, the affected VSRs are the VSRs located along Canton Road including VSR 10, VSR 11, VSR 16, VSR 17, VSR 18, and VSR 20 and VSR 23.

The assessment of cumulative visual impacts of the underpass road also needs to take the proposed WKCD development into the consideration. The construction phase of the underpass road coincides with the construction phase of these four projects. Hence, there are various construction activates undertaken at the project site and its surroundings. In addition to construction activities, a major source of impact is the disturbance to the existing vegetation which may lead to the loss of some visual resources.

It is considered that the combined cumulative visual impacts posed on most of the aforementioned VSRs during construction phase, in particular the nearby residential VSRs, are significant.

Affected VSRs during Operation Phase

Hong Kong Section of the Guangzhou – Shenzhen – Hong Kong Express Rail Link

During operation phase of the underpass road, the XRL project will be mostly completed and potential landscape and visual impacts is likely to be confined to minor above-ground works such as completion of the facades and interiors of the WKT station, ventilation shafts and buildings (based on their target completion by 2015). Hence while there may be some impacts on the visual amenity of the surrounding areas and VSRs located in proximity to the site, including VSR 2 The Elements, VSR 4 The Arch, VSR 7 Austin Station, VSR 8 Planned Residential Development above Austin Station and VSR 19 Travellers along Austin Road West, it is anticipated that the visual impact will be moderately significant, and upon completion of the WKT, visual impacts will be further mitigated via the landscape design integrating the WKT and the WKCD to provide a continuous landscaped open area.

It should be noted however, that visual impacts to VSRs will become substantial upon completion of the planned high rise buildings above the West Kowloon Terminus and Austin Station, particularly to the nearby residential developments because of the loss of open view, which will eventually be partially / substantially blocked by these high rise developments above West Kowloon Terminus and Austin Station.

Road Works at West Kowloon

During operation phase of the underpass road, it is expected that construction of the Road works at West Kowloon will have also been completed (based on their scheduled completion target by 2014). Therefore, despite many of the affected VSRs along Austin Road West would experience significant cumulative impacts during construction phase, it is expected that the visual impacts associated with Road Works at West Kowloon during operation phase is small, especially with appropriate mitigation measures such as road side amenity planting.

Road Improvement Works in West Kowloon Reclamation Development - Phase I and II

Based on the target completion date for this project, Phase I will be completed by operation phase of the underpass road, hence the cumulative impacts during operation phase is anticipated to be small, especially with appropriate mitigation measures such as road side amenity planting.

The programme for construction of Phase II is not yet known, however, with substantial completion of the WKCD development and other concurrent projects in the vicinity, it is anticipated that the remaining visual impacts on VSRs near the junction of Austin Road and Canton Road will be acceptable with mitigation measures.

14.10.7.2 Residual impacts

Residual Landscape Impact during Construction Phase

Despite the mitigation measures mentioned in **Section 14.10.6**, it is inevitable that certain residual impacts would still be placed on the site, both during construction and operation phases. The residual impacts on landscape resources and landscape character areas are generally insubstantial to slight beneficial.

Residual Impact on Landscape Resources during Construction and Operation Phase

Impact on LR1 Open Space

LR 1.7 – Temporary open space along the waterfront promenade within the site boundary

Relatively small area (~0.03ha) of temporary open space to the public will be affected. Affected area consists of parts of the road and cycling track with associated street planting. However, as the construction of underpass road may be at the same time with the construction of the Park and waterfront promenade, there will be *slight adverse* residual impact on this LR during construction phase due to the construction of underpass road. During operation phase, affected area of LR will become part of the Park for public enjoyment, with minimum 23ha of open space for public use will be provided within the site boundary. With the re-provided vegetation grows and established and enhancement of landscape quality with the provision of the open space during operation phase in this LR, residual impact on this LR will become *insubstantial* in Day 1 and *slight beneficial* in Year 10.

Impact on LR2 Roadside Amenity

LR2.9 – Roadside Plantation in front of Tsim Sha Tsui Fire Station

Total 12 trees will be felled and 3 trees will be transplanted due to the construction of the underpass road during construction phase. Tree species to be affected include *Acacia confusa*, *Aleruites moluccana*, *Ficus elastica, Ficus microcarpa*, *Macaranga tanarius*, *Litsea glutinosa*, *Clausema lansium* and *Morus alba*. During construction phase, new compensatory trees with 3 no. transplanted tree will be provided within the site, it is considered as *moderate adverse* residual impact on this LR. With the re-provided vegetation grows and established and enhancement of landscape quality during operation phase in this LR, residual impact on this LR will become *insubstantial* in Day 1 and slight beneficial in Year 10 with the implementation of mitigation measures.

LR2.36 – Tree Cluster in the Eastern Part within the Boundary Area

Total 30 trees with grassland (~0.08ha) will be felled during the site clearance works of the construction of underpass road. However, this relatively small affected area will be further reinstated into part of the Park and Avenue with new compensatory trees within this LR. Aesthetic landscape design, with new compensatory trees, will be incorporated to architectural/engineering structures to enhance the landscape quality of this LR during construction phase, it is considered there will be slight adverse residual impact on this LR. With the re-provided vegetation grows and established and enhancement of landscape quality during operation phase in this LR,, residual impact on this LR will become *insubstantial* in Day 1 and slight beneficial in Year 10 with the implementation of mitigation measures..

Impact on Existing Trees

Based on the broad brush tree survey, approximately 3567 trees are surveyed within the assessment boundary. There are total 387 trees (15 trees in LR2.9 and 372 trees in LR2.36) will be affected by construction of underpass road. All of them are located within the WKCD site boundary. There are approximately 42 trees (12 trees in LR2.9 and 30 trees in LR2.36) with self-seed species and/or poor health and tree form will be felled, 3 trees in LR2.9 with fair health condition and tree form and medium amenity value will be transplanted and 342 trees in LR2.36, with no direct conflicts with the construction of underpass road will be retained in situ. It is considered transplanted tree will be recovered after Year 10. With the implementation of new compensatory tree and transplanted trees to be provided within the sie during construction phase, the residual impact is considered *slight beneficial*. Many of them are not recommended to be transplanted as they are either in poor form and health or weed species. None of the affected tree is LCSD Champion Trees or Registered Old and Valuable Trees. There are no rare species or endangered species but common species. All trees with medium to high amenity value, which are unavoidably affected by construction works will be transplanted within the site. Detail tree felling application

and compensatory planting proposal will be submitted in accordance with ETWB TC 3/2006 during the detailed design stage. Implementation of compensatory planting should be of a ratio not less than 1:1 in terms of quality and quantity within the site. The quality of compensatory trees should be at least of "heavy standard" (Section 3 of the General Specification for Civil Engineering Works refers). Proposals which deviate from this principle will be supported with justification, in order to ensure the greening opportunity within the site is optimised where feasible. Also, sufficient space will be provided for the planting of compensatory trees with the consideration of minimum space required to cater for the establishment and healthy growth of the trees.

Affected tree species include *Acacia auriculiformis, Acacia confusa, Aleurities moluccana, Casuarina equisetifolia, Celtis sinensis, Clausena lansium, Ficus microcarpa, Ficus elastica, Ficus virens, Hibiscus tiliaceus, Leucaena leucocephala, Litsea glutinosa, Macaranga tanarius, Melia azedarach* and *Morus alba*. The majority of tree species affected is self-seeded weed *Leucaena leucocephala*. The condition of the tree range from poor to fair. Amenity value range from low to medium.

The actual number of trees to be transplanted/felled should depend on the result of a more detailed tree survey on the affected trees. The quantities of tree affected are summarized in **Table 14.10.25**.

Table 14.10.25: Residual impacts on existing trees during construction phase

Ref. No.	Landscape Resources	Source of Impact	Residual Impacts during Construction Phase			
			Total no. of tree in LR	No of trees to be felled	No of trees to be transplanted	No of trees to be retained
LR2.9	Roadside Plantation in front of Tsim Sha Tsui Fire Station	LC1-1 to LC1-6	15	12	3	0
LR2.36*	Trees Cluster in the Eastern Part within the Boundary Area	LC1-1, LC1-2, LC1-4 to LC1-6	372	30	0	342
		Total: 387 no. affected trees	387	42	3	342

* Note that some trees located in LR2.36 are currently being relocated to areas around LR2.31 by LCSD, hence the actual tree numbers are subject to further changes.

The compensatory tree planting and new landscape works as mitigation measures to the loss of greenery are proposed for the underpass road. As the landscape quality of the existing trees is low, the proposed substantial number of new tree plantings as a mitigation measures are sufficient to compensate the loss of existing trees. The overall cumulative residual impacts on existing trees are considered to be beneficial in the longer term after development. The beneficial impact would substantially increase with time after trees reach maturity.

Residual Impact on LR3 Waterbody and LR4 Cultural Heritage and Historical Features

None of these landscape resources will be affected during construction and operation phase as the location of these LRs are too far from the proposed underpass road.

Residual Impact on Landscape Character Area during Construction and Operation Phase

The residual impact on landscape character areas are generally *insubstantial* to *slight adverse* during construction phase and *insubstantial* to *slight beneficial* during operation phase. The residual impact on

landscape character areas during operation phase are mostly considered to be beneficial in the long term. Details are summarised in **Table 14.10.26**.

Table 14.10.26: Residual impacts on landscape character areas during construction and operation phase

Ref. No.	Landscape Character Areas	Residual Impact on Landscape Character Areas
Existing Landscape Character Areas		
LCA01	West Kowloon Cultural District Landscape Character Area	Approximately 0.39ha of this LCA will be affected by the construction of underpass road which will result to the existing trees to be felled and incompatibility to the LCA. There are total 100 trees (in LR2.36) in this LCA, of which 10 trees will be felled with grassland (~0.03ha) and 90 trees with no direct conflict with the construction of underpass road will be retained in situ. With the new compensatory tree to be provided within the site, there will be ***slight adverse*** residual impact on this LCA during construction phase. As LCA01 will be under construction and largely become Park area and part of the M+ extension area, MPV, Hotel and the Arena Plaza during operation phase, the quality of the greenery space will be greatly improved. With the re-provided vegetation grows and established and enhancement of landscape quality during operation phase, residual impact on this LCA in Day 1 of operation phase is considered to be ***insubstantial*** **and become *slightly* beneficial** for better connection within WKCD in Year 10 of operation phase.
LCA02	West Kowloon Cultural District Construction Area	Approximately 19.68ha of this LCA02 will be affected by the construction of underpass road, which will result to existing trees will be felled and incompatibility to the LCA. There are total 272 trees (in LR2.36) in this LCA, of which 20 trees will be felled with grassland (~0.05ha) and 90 trees with no direct conflict with the construction of underpass road will be retained in situ. With the new compensatory tree to be provided within the site, there will be *slight adverse* residual impact on this LCA during construction phase. As LCA02 will be under construction and mainly become the waterfront promenade, avenue area, and part of the Park area during operation phase, which will convert the currently ununsed space into a flexible public open space for public. It will be a vibrant public space with landscape softworks to increase amenity value. With the re-provided vegetation grows and established and enhancement of landscape quality during operation phase, residual impact on this LCA during operation phase is considered to be **insubstantial in Day 1 and slightly beneficial in Year 10 during operation phase**
LCA03	West Kowloon Cultural District Temporary Waterfront	Relatively small area (~0.03ha) of this LCA will be affected by the construction of underpass road, which will result to the loss of temporary open space (~0.03ha) in LR1.7 and incompatibility to the LCA. With the new compensatory tree to be provided within the site, there will be *slight adverse* residual impact on this LCA during construction phase. However, as LCA03 will be under construction and substituted by a newly designed waterfront promenade providing better facilitates and open space quality. Also, the operation phase of underpass road facilitates the public enjoyment With the re-provided vegetation grows and established and provision of open space during operation phase, the residual impact in Day 1 of operation phase is considered to be *in**substantial*** **and become *slightly beneficial* in Year 10**.
LCA10	Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) Terminus Construction Site and Austin Station	Approximately 0.06ha of this LCA will be affected by the construction of underpass road, which will result incompatibility to the LCA. As the affected area is relatively small and new ornamental trees to be planted within the site, there will be ***insubstantial*** residual impact on this LCA during construction stage. During operation phase, part of this LCA will become the entrance of the underpass road. With the re-provided vegetation grows and established during operation phase, the residual impact in day 1 of operation phase is considered to be insubstantial and become slight beneficial in Year 10 with mitigation measures during operation phase.
LCA14	Tsim Sha Tsui Commercial/ Retail Complex Landscape	Approximately 0.24ha of this LCA will be affected by the construction of underpass road, which will result 12 tree will be felled and 3 trees will be transplanted in LR2.9 (total 15 tre es) and incompatibility to the LCA. With the new compensatory tree to be provided within the site during construction phase,

Ref. No.	Landscape Character Areas	Residual Impact on Landscape Character Areas
		there will be ***slight adverse*** residual impact on this LCA. During operation phase, part of this LCA will become the entrance of the underpass road and under construction and substituted as part of the waterfront promenade and WKCD area. It will be a vibrant public space with landscape softworks to provide amenity values along with the newly designed waterfront promenade. The operation phase of underpass road also facilitates the public enjoyment. With the re-provided vegetation grows and established and further enhance of landscape quality during operation phase, residual impact is considered to be ***insubstantial*** in Day 1 and *slight beneficial* Year 10 with implementation of mitigation measures during operation phase.

Residual Visual Impact during Construction Phase

Given that the development scale of the Project is localized, the residual visual impact on the VSRs is considered to be slight or insubstantial with the implementation of mitigation measures like erection of decorative screen hoarding, adoption of light colour for temporary ventilation shafts associated with the underpass road, temporary landscaped area with planters and early introduction of landscape treatments. However, the mitigation measures proposed at ground level would not be able to mitigate the visual impacts for views from the higher levels of some of the VSRs, in particular for those along Austin Road West and Canton Road.

Residual Visual Impact during Operation Phase

Residual visual impacts during operation phase will be confined to the VSRs in close proximity to the above ground structures associated with the underpass road, where they have direct and full views to these future structures.

Residual visual impact during operation phase (day 1) would be generally derived by the temporary ventilation shafts associated with the underpass road. The residual visual impact on the VSRs during operation phase (day 1) is considered to be slight with the implementation of mitigation measures such as adoption of light colour for temporary ventilation shafts for the underpass road and temporary landscaped area with planters.

With the implementation of design and mitigation measures such as incorporation of aesthetic road as well as roadside tree planting, the residual adverse impacts on these VSRs are considered to be slight during operation phase (Year 10).

It is considered that the VSRs located to the southeast of the site (i.e. the VSRs located along Gateway Boulevard) have less significant visual impacts than the VSRs located immediately north to the site. This is not only due to these being mostly commercial type of VSRs, which are considered to have medium sensitivity, but also their views to Victoria Harbour are generally not blocked by the Project.

VSRs located further away, and transient VSRs, will only have partial or glimpsed views of the underpass road, therefore the residual impact on these VSRs is considered to be insubstantial.

14.10.8 Environmental Monitoring and Audit

In addition to ensure the effective implementation of mitigation measure recommended in **Section 14.10.6** and compliance with relevant environment standards; systematic procedures for monitoring, auditing and minimizing the environmental impacts associated with construction and operation phase is required.

During the construction and operation phase, monitoring programme are required to ensure that Contractors and Operators properly carry out mitigation measures and evaluate the actual impact on landscape and visual amenity. This should be undertaken by a Registered Landscape Architect (RLA), or capable person, as landscape auditor. Corrective actions should be undertaken if there are unacceptable adverse impacts.

14.10.9 Conclusion

The WKCD is to be developed into a world-class integrated arts and cultural district to enrich the arts and cultural life for the people in Hong Kong and neighbouring area. In terms of planning, the WKCD should not be seen as an isolated development, which accessibility and connectivity to the neighbouring community should be essential to integrate the arts and cultural facilities in the WKCD with its neighbouring areas. The underpass road serving WKCD serves one of the key connections to facilitate the accessibility and connectivity of the overall WKCD development. The location of the underpass road is just underneath the proposed WKCD, running through Canton Road to the proposed WKCD Park drive (extension of Nga Cheung Road). Potential impacts on both landscape and visual amenity during construction phase are unavoidable. The major sources of impacts include various construction activities and removal of existing trees during construction phase.

There are 38 LRs, 14 LCAs and 23 representative VSRs identified within the assessment area that may be affected by underpass road. There will be slight adverse to moderate adverse impacts on some LRs, LCAs and VSRs at close proximity to the site during construction phase. However, impacts during construction phase are temporary only.

In addition, impacts on the landscape resources are considered to be minimal during operation phase since it is located underground.

Despite the temporary ventilation shafts associated with the underpass road will be visible during operation phase (day 1), they will be integrated with the WKCD buildings and they will no longer be visible as individual structures upon completion of the entire WKCD development. Hence they will not be visually prominent and thus it is anticipated that the visual impacts during operation phase (year 10) is slight.

As the underpass road is mostly located underground, the overall residual landscape and visual impacts associated with the construction and operation phases of the underpass road are anticipated to be acceptable with the implementation of appropriate mitigation measures and in the long term beneficial.

14.11 Environmental Monitoring and Audit

14.11.1 Air Quality Impact

14.11.1.1 Construction Phase

Regular dust monitoring is considered necessary during the construction phase of the Project and regular site audits are also required to ensure the dust control measures are properly implemented. Details of the environmental monitoring and audit (EM&A) programme will be presented in the stand-alone EM&A Manual.

14.11.1.2 Operation Phase

Since it has been assessed that all the ASRs would be in compliance with all the relevant AQOs for SO_2, NO_2 and RSP, no residual air quality impacts due to vehicular or marine traffic emissions are anticipated. Therefore, no monitoring is considered necessary for vehicular or marine traffic emissions.

14.11.2 Noise Impact

14.11.2.1 Construction Phase

Residual airborne noise impact is predicted during the construction phase. To ensure that the nearby NSRs will not be subject to unacceptable construction noise impact, an Environmental Monitoring and Audit (EM&A) is recommended. Details on the noise monitoring requirements, methodology and action plans would be described in a separate EM&A Manual.

14.11.2.2 Operation Phase

With implementation of the proposed mitigation measures, no adverse traffic noise impacts are anticipated from the operation of the Project, hence no environmental monitoring and audit is proposed.

Prior to the operation phase of the Project, as part of the design process, commissioning tests should be conducted to ensure the operational noise from the fixed plant within WKCD site would comply with the relevant EIAO-TM noise criteria.

14.11.3 Water Quality

Adverse water quality impact was not predicted during the construction and operation phases of the proposed underpass road. Nevertheless, appropriate mitigation measures are recommended to minimize potential water quality impacts.

Water quality monitoring is recommended to obtain a robust, defensible database of baseline information of marine water quality before construction, and thereafter, to monitor any variation of water quality from the baseline conditions and exceedances of WQOs at sensitive receivers during construction and to ensure the recommended mitigation measures are properly implemented.

Regular audit of the implementation of the recommended mitigation measures during the construction phase at the work areas should also be undertaken to ensure the recommended mitigation measures are properly implemented.

Details of the water quality monitoring and audit programme and the Event and Action Plan are provided in the stand-alone EM&A Manual.

14.11.4 Sewage and Sewage Treatment Implication

There are no sewerage and sewage treatment implications associated with the underpass road.

14.11.5 Waste Management Implications

It will be the Contractor's responsibilities to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices and the relevant regulations and requirements. The recommended mitigation measures shall form the basis of the Waste Management Plan to be developed by the Contractor in the construction phase.

During construction phase, regular site inspection as part of the EM&A procedures should be carried out to determine if various types of waste are being managed in accordance with approved procedures and the Waste Management Plan. It should cover different aspects of waste management including waste generation, storage, recycling, treatment, transport and disposal.

14.11.6 Land Contamination

As explained above, land remediation is not expected at this stage. Therefore, environmental monitoring in relation to land remediation is not required, unless a need for land remediation is identified during the future site investigation for the TST Fire Station area.

However, during construction phase, environmental monitoring and audit (EM&A) is to be carried out in the form of regular site inspection. All related procedures and facilities for handling or storage of chemicals and chemical wastes will be audited regularly to make sure they are in order and intact and reported in the EM&A reports as such.

14.11.7 Ecology Impact

The implementation of good site practices would avoid and minimize any ecological impacts to an acceptable level. No specific ecological monitoring programme is thus required for the underpass road.

14.11.8 Landscape and Visual Impact

In addition to ensure the effective implementation of mitigation measure recommended in **Section 14.10.6** and compliance with relevant environment standards; systematic procedures for monitoring, auditing and minimizing the environmental impacts associated with construction and operation phase is required.

During the construction and operation phase, monitoring programme are required to ensure that Contractors and Operators properly carry out mitigation measures and evaluate the actual impact on landscape and visual amenity. This should be undertaken by a Registered Landscape Architect (RLA), or capable person, as landscape auditor. Corrective actions should be undertaken if there are unacceptable adverse impacts.

14.12 Conclusions

14.12.1 Air Quality Impact

14.12.1.1 Construction Phase

With implementation of the recommended mitigation measures as well as the relevant control requirements as stipulated in the *Air Pollution Control (Construction Dust) Regulation* and EPD's *Guidance Note on the Best Practicable Means for Cement Works (Concrete Batching Plant) BPM 3/2(93)*, it has been assessed that there would neither be exceedance of the hourly TSP limit under the Tier 2 mitigated scenario nor exceedance of the AQO for daily TSP under the Tier 1 mitigated scenario at any of the ASRs throughout the entire construction period. For annual TSP results, no exceedance of the corresponding AQO was predicted at any of the ASRs during the construction phase provided the recommended mitigation measures are in place.

14.12.1.2 Operation Phase

Majority of the vehicular emission sources and all marine emission sources are due to respectively the nearby current/planned road networks serving the West Kowloon area and the existing marine activities in the surrounding waters, but not due to the underpass road itself. Therefore, the underpass road alone would only have very minor contribution to the predicted air quality impacts at the ASRs.

According to the modelling results, all the identified ASRs would be in compliance with the corresponding AQO for hourly, daily and annual SO_2; for hourly, daily and annual NO_2 as well as for daily and annual RSP. However, during the worst case year of 2015, four existing ASRs, namely, WOB-1, VT1-23, SRT-1 and SRT-2, would be subject to exceedance of the AQO for hourly NO_2 (i.e., 300 $\mu g/m^3$) by about 3.7-14.9 $\mu g/m^3$ (or about 1.2%-5.0% of the relevant AQO) for once a year, and two planned ASRs, namely, P09-1 and P37-1, would be subject to marginal exceedance of the AQO for daily NO_2 (i.e., 150 $\mu g/m^3$) by about 0.2-0.3 $\mu g/m^3$ (or about 0.1%-0.2% of the relevant AQO) for once a year. Since the numbers of such hourly and daily NO_2 exceedances are within the respective allowable numbers of exceedances (3 times per year for hourly NO_2 and once per year for daily NO_2), the AQO for hourly and daily NO_2 would still be complied with at the six ASRs.

In conclusion, no adverse air quality impacts due to vehicular or marine traffic emissions are anticipated during the operation phase.

14.12.2 Noise Impact

14.12.2.1 Construction Phase

The construction phase noise impact assessment has been made based on the best available information, taking into account other expected concurrent projects. Having exhausted practicable mitigation measures in the form of quiet plant, movable noise barrier, enclosure and insulting fabric, the construction noise levels at most of the representative NSRs are predicted to comply with the noise standards stipulated in the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). The cumulative construction noise impact predicted at one existing residential development at Austin Road West would exceed the relevant noise criterion by 1 dB(A) for a duration of 1 month. The exceedance was identified as dominantly contributed by the concurrent Express Rail Link (XRL) and Road Works at West Kowloon (RWWK) projects and the noise from this Project is only 66 dB(A). Residual construction noise impacts are

also predicted at two representative NSRs of educational use at Canton Road. The NSRs have already been implemented with noise insulation works and therefore significant noise impact is not anticipated during the construction. Notwithstanding this, it is recommended that the particularly noisy construction activities should be scheduled to avoid examination periods of these NSRs as far as practicable.

14.12.2.2 Operation Phase

The potential road traffic noise impacts have been assessed based on the peak traffic flows in 2032. The exceedances were identified as dominantly contributed by the surrounding existing roads and the committed RWWK project road sections. The predicted noise contributions from the proposed roads of this Project are less than 1.0 dB(A) at those affected NSRs and the road traffic noise levels of the proposed roads are all below the relevant noise criteria. Direct noise mitigation measures on the Project road sections are deemed not necessary as they would be ineffective in improving the noise environment at the sensitive receivers. No adverse noise impacts arising from the proposed underpass are predicted at any of the representative NSRs.

Noise impact from the planned fixed plants could be effectively mitigated by implementing noise control measures at sources during the detailed design stage. With the adoption of the proposed maximum allowable Sound Power Levels (SWLs) of the proposed fixed plant, the impact noise levels at all selected NSRs would comply with the relevant noise criteria for the daytime, evening time and night time periods. Therefore, significant fixed plant noise impact to the existing NSRs is not anticipated.

14.12.3 Water Quality Impact

14.12.3.1 Construction Phase

The key issue in terms of water quality during the construction phase of the underpass road would be the potential for release of wastewater into coastal waters from construction site runoff and drainage.

Deterioration in water quality could be minimised to acceptable levels through implementing adequate mitigation measures such as control measures on suspended solids release, on-site runoff and drainage from the works areas to minimise suspended solids spillage and construction runoff prior to discharge. Proper site management and good housekeeping practices would also be required to ensure that construction wastes and other construction-related materials would not enter the public drainage system and coastal waters. Sewage effluent arising from the construction workforce would also be handled through provision of portable toilets.

With the implementation of these recommended mitigation measures, no unacceptable impacts on water quality from the construction works for the underpass road are anticipated. Water quality monitoring and site inspections during construction phase should be undertaken routinely to inspect the construction activities and works areas to ensure the recommended mitigation measures are properly implemented.

14.12.3.2 Operation Phase

Surface runoff from the proposed underpass road may be contaminated by oils leaked from passing vehicles. It is considered that impacts upon water quality will be acceptable provided that the proposed underpass road is designed with adequate drainage systems and appropriate oil interceptors, as required

14.12.4 Sewage and Sewage Treatment Implication

There are no sewerage and sewage treatment implications associated with the underpass road.

14.12.5 Waste Management Implication

14.12.5.1 Construction Phase

The major waste types generated by the construction activities will include inert C&D materials from excavation works for the basement (including the underpass road and the flyover) as well as from construction of superstructures and substructures; C&D materials from general site clearance; chemical waste from maintenance and servicing of construction plant and equipment; and general refuse from the workforce. Provided that all these identified wastes are handled, transported and disposed of in strict accordance with the relevant legislative and recommended requirements and that the recommended good site practices and mitigation measures are properly implemented, no adverse environmental impact is expected during the construction phase.

14.12.5.2 Operation Phase

During operation phase, this underpass road project will not involve any waste generating activities. Therefore, no adverse waste management impact is anticipated during operation phase, and no mitigation measures are required.

14.12.6 Land Contamination

The land contamination assessment has been conducted by reviewing historical/current land uses, desktop review and site surveys with respect to the potential land contamination at the Project area. Other relevant information was also collected from the related Government Departments.

Based on the findings of the site surveys on the existing and historical land uses in the Project area and review of relevant records and reports, adverse land contamination impacts associated with the construction and operation of the Project is not anticipated except for demolition of the two underground fuel oil storage tanks and associated pipes at the existing TST Fire Station within the WKCD site. As the existing TST Fire Station will remain in operation until its relocation in phases, which will unlikely be started before 2020, it is proposed to carry out further site investigation after obtaining access to the Fire Station but prior to demolition of the underground fuel oil tanks and associated pipes in order to obtain up-to–date site investigation findings for assessment of land contamination that may occur between now and its future relocation. The site investigation findings should be documented in a CAR and where necessary a RAP should also be prepared for submission to EPD for approval.

Mitigation measures for handling of contaminated materials, in case it is discovered after commencement of the works, and regular site audits are recommended to minimize the potential adverse impacts on workers' health and safety and disposal of any potentially contaminated materials.

14.12.7 Ecology Impact

The findings from the field survey and desktop review indicated that the major terrestrial habitats in the Study Area are developed area, open field and plantation, with small amount of sloping seawall along the coastline. All these habitats are with low vegetation cover, short planting history and of low to very low

ecological value. Therefore, direct ecological impact on loss of habitat is considered to be of insignificant. The indirect disturbance impact to offsite habitat is considered to be of insignificant in both construction and operation phases, since the proposed underpass road is surrounded by urbanized area. The plantation and landscape planting included in the development plan would have potential positive contribution to the local.

14.12.8 Landscape and Visual Impact

The WKCD is to be developed into a world-class integrated arts and cultural district to enrich the arts and cultural life for the people in Hong Kong and neighbouring area. In terms of planning, the WKCD should not be seen as an isolated development, which accessibility and connectivity to the neighbouring community is also essential to integrate the arts and cultural facilities in the WKCD with its neighbouring areas. The underpass road serving WKCD serves one of the key connections to facilitate the accessibility and connectivity of the overall WKCD development. The location of the underpass road is just underneath the proposed WKCD, running through Canton Road to the proposed WKCD Park drive (extension of Nga Cheung Road). Potential impacts on both landscape and visual amenity during construction phase are unavoidable. The major sources of impacts include various construction activities and removal of existing trees during construction phase.

There are 38 LRs, 14 LCAs and 23 representative VSRs identified within the assessment area that may be affected by underpass road. There will be slight adverse to moderate adverse impacts on some LRs, LCAs and VSRs at close proximity to the site during construction phase. However, impacts during construction phase are temporary only. Impacts on the landscape resources are considered to be minimal during operation phase since it is located underground.

The ventilation shafts associated with the underpass road will be integrated with the WKCD buildings and will no longer be visible as individual structures upon completion of the entire WKCD development, hence they will not be visually prominent and thus it is anticipated that the visual impacts during operation (year 10) phase is slight.

As the underpass road is mostly located underground, the overall residual landscape and visual impacts associated with the construction and operation phases of the underpass road are anticipated to be acceptable with the implementation of appropriate mitigation measures and in the long term beneficial.

14.13 Implementation Schedule

The implementation schedule for the mitigation measures to be implemented under this Project is presented in Table 14.13.1.

Table 14.13.1: Implementation Schedule

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
Air Quality Impact (Construction)									
14.3.6.1		**General Dust Control Measures** Frequent water spraying for active construction areas (12 times a day or once every one hour), including Heavy construction activities such as construction of buildings or roads, drilling, ground excavation, cut and fill operations (i.e., earth moving)	Within WKCD site / Duration of the construction phase / Prior to commencement of operation	Contractor appointed by WKCDA		✓			EIA Recommendation and Air Pollution Control (Construction Dust) Regulation
14.3.6.1		**Best Practice For Dust Control** The relevant best practices for dust control as stipulated in the Air Pollution Control (construction Dust) Regulation should be adopted to further reduce the construction dust impacts from the Project. These best practices include: *Good Site Management* ■ Good site management is important to help reducing potential air quality impact down to an acceptable level. As a general guide, the Contractor should maintain high standard of housekeeping to prevent emission of fugitive dust. Loading, unloading, handling and storage of raw materials, wastes or by-products should be carried out in a manner so as to minimise the release of visible dust emission. Any piles of materials accumulated on or around the work areas should be cleaned up regularly. Cleaning, repair and maintenance of all plant facilities within the work areas should be carried out in a manner minimising generation of fugitive dust emissions. The material should be handled properly to prevent fugitive dust emission before cleaning. *Disturbed Parts of the Roads* ■ Each and every main temporary access should be paved with concrete, bituminous hardcore materials or metal plates and kept clear of dusty materials; or ■ Unpaved parts of the road should be sprayed with water or a dust suppression chemical so as to keep the entire road	Within WKCD site / Duration of the construction phase / Prior to commencement of operation	Contractor appointed by WKCDA		✓			EIA Recommendation and Air Pollution Control (Construction Dust) Regulation

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
		surface wet. *Exposed Earth* ■ Exposed earth should be properly treated by compaction, hydroseeding, vegetation planting or seating with latex, vinyl, bitumen within six months after the last construction activity on the site or part of the site where the exposed earth lies. *Loading, Unloading or Transfer of Dusty Materials* ■ All dusty materials should be sprayed with water immediately prior to any loading or transfer operation so as to keep the dusty material wet. *Debris Handling* ■ Any debris should be covered entirely by impervious sheeting or stored in a debris collection area sheltered on the top and the three sides. ■ Before debris is dumped into a chute, water should be sprayed so that it remains wet when it is dumped. *Transport of Dusty Materials* ■ Vehicle used for transporting dusty materials/spoils should be covered with tarpaulin or similar material. The cover should extend over the edges of the sides and tailboards. *Wheel washing* ■ Vehicle wheel washing facilities should be provided at each construction site exit. Immediately before leaving the construction site, every vehicle should be washed to remove any dusty materials from its body and wheels. *Use of vehicles* ■ The speed of the trucks within the site should be controlled to about 10km/hour in order to reduce adverse dust impacts and secure the safe movement around the site. ■ Immediately before leaving the construction site, every vehicle should be washed to remove any dusty materials from its body and wheels. ■ Where a vehicle leaving the construction site is carrying a								

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
		load of dusty materials, the load should be covered entirely by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle. *Site hoarding* ■ Where a site boundary adjoins a road, street, service lane or other area accessible to the public, hoarding of not less than 2.4m high from ground level should be provided along the entire length of that portion of the site boundary except for a site entrance or exit.							
14.3.6.1		**Best Practicable Means for Cement Works (Concrete Batching Plant)** The relevant best practices for dust control as stipulated in the Guidance Note on the Best Practicable Means for Cement Works (Concrete Batching Plant) BPM 3/2(93) should be followed and implemented to further reduce the construction dust impacts of the Project. These best practices include: Exhaust from Dust Arrestment Plant ■ Wherever possible the final discharge point from particulate matter arrestment plant, where is not necessary to achieve dispersion from residual pollutants, should be at low level to minimise the effect on the local community in the case of abnormal emissions and to facilitate maintenance and inspection Emission Limits ■ All emissions to air, other than steam or water vapour, shall be colourless and free from persistent mist or smoke Engineering Design/Technical Requirements ■ As a general guidance, the loading, unloading, handling and storage of fuel, raw materials, products, wastes or by-products should be carried out in a manner so as to prevent the release of visible dust and/or other noxious or offensive emissions	Within WKCD site / Duration of the construction phase / Prior to commencement of operation	Contractor appointed by WKCDA		✓			EIA recommendation; Guidance Note on the Best Practicable Means for Cement Works (Concrete Batching Plant) BPM 3/2(93)
Air Quality Impact (Operation)									

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
		No mitigation measure is required.							
Noise Impact (Construction)									
14.4.7.1		**Good Site Practice** Good site practice and noise management can significantly reduce the impact of construction site activities on nearby NSRs. The following package of measures should be followed during each phase of construction: ■ only well-maintained plant to be operated on-site and plant should be serviced regularly during the construction works; ■ machines and plant that may be in intermittent use to be shut down between work periods or should be throttled down to a minimum; ■ plant known to emit noise strongly in one direction, should, where possible, be orientated to direct noise away from the NSRs; ■ mobile plant should be sited as far away from NSRs as possible; and ■ material stockpiles and other structures to be effectively utilised, where practicable, to screen noise from on-site construction activities.	Within WKCD site / During construction phase / Prior to commencement of operation	Contractor appointed by WKCDA		✓			EIAO and Noise Control Ordinance
14.4.7.1		**Adoption of Quieter PME** The recommended quieter PME adopted in the assessment were taken from EPD's QPME Inventory and "*Sound Power Levels of Other Commonly Used PME*". It should be noted that the silenced PME selected for assessment can be found in Hong Kong.	Within WKCD site / During construction phase / Prior to commencement of operation	Contractor appointed by WKCDA		✓			EIAO and Noise Control Ordinance
14.4.7.1		**Use of Movable Noise Barriers** Movable noise barriers can be very effective in screening noise from particular items of plant when constructing the Project. Noise barriers located along the active works area close to the noise generating component of a PME could produce at least 10 dB(A) screening for stationary plant and 5 dB(A) for mobile plant provided the direct line of sight between the PME and the NSRs is blocked.	Within WKCD site / During construction phase / Prior to commencement of operation	Contractor appointed by WKCDA		✓			EIAO and Noise Control Ordinance

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
14.4.7.1		**Use of Noise Enclosure/ Acoustic Shed** The use of noise enclosure or acoustic shed is to cover stationary PME such as air compressor and concrete pump. With the adoption of the noise enclosure, the PME could be completely screened, and noise reduction of 15 dB(A) can be achieved according to the EIAO Guidance Note No.9/2010.	Within WKCD site / During construction phase / Prior to commencement of operation	Contractor appointed by WKCDA		✓			EIAO and Noise Control Ordinance
14.4.7.1		**Use of Noise Insulating Fabric** Noise insulating fabric can also be adopted for certain PME (e.g. drill rig, pilling machine etc). The fabric should be lapped such that there are no openings or gaps on the joints. According to the approved Tsim Sha Tsui Station Northern Subway EIA report (AEIAR-127/2008), a noise reduction of 10 dB(A) can be achieved for the PME lapped with the noise insulating fabric.	Within WKCD site / During construction phase / Prior to commencement of operation	Contractor appointed by WKCDA		✓			EIAO and Noise Control Ordinance
14.4.7.1		**Scheduling of Construction Works outside School Examination Periods** During construction phase, the contractor should liaise with the educational institutions (including NSRs LCS and CRGPS) to obtain the examination schedule and avoid the noisy.	Within WKCD site / During construction phase / Prior to commencement of operation	Contractor appointed by WKCDA		✓			EIAO and Noise Control Ordinance
Noise Impact (Operation)									
14.4.7.2		**Road Traffic Noise** Sound-absorbing materials should be installed on inner walls and ceilings of the underpass at the portals at the junction of Lin Cheung Road and Austin Road West, interim access of Austin Road West and permanent access at Canton Road. The sound-absorbing materials would be extended at least 30m into the underpass at the portals.	Portal at the junction of Lin Cheung Road and Austin Road West, Interim Access at Austin Road West and Permanent access at Canton Road / Before commencement of operation of road project	Contractor appointed by WKCDA / Highways Department	✓	✓	✓		EIAO
14.4.7.2		**Fixed Plant Noise** Specification of the maximum allowable sound power levels of the proposed fixed plants during daytime and night-time should be followed. The following noise reduction measures shall be considered as far as practicable during operation: ■ Choose quieter plant such as those which have been effectively silenced;	Within WKCD site / During operation phase / Throughout operation phase	Design Architect / Contractor appointed by WKCDA	✓		✓		EIAO and Noise Control Ordinance

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
		■ Include noise levels specification when ordering new plant (including chillier and E/M equipment); ■ Locate fixed plant/louvre away from any NSRs as far as practicable; ■ Locate fixed plant in walled plant rooms or in specially designed enclosures; ■ Locate noisy machines in a basement or a completely separate building; ■ Install direct noise mitigation measures including silencers, acoustic louvres and acoustic enclosure where necessary; and ■ Develop and implement a regularly scheduled plant maintenance programme so that equipment is properly operated and serviced in order to maintain a controlled level of noise.							
Water Quality Impact (Construction)									
14.5.5.1		**Construction site runoff and drainage** The site practices outlined in ProPECC Note PN 1/94 should be followed as far as practicable in order to minimise surface runoff and the chance of erosion. The following measures are recommended to protect water quality and sensitive uses of the coastal area, and when properly implemented should be sufficient to adequately control site discharges so as to avoid water quality impacts: ■ At the start of site establishment, perimeter cut-off drains to direct off-site water around the site should be constructed with internal drainage works and erosion and sedimentation control facilities implemented. Channels, earth bunds or sand bag barriers should be provided on site to direct storm water to silt removal facilities. The design of the temporary on-site drainage system should be undertaken by the WKCDA's Contractor prior to the commencement of construction; ■ Sand/silt removal facilities such as sand/silt traps and sediment basins should be provided to remove sand/silt	Within WKCD site / Duration of the construction phase / Prior to commencement of operation	Contractor appointed by WKCDA		✓			ProPECC Note PN 1/94

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
		particles from runoff to meet the requirements of the TM standards under the WPCO. The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC Note PN 1/94. Sizes may vary depending upon the flow rate. The detailed design of the sand/silt traps should be undertaken by the WKCDA's Contractor prior to the commencement of construction. ■ All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly during rainstorms. Deposited silt and grit should be regularly removed, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times. ■ Measures should be taken to minimize the ingress of site drainage into excavations. If excavation of trenches in wet periods is necessary, they should be dug and backfilled in short sections wherever practicable. Water pumped out from foundation excavations should be discharged into storm drains via silt removal facilities. ■ All vehicles and plant should be cleaned before leaving a construction site to ensure no earth, mud, debris and the like is deposited by them on roads. An adequately designed and sited wheel washing facility should be provided at construction site exit where practicable. Wash-water should have sand and silt settled out and removed regularly to ensure the continued efficiency of the process. The section of access road leading to, and exiting from, the wheel-wash bay to the public road should be paved with sufficient backfall toward the wheel-wash bay to prevent vehicle tracking of soil and silty water to public roads and drains. ■ Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system. ■ Manholes (including newly constructed ones) should be							

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
		adequately covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the drainage system and stormwater runoff being directed into foul sewers. ■ Precautions should be taken at any time of the year when rainstorms are likely. Actions should be taken when a rainstorm is imminent or forecasted and actions to be taken during or after rainstorms are summarized in Appendix A2 of ProPECC Note PN 1/94. Particular attention should be paid to the control of silty surface runoff during storm events, especially for areas located near steep slopes. ■ Bentonite slurries used in piling or slurry walling should be reconditioned and reused wherever practicable. Temporary enclosed storage locations should be provided on-site for any unused bentonite that needs to be transported away after all the related construction activities are completed. The requirements in ProPECC Note PN 1/94 should be adhered to in the handling and disposal of bentonite slurries.							
14.5.5.1		**Barging facilities and activities** Recommendations for good site practices during operation of the proposed barging point include: ■ All vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tide conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash; ■ Loading of barges and hoppers should be controlled to prevent splashing of material into the surrounding water. Barges or hoppers should not be filled to a level that will cause the overflow of materials or polluted water during loading or transportation; ■ All hopper barges should be fitted with tight fitting seals to their bottom openings to prevent leakage of material; and ■ Construction activities should not cause foam, oil, grease, scum, litter or other objectionable matter to be present on the water within the site.	Within WKCD site / During construction phase / Prior to commencement of operation	Contractor appointed by WKCDA		✓			WPCO

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
14.5.5.1		**Sewage effluent from construction workforce** Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site where necessary to handle sewage from the workforce. A licensed contractor should be employed to provide appropriate and adequate portable toilets and be responsible for appropriate disposal and maintenance.	Within WKCD site / During construction phase / Prior to commencement of operation	Contractor appointed by WKCDA		✓			ProPECC Note PN 1/94
14.5.5.1		**General construction activities** Construction solid waste, debris and refuse generated on-site should be collected, handled and disposed of properly to avoid entering any nearby storm water drain. Stockpiles of cement and other construction materials should be kept covered when not being used. Oils and fuels should only be stored in designated areas which have pollution prevention facilities. To prevent spillage of fuels and solvents to any nearby storm water drain, all fuel tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. The bund should be drained of rainwater after a rain event.	Within WKCD site / During construction phase / Prior to commencement of operation	Contractor appointed by WKCDA		✓			ProPECC Note PN 1/94
Water Quality Impact (Operation)									
14.5.5.2		**Road and surface runoff** For operation of the proposed WKCD development and associated local road network, a surface water drainage system would be provided to collect road and surface runoff. It is recommended that the road drainage should be provided with adequately designed silt trap and oil interceptors, as necessary. The design of the operation stage mitigation measures for the proposed WKCD development and associated local road network should take into account the guidelines published in the *Practice Note for Professional Persons on Drainage Plans Subject to Comment by the Environmental Protection Department* (ProPECC Note PN 5/93) and *Highways Department Guidance Notes RD/GN/035 – Road Pavement Drainage Design*.	Within WKCD site / During operation phase / Throughout operation phase	HyD (for exclusive road drains)			✓		ProPECC Note PN 5/93, *Highways Department Guidance Notes RD/GN/035*
Sewerage and Sewage Treatment Implications (Design)									

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
		No mitigation measure is required.							
Sewerage and Sewage Treatment Implications (Operation)									
		No mitigation measure is required.							
Waste Management Implications (Construction)									
14.7.4.1		**Good Site Practices** Recommendations for good site practices during the construction activities include: ■ Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site ■ Training of site personnel in proper waste management and chemical handling procedures ■ Provision of sufficient waste disposal points and regular collection of waste ■ Appropriate measures to minimise windblown litter and dust/odour during transportation of waste by either covering trucks or by transporting wastes in enclosed containers ■ Provision of wheel washing facilities before the trucks leaving the works area so as to minimise dust introduction to public roads ■ Well planned delivery programme for offsite disposal such that adverse environmental impact from transporting the inert or non-inert C&D materials is not anticipated	WKCD construction site / Throughout construction stage / Until completion of all construction activities	Contractor appointed by WKCDA		✓			Waste Disposal Ordinance; Waste Disposal (Chemical Wastes) (General) Regulation; and Technical Circular (Works) No. 19/2005 Environmental Management on Construction Site
14.7.4.1		**Waste Reduction Measures** Recommendations to achieve waste reduction include: ■ Sort inert C&D materials to recover any recyclable portions such as metals ■ Segregation and storage of different types of waste in different containers or skips to enhance reuse or recycling of materials and their proper disposal ■ Encourage collection of recyclable waste such as waste	WKCD construction site / Throughout construction stage / Until completion of all construction activities	Contractor appointed by WKCDA		✓			Waste Disposal Ordinance

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
		paper and aluminium cans by providing separate labelled bins to enable such waste to be segregated from other general refuse generated by the work force ■ Proper site practices to minimise the potential for damage or contamination of inert C&D materials ■ Plan the use of construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste							
14.7.4.1		**Inert and Non-inert C&D Materials** In order to minimise impacts resulting from collection and transportation of inert C&D materials for off-site disposal, the excavated materials should be reused on-site as fill material as far as practicable. In addition, inert C&D materials generated from excavation works could be reused as fill materials in local projects that require public fill for reclamation. ■ The surplus inert C&D materials will be disposed of at the Government's PFRFs for beneficial use by other projects in Hong Kong. ■ Liaison with the CEDD Public Fill Committee (PFC) on the allocation of space for disposal of the inert C&D materials at PFRF is underway. No construction work is allowed to proceed until all issues on management of inert C&D materials have been resolved and all relevant arrangements have been endorsed by the relevant authorities including PFC and EPD. ■ The C&D materials generated from general site clearance should be sorted on site to segregate any inert materials for reuse or disposal of at PFRFs whereas the non-inert materials will be disposed of at the designated landfill site. ■ In order to monitor the disposal of inert and non-inert C&D materials at respectively PFRFs and the designated landfill site, and to control fly-tipping, it is recommended that the Contractor should follow the Technical Circular (Works) No.6/2010 for Trip Ticket System for Disposal of Construction & Demolition Materials issued by Development Bureau. In addition, it is also recommended that the	WKCD construction site / Throughout construction stage / Until completion of all construction activities	Contractor appointed by WKCDA		✓			Waste Disposal Ordinance ; Technical Circular (Works) No.6/2010 for Trip Ticket System for Disposal of Construction & Demolition Materials; and Technical Circular (Works) No. 19/2005 Environmental Management on Construction Site

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
		Contractor should prepare and implement a Waste Management Plan detailing their various waste arising and waste management practices in accordance with the relevant requirements of the Technical Circular (Works) No. 19/2005 Environmental Management on Construction Site.							
14.7.4.1		**Chemical Waste** If chemical wastes are produced at the construction site, the Contractor will be required to register with the EPD as a chemical waste producer and to follow the guidelines stated in the "Code of Practice on the Packaging Labelling and Storage of Chemical Wastes". Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosive, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor should use a licensed collector to transport and dispose of the chemical wastes at the approved Chemical Waste Treatment Centre or other licensed recycling facilities, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation. Potential environmental impacts arising from the handling activities (including storage, collection, transportation and disposal of chemical waste) are expected to be minimal with the implementation of appropriate mitigation measures as recommended.	WKCD construction site / Throughout construction stage / Until completion of all construction activities	Contractor appointed by WKCDA		✓			Code of Practice on the Packaging Labelling and Storage of Chemical Wastes; Waste Disposal (Chemical Waste) (General) Regulation
14.7.4.1		**General Refuse** General refuse should be stored in enclosed bins or compaction units separated from inert C&D materials. A reputable waste collector should be employed by the Contractor to remove general refuse from the site, separately from inert C&D materials. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.	WKCD construction site / Throughout construction stage / Until completion of all construction activities	Contractor appointed by WKCDA		✓			Waste Disposal Ordinance and Public Health and Municipal Services Ordinance - Public Cleansing and Prevention of Nuisances Regulation
Waste Management Implications (Operation)									

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
		No mitigation measure is required.							
Land Contamination (Construction)									
14.8.5		The potential for land contamination issues at the TST Fire Station due to its future relocation will be confirmed by site investigation after land acquisition. Where necessary, mitigation measures for minimising potential exposure to contaminated materials (if any) or remediation measures will be identified. If contaminated land is identified (e.g., during decommissioning of fuel oil storage tanks) after the commencement of works, mitigation measures are proposed in order to minimise the potentially adverse effects on the health and safety of construction workers and impacts arising from the disposal of potentially contaminated materials. The following measures are proposed for excavation and transportation of contaminated material: ■ To minimize the chance for construction workers to come into contact with any contaminated materials, bulk earth-moving excavation equipment should be employed; ■ Contact with contaminated materials can be minimised by wearing appropriate clothing and personal protective equipment such as gloves and masks (especially when interacting directly with contaminated material), provision of washing facilities and prohibition of smoking and eating on site; ■ Stockpiling of contaminated excavated materials on site should be avoided as far as possible; ■ The use of contaminated soil for landscaping purpose should be avoided unless pre-treatment was carried out; ■ Vehicles containing any contaminated excavated materials should be suitably covered to reduce dust emissions and/or release of contaminated wastewater; ■ Truck bodies and tailgates should be sealed to stop any discharge; ■ Only licensed waste haulers should be used to collect and	Site of the existing Tsim Sha Tsui Fire Station / During excavation activities / Prior to construction of WKCD facilities	Contractor appointed by WKCDA		✓			Waste Disposal Ordinance; and Waste Disposal (Chemical Waste) (General) Regulation

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
		transport contaminated material to treatment/disposal site and should be equipped with tracking system to avoid fly tipping; ■ Speed control for trucks carrying contaminated materials should be exercised; ■ Observe all relevant regulations in relation to waste handling, such as Waste Disposal Ordinance (Cap 354), Waste Disposal (Chemical Waste) (General) Regulation (Cap 354) and obtain all necessary permits where required; and ■ Maintain records of waste generation and disposal quantities and disposal arrangements.							
Land Contamination (Operation)									
		No mitigation measure is required.							
Ecological Impact (Construction)									
		No mitigation measure is required.							
Ecological Impact (Operation)									
		No mitigation measure is required.							
Landscape and Visual Impact (Construction)									
Table 14.10.17 (CM1)		Trees should be retained in situ on site as far as possible. Should tree removal be unavoidable due to construction impacts, trees will be transplanted or felled with reference to the stated criteria in the Tree Removal Applications to be submitted to relevant government departments for approval in accordance to ETWB TCW No. 29/2004 and 3/2006.	WKCD construction site / Throughout construction stage / Until completion of all construction activities	Contractor appointed by WKCDA	✓	✓			ETWB TCW No. 29/2004 and 3/2006
Table 14.10.17 (CM2)		Compensatory tree planting shall be incorporated to the proposed project and maximize the new tree, shrubs and other vegetation planting to compensate tree felled and vegetation removed. Also, implementation of compensatory planting should be of a ratio not less than 1:1 in terms of quality and quantity within the site.	WKCD Park and public areas / After completion of site formation / Prior to operation stage	Contractor appointed by WKCDA	✓	✓			ETWB TCW No. 3/2006
Table 14.10.17		Buffer trees for screening purposes to soften the hard architectural and engineering structures and facilities.	Alongside superstructures within WKCD / After completion	Contractor appointed by WKCDA	✓	✓			EIAO-TM

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
(CM3)			of superstructure construction / Prior to operation stage						
Table 14.10.17 (CM4)		Softscape treatments such as vertical green wall panel / planting of climbing and/or weeping plants, etc, to maximize the green coverage and soften the hard architectural and engineering structures and facilities.	Alongside superstructures within WKCD / After completion of superstructure construction / Prior to operation stage	Contractor appointed by WKCDA	✓	✓			EIAO-TM
Table 14.10.17 (CM5)		Roof greening by means of intensive and extensive green roof to maximize the green coverage and improve aesthetic appeal and visual quality of the building/structure.	Alongside superstructures within WKCD / After completion of superstructure construction / Prior to operation stage	Design Consultant / Contractor appointed by WKCDA	✓	✓			EIAO-TM
Table 14.10.17 (CM6)		Sensitive streetscape design should be incorporated along all new roads and streets.	Alongside superstructures within WKCD / After completion of superstructure construction / Prior to operation stage	Design Consultant / Contractor appointed by WKCDA	✓	✓			EIAO-TM
Table 14.10.17 (CM7)		Structure, ornamental planting shall be provided along amenity strips to enhance the landscape quality.	Alongside superstructures within WKCD / After completion of superstructure construction / Prior to operation stage	Contractor appointed by WKCDA	✓	✓			EIAO-TM
Table 14.10.17 (CM8)		Landscape design shall be incorporated to architectural and engineering structures in order to provide aesthetically pleasing designs.	Alongside superstructures within WKCD / After completion of superstructure construction / Prior to operation stage	Design Consultant / Contractor appointed by WKCDA	✓	✓			EIAO-TM
Table 14.10.2		Use of decorative screen hoarding/boards	WKCD construction sites / Throughout construction stage / Prior	Contractor appointed by WKCDA		✓			ETWB TCW No. 3/2006

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1] Des	Con	Op	Dec	Relevant Legislation & Guidelines
1 (MMC1)			to operation stage						
Table 14.10.21 (MMC2)		During the transition period, the temporary ventilation shafts associated with the underpass road will adopt light colour	WKCD basement construction sites / After completion of ventilation shaft superstructure / Prior to operation stage	Design Architect / Contractor appointed by WKCDA	✓	✓			EIAO-TM
Table 14.10.21 (MMC3)		The early introduction of landscape treatments	WKCD construction sites / Towards the end of construction stage / Prior to operation stage	Contractor appointed by WKCDA		✓			EIAO-TM
Table 14.10.21 (MMC4)		The temporary landscape areas will help achieve the visual balance and reduce the visual impacts derived by the construction activities within the site.	Temporary landscape areas/ Throughout construction stage / Prior to operation stage	Contractor appointed by WKCDA		✓			EIAO-TM
Table 14.10.21 (MMC5)		Control of night time lighting such as avoidance of lighting from spilling onto nearby residential developments.	WKCD construction sites / During night time / Throughout construction stage	Contractor appointed by WKCDA		✓			EIAO-TM
Landscape and Visual Impact (Operation)									
Table 14.10.18 (OM1)		Provide proper planting establishment works, including watering, pruning, weeding, pest control, replacement of dead plant, etc,	WKCD open areas / Throughout operation phase / As-needed basis	Contractor appointed by WKCDA			✓		EIAO-TM
Table 14.10.18 (OM2)		Provision of open space in various forms and at different levels on or above ground, including park, waterfront promenade, piazzas and terrace garden and associated green connection for public enjoyment.	WKCD open areas / Throughout operation phase / As-needed basis	Design Consultant / Contractor appointed by WKCDA	✓		✓		EIAO-TM
Table 14.10.22 (MMO1)		The temporary ventilation shafts associated with the underpass road will adopt light colour during operation phase (day 1).	WKCD buildings / During design stage / Prior to operation stage (year 10)	Design Architect / Contractor appointed by WKCDA	✓		✓		EIAO-TM

EIA Ref.	EM&A Ref.	Environmental Protection Measures	Location / Duration of measures / Timing of completion of measures	Implementation Agent	Implementation Stage[1]				Relevant Legislation & Guidelines
					Des	Con	Op	Dec	
Table 14.10.22 (MMO2)		The temporary landscaped areas with planters will help achieve the visual balance during operation phase (day 1).	Temporary landscaped areas / Throughout construction stage / Prior to operation stage (year 10)	Design Architect / Contractor appointed by WKCDA			✓		EIAO-TM
Table 14.10.22 (MMO3)		Planters and other softscape treatments during operation phase (day 1).	WKCD construction sites / Prior to operation stage (year 10)	Contractor appointed by WKCDA			✓		EIAO-TM
Table 14.10.22 (MMO4)		Use of decorative screen hoarding/boards during operation phase (day 1) .	WKCD construction sites / Prior to operation stage (year 10)	Contractor appointed by WKCDA			✓		ETWB TCW No. 3/2006
Table 14.10.22 (MMO5)		Aesthetic design of roads and roadside planting during operation phase (year 10)	Areas close to the entrance of the underground road / Throughout operation stage	Contractor appointed by WKCDA			✓		EIAO-TM
Table 14.10.22 (MMO6)		Control of night time lighting such as avoidance of lighting from spilling onto nearby residential developments during operation phase (day 1 and year 10)	WKCD building exterior and open areas / During night time / Throughout operation stage	Contractor appointed by WKCDA			✓		EIAO-TM

[1] Des = Design; Con = Construction; Op = Operation; Dec = Decommission