West Kowloon Cultural District
西九文化區

Environmental Impact Assessment – Executive Summary
環境影響評估－行政摘要

July 2013
二零一三年七月

West Kowloon Cultural District Authority
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29F, Tower 6, The Gateway, 9 Canton Road, Tsim Sha Tsui, Kowloon, Hong Kong
九龍尖沙咀廣東道 9 號港威大廈第 6 座 29 樓

Mott MacDonald, 20/F AIA Kowloon Tower, Landmark East, 100 How Ming Street, Kwun Tong, Kowloon, Hong Kong
T +852 2828 5757 F +852 2827 1823, W www.mottmac.com

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1. Introduction

The West Kowloon Cultural District (WKCD) is a proposed world-class integrated arts, cultural, entertainment and commercial district located on the West Kowloon Reclamation south of Austin Road West and the Western Harbour Crossing Toll Plaza as shown in **Figure 1.1**. The site is currently zoned as "Other Specified Uses" annotated "Arts, Cultural, Entertainment, Commercial and Other Uses" under the Draft South West Kowloon Outline Zoning Plan (No. S/K20/26) gazetted on 30 June 2011, and comprises approximately 40ha of land bordering the Jordan/Tsim Sha Tsui area.

To identify public aspirations and the optimal development scheme for the WKCD, a series of public engagement exercises and conceptual plan designs were commissioned between October 2009 and October 2011 by the West Kowloon Cultural District Authority (WKCDA).

Following the findings of the public engagement exercises, on 30 December 2011, the WKCDA submitted a Development Plan for the WKCD to the Town Planning Board, based on the Conceptual Plan prepared by Foster + Partners, and the Development Plan was agreed on 9 March 2012.

2. Project Description

2.1 Scope of the Project

The proposed WKCD development will comprise the following major facilities.

Core Arts and Cultural Facilities (CACF)

The CACF will consist of:

- A Mega Performance Venue, an enclosed facility designed for popular amplified music events, with the flexibility to accommodate other art forms and large-scale entertainment events;
- Exhibition Centre Complex, designed for large-scale cultural, entertainment and commercial events with facilities to support entrepreneurial arts related events and cultural activities – extending from art fairs and book fairs to fashion shows, performance installations, product launches and celebrations and galas;
- A Great Theatre, designed for large-scale productions optimised for a wide range of amplified music theatrical performances with supporting facilities such as spacious foyer designed to accommodate small-scale informal performances and temporary exhibitions, VIP rooms, box lounges, integrated retail and dining facilities, and ample rehearsal spaces;
- A Musical Theatre, intended primarily for broadway-style musicals and performances of other art forms, including western and Chinese opera and dance;
- A Lyric Theatre, a facility with an orchestra pit for dance, ballet, opera, musicals and theatrical performances, which is designed principally for operatic and dramatic performances, various forms of dance and a wide range of art forms, incorporating unamplified and amplified music accompaniment;
- A Centre for Contemporary Performance (CCP) comprising three flexible performing spaces of different sizes (blackbox theatres) and additional workshop/classrooms for educational programs. The CCP will be a facility for contemporary performing arts, mulit- and cross disciplinary, multimedia theatre, music and dance;
- Thrust Theatre, primarily designed to meet the needs of larger contemporary dance ensembles and spoken-word drama with amplified music;
- Proscenium Theatre, designed for medium-scale theatrical and dance performances with amplified music, primarily to meet the needs of spoken word theatre and various forms of dance;
- Outdoor Theatre, integrated within the landscape design of the Great Park, designed as a space primarily for both free and ticketed amplified or electronically reinforced music performance;
- A Music Centre comprising a Concert Hall and a Recital Hall, designed for the acoustics and performance requirements of large scale unamplified instrumental and vocal music, of both western and Chinese origin;
- A Xiqu Centre with Large Theatre and Small Theatre as well as a commercially operated teahouse – showcase and education venue for Chinese opera, and a single balcony courtyard type venue with integrated catering facilities;
- An enclosed Freespace with Music Box – a physical cluster of two indoor venues. The two indoor venues are namely Music Box and Freespace Theatre. Music Box is intended for the presentation of

pop culture events with a focus on music, and is highly flexible for stage position and seating configuration. Freespace theatre is intended for popular and experimental performances such as music, theatre and dance. This venue is highly flexible and offers an opportunity for the presentation of broad range of performance types with stalls format; and

- A museum (Museum Plus) for visual culture – contemporary art, design, architecture, moving image and popular culture – looking at the world from a Hong Kong perspective.

Other Arts and Cultural Facilities (OACF)

The CACF will be supported by the OACF which include Resident Company Centres, Arts and Craft Studios, Pavilions and Literary Arts Centre.

Infrastructure and Support Facilities

The WKCD will also involve the following infrastructure and support facilities:

- Government, Institution or Community (GIC) facilities including electricity substation, police post etc.;
- Various retail, dining and entertainment (RDE) facilities; and hotel, office and residential (HOR) developments. All residential buildings inside WKCD will be mixed with commercial components such as RDE and office at lower floors to support the leisure lifestyle and minimize the environmental impacts at residential floors;
- A district cooling system to provide chilled water for WKCD facilities for substantial energy saving, with possible extension to Government, Institution or Community facilities and hotel, office and residential developments subject to technical, financial and implementation mechanisms;
- On-site renewable energy systems e.g., wind turbines and photovoltaics for local electricity supply;
- A green transportation system in the form of travellators and eco-buses (operating in the underpass road), coupled with substantial pedestrianisation within the WKCD;
- Local road networks comprising a main underpass of approximately 1400 m in length, a flyover bridge of approximately 200 m in length across the Western Harbour Crossing toll plaza, at-grade link roads, lay-bys and emergency vehicular access;
- Other accessibility features including possible external footbridge connections from WKCD to Kowloon Park, China Ferry Pier, the International Commerce Centre, Elements mall, and pedestrian links (e.g. subway and landscape deck) to West Kowloon Terminus and Austin Station;
- One optional viewing platform and two possible piers for water access subject to the Protection of the Harbour Ordinance (Cap. 531). The viewing platform is an extension of the waterfront promenade, possibly composed of cantilever structure on top of seabed and foreshore. The two possible piers aims to enable marine connectivity for visitor to the MPV/EC and the Great Theatre;
- Modification of seawalls for the construction of seawater discharges/outfalls and landing steps near south or south-west boundary of the WKCD site;
- Optional water reuse facilities – options to be considered include green building initiatives such as rainwater harvesting and/or reuse of condensate from air conditioning systems;
- Optional automatic refuse collection system, if technically feasible and financially viable. The system aims to enhance recycling and to minimize nuisance to be caused from typical waste collection. Should the automatic refuse collection system be implemented, the piping network will be installed

underground and rely on transport of waste by vacuum, replacing the traditional refuse room and waste container;

- Possible relocation of the existing Tsim Sha Tsui Fire Station located at the south east boundary of the WKCD site in stages; and
- Associated utilities, drainage, sewerage, sewage pump sumps, waterworks, engineering works, landscaping and environmental mitigation measures.

The Project is a Designated Project by virtue of Item 1 of Schedule 3 of the Environmental Impact Assessment Ordinance (EIAO) (Cap.499), which specifies an "engineering feasibility study of urban development projects with a study area covering more than 20 ha or involving a total population of more than 100,000". The Project also includes the following individual designated projects defined under Schedule 2 of the EIAO:

(i) a flyover more than 100m in length between abutments over the Western Harbour Crossing toll plaza (Item A.8, Part I, Schedule 2); and

(ii) an underpass more than 100m in length under the built areas (Item A.9, Part I, Schedule 2.

Locations of the Designated Project items are shown in **Figure 2.1**.

The proposed flyover bridge (a designated project under Schedule 2 of the EIAO) will be above the Western Harbour Crossing (WHC) toll plaza at +14.0mPD for extension of the existing elevated deck at the junction of Austin Road West / Nga Cheung Road to the New Yau Ma Tei Public Cargo Working Area (NYMTPCWA). It aims to provide a second access for the Mega Performance Venue and Exhibition Centre, and flexibility for event management. The proposed flyover will be a single two-lane two-way elevated highways structure supported by four piers (which had already been constructed under two previous projects, namely, Contract No. WK25/96 Remaining Road Works Stage 1, and the WHC project). The abutments will be located at the two ends of the bridge deck. The flyover is about 200m long and 7.3m width with 1m marginal strip at each side.

The proposed underpass road (a designated project under Schedule 2 of the EIAO) will be largely located 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. There will be three access points to the underpass road (see **Figure 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. As the access point at Canton Road will not be constructed until after relocation of the Tsim Sha Tsui Fire Station, 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, 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.

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.

2.2 Need for the Project

2.2.1 WKCD Development

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. The development of WKCD can foster organic growth and development of cultural and creative industries, attract and nurture talents, promote international exchange and co-operation, enhance the quality of life for citizens and make Hong Kong the cultural gateway to the Pearl River Delta. It also provides an opportunity for incorporating a variety of green features to improve the environmental performance of the development.

The establishment of the CACF will form the heart of the arts and cultural community in Hong Kong and will provide and strengthen the platform for showcasing all forms of art and culture as well as promote the creation, communication and exchange of arts and cultural ideas. These facilities will also provide a focal point for arts and cultural enthusiasts to immerse in both locally and internationally recognised arts and cultural entertainment. In addition, the OACF will complement the signature arts and cultural facilities by providing related supporting facilities including various studios and centres for the preparation and compilation of a diverse range of arts and cultural programmes.

The Park will form a centrepiece for the WKCD and will create a large open space planted with numerous trees and overlooking the magnificent views of Victoria Harbour, which will significantly increase the amount of quality green space in the urban area and will also provide a key attraction for both locals and tourists. The large open space with trees and landscape features will have potential contribution to ecological enhancement as the current Project site predominantly consists of artificial habitats of low ecological value. The landscape and visual environment will be improved by blending in with the surrounding environment and existing facilities such as the Kowloon South Salt Water Pumping Station. It will provide a location for outdoor leisure and small-scale, impromptu arts and cultural performances and exhibits.

Overall, development of the WKCD will not only bring value-added contribution to the Gross Domestic Product (GDP) of the economy, visitor spending and employment opportunities, but also various intangible benefits for the development of a creative economy, nurturing local talents, attracting and retaining investors and talents, raising quality of life, reinforcing economic integration with the Pearl River Delta and branding Hong Kong as a world-class city.

In the absence of the project, the lack of suitable infrastructure for arts and culture will continue to inhibit the healthy growth of the arts and cultural sector in Hong Kong. The lack of an integrated arts and cultural district will reduce the tourism appeal of Hong Kong, and the tourism sector has already indicated that Hong Kong is at risk of losing its competitive edge as a tourist attraction/destination in the absence of (or undue delay in) implementation of the WKCD project. The people of Hong Kong will also be affected by a lack of new facilities for attending performances and exhibitions, and have already voiced their opinions early on in the public consultations for the WKCD development that the project should not be abandoned, and that they are keen to see the project implemented as soon as possible. Furthermore, WKCD is

intended to incorporate open space, tree plantings and landscape features, increasing the greenery spaces for members of the public to relax. Without the Project, these features will not be developed.

2.2.2 Underpass Road

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. 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 the CP by Foster + Partners, 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 proposed underpass road.

2.2.3 Flyover

The Mega Performance Venue (MPV) has been designed to cater for over 15,000 seating capacity. For time-specific events, such as concerts, the arrival or departure of over 15,000 visitors may be expected within a one hour timeframe. This has the potential to create a significant pressure on the vehicular access to MPV, where private cars and some public transportation modes (buses and taxis) compete and queue for space to dropoff/pickup at the MPV entrance. With the provision of a second vehicular access to the MPV via the flyover, vehicular traffic arriving at or departing from the MPV can be more evenly dispersed, allowing better transportation efficiency and greater flexibility for handling unexpected or emergency situations.

2.3 Consideration of Alternatives and Summary of Selection of Preferred Scenario

2.3.1 WKCD Development

To explore how the WKCD should be built, a three-stage public engagement (PE) exercise was conducted. The Stage 1 PE exercise was conducted between 8 October 2009 and 7 January 2010 and its primary purpose was to gauge the public and stakeholders' views on their aspirations and expectations of the WKCD as well as users' requirements for the arts and cultural facilities. Important concepts for the WKCD identified in the Stage 1 PE exercise, such as green setting and environmental friendliness, connectivity and convenience, and the catering to the needs of different users, were taken into consideration in the formulation of the three Conceptual Plan (CP) options under the Stage 2 PE. The three CPs are:

1. "*City Park*" – by Foster + Partners
2. "*Cultural Connect: Key to Sustained Vitality*" – by Rocco Design Architects Ltd.
3. "*Project for a New Dimension*" – by Office for Metropolitan Architecture

The Stage 2 PE exercise was conducted between 20 August 2010 and 20 November 2010. The results of the public survey from the Stage 2 PE exercise found that the public generally favoured the "*City Park*" Option. This preferred CP was then taken forward for Stage 3 PE exercise, after modification to incorporate desirable features from other CPs (such as an possible viewing platform) as well as technical considerations. The Stage 3 PE exercise to showcase the modified CP started on 30 September 2011 and was concluded on 30 October 2011. The findings from the Stage 3 PE exercise reaffirmed the generally

supportive views from the public on various aspects of the CP, and the CP was subsequently finalised into a Development Plan for submission to Town Planning Board.

The Development Plan for the project has gone through both public consultation and technical assessments of development options which has culminated into the selection of the current preferred scenario for development. This Development Plan is thus the recommended option for development of WKCD as it is considered to best meet the aspirations of the public while maintaining technical feasibility and incorporation of environmental considerations. Throughout the options selection process, environmental considerations have played an important part in setting limits, boundaries, and some of the core requirements of the Project. The following summarises the key environmental considerations that have been incorporated into the Development Plan to improve the environmental performance of the project.

2.3.1.1 Key Environmental Benefits

The key environmental benefits that will be generated from the project include the following:

- Creation of a Park with trees and various landscape and amenity planting. This park will significantly enhance the environmental setting and increase the amount of green space in West Kowloon. The roof and podium structures for the WKCD buildings will also incorporate green roof elements to maximise the provision of green space within the WKCD;
- Landscape and visual enhancement will be achieved via provision of new aesthetic structures that complement the surroundings with many of the CACF forming future signature buildings and provision of landscaping elements to create a visual attraction from both near and afar; and
- Adoption of a green transportation system that focuses on pedestrianisation and augmented by additional modes such as eco-buses and travellators.

2.3.1.2 Key Environmental Impacts Avoided or Minimised

The three different consultants commissioned by the WKCDA in preparing the Conceptual Plan had also carried out preliminary technical assessments on the options as part of the submission. The technical assessments were conducted with the aim of identifying environmental impacts and alternative strategies in advance. As a result of this process, a number of environmental impacts have been avoided or minimised in the Development Plan. These include the following:

- Locating the vehicular network within the site to the basement level to avoid the traffic noise impact, and increase ground level space for landscaping and planting;
- Consideration of air or noise-sensitive uses (e.g., residential developments) within the WKCD and locating these away from nearby sources of air or noise emissions wherever practicable;
- Relocation of the planned air sensitive receivers (e.g. Outdoor Theatre) away from the Western Harbour Crossing to minimise the potential air quality impact;
- Relocation of potential noise sources (e.g. Outdoor Theatre) away from existing and planned NSRs to avoid potential operation phase noise impact;

Other design options that were proposed during the Conceptual Plan stages and were discarded due to non-environmental reasons but have nevertheless contributed to the avoidance or minimisation of potential adverse environmental impacts include the following:

- Removal of proposed aircraft and helicopter landing facilities and thus avoidance of potential adverse aircraft noise impacts to existing and planned noise sensitive receivers;
- Removal of elevated automatic people mover and thus avoidance of potential adverse railway noise and visual impact to existing and planned noise sensitive receivers, while also increasing ground level space for landscaping and planting; and
- Removal of proposed sewage treatment plant which avoids potential odour impacts.

2.3.1.3 Key Environmentally Friendly Designs Incorporated

Sustainability is also a part of the vision for the project; hence the following key environmentally friendly designs have been incorporated into the preferred scenario:

- Renewable energy systems including use of solar photovoltaics and wind turbines;
- A district cooling system for providing chilled water to WKCD facilities (with substantial energy savings compared to conventional air-cooled chillers);
- Green roofs as part of the thermal control for WKCD buildings;
- Water conservation features such as rainwater harvesting and reuse of condensate from air conditioning systems where practicable; and
- Provision of cycling tracks and extensive pedestrian network to complement the green transportation system.

2.3.2 Construction Method and Sequence

As described in **Section 2.5**, a number of alternative construction methods and sequence of works has been reviewed and compared prior to recommending the preferred option. Consideration of environmental impacts during construction stage has been one of the main factors affecting the choice of construction method and construction sequence. The current recommended option has aimed to provide the optimum balance between environmental concerns and non-environmental considerations such that the WKCD project can be efficiently and sensitively implemented.

A summary of the major construction activities and the comparison of alternative options including justification for the recommended option are provided in **Table 2.1**.

Table 2.1: Summary of Alternative Construction Methodologies and Environmental Benefits/Dis-benefits

Construction Activity	Technical Requirements	Constraints	Environmental Benefit / Dis-benefit
Excavation			
Temporary cut slopes	Requires extensive working space for provision of temporary cut slopes	Basement area extends close to Victoria Harbour and trunk roads – insufficient space for temporary cut slopes	Larger excavation area may increase potential construction dust release
Excavation lateral support (ELS) system	Requires lateral support by diaphragm wall or similar ELS system. The ELS System should effectively avoid ingress of water to the works area.	Construction duration will be increased due to the construction of ELS System	Excavation extent and potential groundwater intrusion is minimised by use of vertical diaphragm wall

Construction Activity	Technical Requirements	Constraints	Environmental Benefit / Dis-benefit
Disposal by trucks	None	High traffic volumes on existing urban road network surrounding WKCD	Potential increased dust and road traffic noise impact to adjacent ASRs/NSRs
Disposal by barges	Designated barging point required –use the existing MTRC barging point on WKCD site	Interface with MTRC's use of the barging point prior to handover of the site back to WKCD	Potential water quality impacts from barge loading operation
Recommended Option Excavation via ELS and disposal by barges (with trucks used for transporting the excavated materials from the excavation area to the barging point) is the preferred scenario as environmental impacts are minimised compared to other options.			
Foundation Works			
Large diameter bored piles	Comparatively larger working spaces are required due to larger piling plants. It is relatively easy to overcome underground obstructions. This pile type has largest structural capacities to cater for lateral and vertical loads and less numbers of piles are required.	May be susceptible to bulging or necking during pile concreting in unstable ground due to the larger pile size.	More C&D material will be generated comparing with driven H-piles.
Pre-bored rock socket steel H-piles	Working spaces required are smaller and flexible to suit the design of the structures, in particular for areas which require temporary traffic diversion and are congested with utilities. It is relatively easy to overcome underground obstructions.	May be susceptible to bulging or necking during pile concreting in unstable ground. Possible collapse of the annulus space (over-cut) between the side wall and temporary casing before pile concreting would reduce the skin friction. The design loading is smaller comparing with bored piles.	More C&D material will be generated comparing with driven H-piles.
Driven steel H-piles	Lower loading capacity therefore greater number of piles required. Working space required are smaller and flexible to suit the design of the structures, in particular for areas which require temporary traffic diversion.	Higher ground borne vibration and movement induced from the driving operation may cause damage to the adjacent piles, structures and utilities installations. Pre-boring may be required to overcome underground obstructions and require longer construction period.	Generates the greatest noise and vibration which may impact nearby NSRs. Installation is generally unaffected by groundwater conditions
Recommended Option Use of large diameter bored piles is recommended as it has less environmental impact than some other options and is able to provide the larger loading capacity to meet the design requirements for the future WKCD facilities.			
Site Formation			
Utilities, roadworks and landscaping	Conventional methods	No specific constraints	No difference
Possible piers,	Installation of marine piles,	No specific constraints	No dredging will be

Construction Activity	Technical Requirements	Constraints	Environmental Benefit / Dis-benefit
intakes/outfalls and landing steps	removal and re-provision of existing seawall		required
Recommended Option The standard construction methods for utilities, roadworks and landscaping will be adopted as there is no significant implication on environmental impact. Use of marine piles for pier / marine structures construction avoids the need for dredging and is not associated with significant environmental impact, hence it is preferred.			
Superstructures (Buildings)			
Conventional in-situ reinforced concrete	Simple construction method, extensive experience in this type of construction among local contractors. Suitable for complicated structural form of the structures.	No specific constraints	More C&D waste will be generated comparing with precast concrete. Noise generation due to concreting works.
Precast concrete	Suitable for structures when the dimension of the structural members are standardized.	Uneconomical if only a small number of units is required. Connection details may have to be specially designed and would therefore be expensive; The transportation of long units may be difficult.	Less C&D waste will be generated as formwork can be used more effectively. Construction of concrete panels is carried out off-site and potential environmental impact could be minimized.
Steelwork	Fast construction and suitable for long span structures.	The construction cost is generally more expensive than concrete, in particular for fire resistance and corrosion.	Steel members are fabricated off-site and connected on-site. The potential environmental impact could be minimized.
Recommended Option Generally, the various methods for superstructure construction do not present significant differences in environmental impacts, hence the option to be adopted for individual buildings will be subject to the future building / facilities requirement to be determined in the detailed design stage.			
Superstructures (Bridges)			
Precast segmental	Conventional falseworks and formworks are not required and therefore extensive temporary road closures/diversions at the interchange can be avoided. Construction time is shorter and better construction planning can be achieved.	Construction cost is relatively high. The gantry girder cannot be very long thus restricting the span length to a maximum of around 60m currently in Hong Kong.	In-situ concreting works are significantly reduced compared with the other methods, minimizing the potential impacts to the environment, such as noise and air quality. In addition, the operation is quiet compared with other methods.
Precast span	Extensive experience in this type of construction among local contractors.	More movement joints and bearings may be needed for single span structures. This deteriorates the riding quality and poses future maintenance problems. Transportation of long beams in the nighttime, with implementation of Temporary Traffic Arrangement may be required.	The potential environmental impact is less comparing with cast-in-situ method.

Construction Activity	Technical Requirements	Constraints	Environmental Benefit / Dis-benefit
		The maximum span length of precast concrete beams is relatively short (about 30m), the use of this method limits the span of the elevated structure and thus increases the number of piers and foundations. This means additional cost will be incurred.	
Cast in-situ	Simple construction method, extensive experience in this type of construction among local contractors.	Span-by-span method requires longer construction time. Extensive working space is required for the erection of falsework, temporary traffic diversion is required.	Air and noise generation due to concreting works. More C&D waste will be generated comparing with other method.
Recommended Option Precast segmental method is considered to be preferable as it is associated with less environmental impacts compared to other options, and is able to meet the technical requirements and constraints.			

The preferred construction sequencing for the basement construction is as subdivided zones as this sequencing allows for better scheduling of excavation activities such that the magnitude of environmental impacts can be reduced. Early construction of the Park is also preferred as this allows early implementation of some of the environmental benefits of the project, including provision of landscape amenity and reduction of visual impacts due to construction of other parts of the WKCD. The phased construction sequence for CACF is the preferred option for CACF construction as this enables a reduction of the extent and magnitude of environmental impacts while allowing a more flexible programme for implementation of different facilities as needed.

A summary of the proposed construction sequence for major construction elements and the environmental benefits/dis-benefits is provided in **Table 2.2**.

Table 2.2: Summary of Preferred Construction Sequence and Environmental Benefits/Dis-benefits

Major Construction Elements	Proposed Construction Period	Justifications / Constraints	Environmental Benefit / Dis-benefit
Basement	2013 to 2017		
Zone 1 (including underpass roads)	2013 to 2014	Partially constrained by the existing West Rail line, requires special approval for construction adjacent to and over the underground railway tunnel	Concurrent construction with MTRC XRL project with potential cumulative impacts
Zone 2 (including underpass roads)	2014 to 2017	Partly constrained by existing Airport Express / Tung Chung Rail line	Phased construction reduces number of construction plant operating at the same time. Some concurrent construction with MTRC XRL project with potential cumulative impacts
Zone 3 (including underpass roads)	2014 to 2016	Partly constrained by existing Airport Express / Tung Chung Rail line	Concurrent construction with MTRC XRL project with potential cumulative impacts

Major Construction Elements	Proposed Construction Period	Justifications / Constraints	Environmental Benefit / Dis-benefit
Zone 4	2016 to 2017	Delayed construction partly due to operation of the on-site tree nursery (to be located within Zone C of the Park) till late 2014, and to reduce the extent of concurrent basement construction with Zone 1 to 3	Delayed construction reduces cumulative impacts
Flyover	2014 to 2017	To provide second vehicular access to the MPV and EC and flexibility for event management.	Improve traffic flow condition with evenly dispersed vehicular traffic and better transportation efficiency, hence reducing the potential air quality/noise impacts from traffic emissions
The Park	2013 to 2019		
Zone A	2013 to 2015	To meet public wish for completion of the Park as soon as possible	Concurrent construction with MTRC XRL project with potential cumulative impacts
Zone B	2015 to 2017	Partly constrained by progress on the basement Zone 2 and 3	Less construction phase overlap with the basement construction thus reducing the number of concurrent plant in operation. Completion of Zone A reduces some of the visual impacts
Zone C	2017 to 2019	Partly constrained by construction of the basement and CACF at Zone 4 and the Hotel	Avoids cumulative impacts from concurrent construction with the basement. Completion of Zone A and B reduces the visual impacts
Hotel			
Zone 5	2017 to 2020	Subject to land sale and factors affecting utilisation, e.g. implementation of CACF	Avoids cumulative impacts from concurrent construction with the basement. Completion of Zone A and B reduces the visual impacts
CACF	2014 to 2020		
Zone 1	2014 to 2016	Dependent on completion of the basement Zone 1	Some cumulative impact from concurrent construction with basement and MTRC XRL project
Zone 2	2015 to 2020	Dependent on progress of the basement for Zone 2	Phased construction reduces number of construction plant operating at the same time. Completion of CACF Zone 1 may provide partial screening of noise impacts for NSRs at Canton Road
Zone 3	2016 to 2018	Dependent on completion of the basement Zone 3	Some cumulative impact from concurrent construction with basement
Zone 4	2017 to 2020	Dependent on completion of the basement Zone 4	Avoids cumulative impacts from concurrent construction with the basement. Completion of much of the CACF and the Park Zone A and B reduces the visual impacts

2.3.3 Underpass Road

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 2.3** compares the environmental benefits and disbenefits of these three road options.

Table 2.3: 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 buildings.	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 considered as 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.

For construction of the underpass road, excavation is by far the most significant component of the construction activities involved, Two options for open cut excavation are available: open cut with temporary cut slopes, or via excavation lateral support (ELS) system. For disposal of the excavated materials, two options are considered: disposal by trucks, or disposal by barges. 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.

The preferred construction scenario for the underpass road is excavation via excavation lateral support (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.

2.3.4 Flyover

Unlike most other new 'flyover' projects, this proposed flyover has technically already been planned and provisioned for by two predecessor projects. Piled foundations and stub columns at the WHC toll plaza were constructed to allow for a future 6-lane Austin Road extension on an alignment directly above the toll plaza. Of the four piers required for the flyover superstructure, three are within the WHC boundary and have already been reserved during the construction of the toll plaza while the remaining pier at the junction of Nga Cheung Road and Austin Road had also been constructed under the West Kowloon Reclamation project. The east end of the proposed flyover will be connected to the existing elevated road junction of Austin Road West and Nga Cheung Road (constructed under Contract No. WK25/96 Remaining Road Works Stage 1) which will become an elevated roundabout after completion of the WKCD proposed road network.

Given these predefined conditions, the proposed flyover is virtually the only alignment option for provision of the essential alternative vehicular access to the Mega Performance Venue and Exhibition Centre. Nevertheless, for comparison purposes the provision of this alternative vehicular access in the form of at-grade or underground road has been preliminarily reviewed as follows:

- At-grade – not possible due to direct conflict with the existing WHC operation
- Underground – would not be technically viable due to insufficient space and obstruction by existing piled foundations below the WHC toll plaza, as well as conflict with the design for Austin Road under the Road Works at West Kowloon project.

In view of the predefined conditions and the preliminary review results, the proposed flyover is the preferred and viable development option.

For construction of the superstructures for vehicular and pedestrian bridges, the following methods may be adopted:

- Cast in-situ deck – scaffolding/falsework is erected for the placement of formwork before in-situ concreting of deck structure;
- Single span lifting method – the entire span precast deck will be lifted into position;
- Steel truss with concrete deck – this method involves lifting the prefabricated steel truss followed by construction of the concrete deck; and

- Precast segmental method - the bridge deck will be constructed as precast segments (each a few metres long), which are lifted into position and then tied together with pre-stressing cables. This method has been extensively adopted in Hong Kong in the past.

The aforementioned methods do not differ significantly in terms of environmental impacts. The selection of method is, rather, driven by consideration on site constraints such as avoiding disturbance to existing traffic, providing sufficient headroom between the road and falsework during the construction stage, design form of the proposed bridges and also the individual contractors' available equipment/resources in-hand. Construction of the flyover is severely constrained by the Western Harbour Crossing (WHC) and the location of the existing piled foundations and stub columns.

The preferred construction scenario for the flyover is the precast segmental method, as this method is associated with less environmental impacts compared to other options, and is considered to be best able to meet the technical requirements and site constraints.

2.4 Implementation 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. Construction of the proposed underpass road will be integrated with construction of the WKCD basement. Construction of the proposed flyover will be completed by 2017 while its implementation is subject to factors such as funding and associated arrangements, as well as interface with and restrictions imposed by the operators of the existing WHC tunnel entrance and toll plaza. A tentative construction programme and implementation plan for WKCD is summarised in **Table 2.4** as follows:

Table 2.4: Summary of Tentative Construction and Implementation Programme for Key Facilities of WKCD

Key Facility	Tentative Construction Period	Tentative Implementation Period
The Park	Zone A – 2013 to 2015 Zone B – 2015 to 2017 Zone C – 2017 to 2019	Zone A – 2014 to 2015 Zone B – 2016 to 2017 Zone C – 2018 to 2019
Xiqu Centre	2013 to 2016	Main Theatre and Tea House – 2016 to 2017 Small Theatre – beyond 2020
Free Space (with Music Box)	2013 to 2015	2016 to 2017
Centre for Contemporary Performance	2015 to 2017	2017 and 2018 (subject to the construction programme of the Express Rail Link)
M+	2015 to 2018	Phase I – 2018 Phase II – beyond 2020
Lyric Theatre	2015 to 2017	2017 to 2018
Proscenium Theatre	2016 to 2020	2020
Music Centre (Concert Hall and Recital Hall)	2018 to 2020	2020
Mega Performance Venue and Exhibition Centre	2017 to 2020	2020 (subject to alternative funding options)
Musical Theatre	2018 to 2020	2020 (subject to alternative funding options)
Great Theatre	2015 to 2020*	Beyond 2020
Thrust Theatre	2015 to 2020*	Beyond 2020

Note: The proposed construction periods for the facilities are based on the zones it falls in. The construction periods have included the construction of the basement.

* Foundation works are constructed from 2015 to 2016 with interim landscape area in place up to the construction of superstructure in 2020 or beyond.

The existing Tsim Sha Tsui Fire Station is scheduled to be relocated in phases and it will unlikely be relocated before 2020.

3. Summary of the Environmental Impact Assessment for WKCD Development

3.1 Air Quality Impact

3.1.1 Construction Phase

Dust generated from various construction activities is the primary concern during the construction phase. The main construction activities that would contribute to construction dust emission include excavation activities, foundation works, concrete batching plant and barging points, site formation and movement of mobile plant and vehicles on haul roads. Representative air sensitive receivers (ASRs) within the 500m assessment area were identified for the construction phase assessment. Relevant modeling has been carried out to predict the hourly, daily and annual total suspended particulates (TSP) levels at the ASRs due to the dust-emitting construction activities for both scenarios of without and with the dust mitigation measures in place.

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 predicted that with the average background TSP level of 68.4 µg/m³ the maximum cumulative hourly, daily and annual TSP concentrations at all the ASRs would be respectively up to 438 µg/m³, 257 µg/m³ and 79 µg/m³. Therefore, it is anticipated that there would be no exceedence of the hourly TSP limit (500 µg/m³), the Air Quality Objective (AQO) for daily TSP (260 µg/m³) or the AQO for annual TSP (80 µg/m³) at any of the ASRs throughout the entire construction period provided the recommended mitigation measures are in place.

3.1.2 Operation Phase

During the operation phase the major sources of air pollution include vehicular emissions in the vicinity of and within the Project area including from open roads, ventilation shafts, tunnel portals and from the nearby WHC portal; marine emissions relating to the nearby China Ferry Terminal, Ocean Terminal and New Yau Ma Tei Public Cargo Working Area (NYMTPCWA), and; odours from the adjacent New Yau Ma Tei Typhoon Shelter (NYMTTS). It should be noted that majority of the vehicular emissions 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. Therefore, the WKCD Project alone would only have very minor contribution to the predicted air quality impacts at the ASRs.

Vehicle and Marine Emissions

According to the modeling results, the predicted cumulative maximum respirable suspended particulate (RSP), sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) concentrations at all ASRs together with the maximum numbers of any predicted exceedances in a year can be summarized in **Table 3.1**. It can be seen from the Table that 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.

Table 3.1: 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
	1 year	55	0	42.8 – 51.7	0
SO_2	1 hour	800	3	84.7 – 619.1	0
	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
	24 hours	150	1	108.0 – 150.3	0 – 1
	1 year	80	0	45.0 – 79.7	0

However, four existing ASRs 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 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. Analysis of such NO_2 exceedances shows that majority (some 81%-94%) of the hourly/daily NO_2 concentrations at the six ASRs would be from the background concentrations plus the surrounding marine traffic emissions, with the remaining 6%-19% from the nearby road traffic emissions. As the WKCD Project would only contribute to some road traffic emissions (from the underpass road within WKCD and the flyover across WHC portal), the 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.

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

Odour Emissions from New Yau Ma Tei Typhoon Shelter (NYMTTS)

Based on the odour source monitoring and review results, it has been ascertained that malodour emissions from NYMTTS are localised at the areas in the vicinity of outfalls from the Cherry Street and Jordon Road Box Culverts and are mainly due to effluent discharge from these two Box Culverts. As a result, it is recommended to implement the Government's planned measures to improve the interception of effluent discharge into the NYMTTS via the two Box Culverts in order to help mitigate the odour emissions from NYMTTS.

With the recommended improvement measures for NYMTTS in place, it is predicted that the potential odour impacts on all the ASRs within WKCD would be reduced to 1.5 - 8.9 ou/m^3 for residential ASRs and to 1.2 - 13.7 ou/m^3 for non-residential ASRs. Residential ASRs refer to those ASRs that have been planned for residential uses whereas non-residential ASRs refer to those that have been planned for such non-residential uses as offices, retails, hotels, performance venues, open space, etc. Under the mitigated scenarios, the predicted numbers of times of exceeding the odour criterion in a year would be up to 33 hours per year (or up to 0.4% of the time in a year) and 213 hours per year (or up to 2.4% of the time in a year) for residential ASRs and non-residential ASRs respectively.

Potential residual odour impacts are predicted at 2 to 21 of the 65 residential ASRs as well as at 62 to 351 of the 473 non-residential ASRs under the mitigated scenarios. Nevertheless, the potential residual

impacts have been assessed to be acceptable in view of the nature, magnitude, duration and frequency of the impacts as well as the conservative odour modelling results. It is particularly important to note that WKCD does not contribute to the odour emitted from NYMTTS.

Odour Emissions from Optional Waste Facilities

With the proper locations of the optional waste facility (i.e., automatic waste collection facility) and the odour containment and control measures in place to substantially confine and reduce the potential odour emissions at sources, it is anticipated that there would not be significant odour impact on the nearby ASRs.

3.2 Noise Impact

3.2.1 Construction Phase

The potential noise impacts arising from the Project mainly involve site formation, construction of the proposed structure and superstructures within WKCD. A total of 20 noise sensitive receivers (NSRs) were identified for the construction phase assessment. The predicted results indicate that the noise impact of unmitigated construction activities from the project would cause exceedance of the relevant daytime construction noise standards stipulated in the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) at most of the NSRs. Mitigation measures are therefore required to alleviate the noise impacts generated during the construction phase. Recommended mitigation measures include good site practise to limit noise emissions at source, selection of quieter plant, use of movable noise barrier, enclosure and noise insulation fabric as well as scheduling of construction works outside school examination periods.

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 criteria 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. However, the two NSRs have already been implemented with noise insulation works and therefore significant noise impacts are not anticipated. 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.

3.2.2 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. As a result, at-receiver mitigation measures in form of balcony has been proposed for those NSRs with predicted noise levels exceeding the road traffic noise criteria. With implementations of

the proposed at-receiver noise mitigation measures in form of balcony at Parcels 3, 5, 9, 24, 27, 28 & 29, adverse traffic noise impact is not anticipated.

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.

The predicted open air entertainment noise levels arising from the proposed Outdoor Theatre at all selected NSRs will comply with the relevant noise criteria for the daytime, and evening time periods. Since no operation of Outdoor Theatre will be anticipated at night-time period, significant open air entertainment noise impact to the nearby NSRs is not anticipated. Mitigation measure is therefore considered not required.

Exceedance in ground-borne noise criteria at Xiqu Centre, M+ (Phases I & II), Lyric Theatre and CCP in the vicinity of the existing and planned railways operating underground is expected due to the stringent criteria for these special venues. The mitigation measures such as building isolation and box-in-box installation would most likely be integrated into the structural and foundation design of the relevant art performance venues in WKCD. Further review of the impact would be carried out at the detailed design stage of the art performance venues. WKCDA will incorporate, into the relevant design contracts of all special venues including Xiqu Centre, CCP, Lyric Theatre, Music Centre, Musical Theatre and the Museum M+ (Phase I & II), the comparable stringent criteria and requirements that make reference to the ground-borne noise assessment findings and the suggested mitigation measures. With such mitigation in place, no adverse ground-borne noise impact is anticipated.

The helicopter noise from the existing helipad at Shun Tak Centre, which is located at 1.1km from site boundary of WKCD, is measured to be around L_{max} 73dB(A) at the location of the proposed Outdoor Theatre to the west of the Project site, which is the place within the WKCD site nearest to the existing helipad. Therefore, it is considered that the helicopter noise would comply the helicopter noise criteria and hence adverse helicopter noise impact is not anticipated at the residential and commercial development on the WKCD. Given the activities to be conducted in the outdoor theatre, such as popular music concerts, will rely on public address (PA) system and are expected to have high sound levels and that helicopter noise would be just noticeable and transient, adverse helicopter noise impact to the Outdoor Theatre is not anticipated.

Potential nuisance due to marine traffic noise is anticipated for the planned Parcels 2, 3, 10, 11, 13, 21, 26 and 32, which are located close to the south boundary of WKCD. By designing these buildings so as to avoid any sensitive façades with openable window facing the noise source, potential nuisance from marine traffic noise is not anticipated. In addition, given the large separation between the nearest planned NSR on the WKCD (NSR P32) and the New Yau Ma Tei Typhoon Shelter, it is anticipated that the noise impact from the operation of the typhoon shelter would be minimal.

3.3 Water Quality Impact

3.3.1 Construction Phase

The key issue in terms of water quality during the construction phase of the Project would be the potential for release of effluent into coastal waters from construction site runoff and drainage as well as the potential

for release of suspended solids into the surrounding water from excavation and backfilling for modification of seawall and construction of cooling water discharges/outfalls; landing steps and possible piers/viewing platform.

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. For this, the site practices outlined in ProPECC Note PN 1/94 should be followed as far as practicable. 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.

To minimise any adverse water quality impact from the seawall modifications and the marine pile installation for construction of the possible piers, silt curtains should be deployed to completely enclose such works. The recommended good site practices should be strictly followed to avoid or minimise the potential water quality impact during operation of the proposed barging points.

With the implementation of these recommended mitigation measures, no unacceptable impacts on water quality from the construction works for the Project are anticipated. Water quality monitoring during the course of marine construction works 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.

3.3.2 Operation Phase

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

Sewage and wastewater effluents generated from the proposed WKCD development would be connected to the proposed foul sewerage system which has sufficient capacity to cater for the sewage flow from the Project. Therefore, no adverse sewage impact is anticipated resulting from the Project.

With the optional pump sump with very limited capacity, located at the basement level of WKCD and provision of standby pump facilities and dual power supply with sufficient capacity (100%), there would not be occurrence of emergency discharge event. With the implementation of suitable design measure, there would not be any insurmountable water quality impacts associated with the optional sewage pump sump operation. Discharge from district cooling water system (DCWS) would be controlled under the Water Pollution Control Ordinance (WPCO) discharge licence in which the monitoring for the spent cooling water discharge would be specified.

Water collection and treatment system would be installed for reuse of the reclaimed water via rainwater harvesting and reuse of condensate from air conditioning systems, which is being considered for potential uses such as irrigation. Provided that the rainwater harvesting installation and the condensate collection and disinfection system is well maintained, no adverse impact is anticipated from reuse of rainwater and condensate for irrigation. As the demand for reused rainwater is significant, discharge of surplus reused rainwater is not anticipated. Water quality impact as a result of discharge of surplus reused rainwater is

therefore not anticipated. Discharge of surplus reused rainwater, if deemed necessary would be required to comply with requirements specified in the WPCO.

The thermal impact due to sea water discharge from the district cooling water system (DCWS) and two independent cooling systems on the harbour water is predicted to be localized and minor as the general flushing capacity in Victoria Harbour is high. As the chlorine would be subject to decay, the impact from any residual chlorine of the sea water discharge is also predicted to be localized and confined in area close to the outfall. No mitigation measures would therefore be required.

3.4 Sewerage and Sewage Treatment Implications

By comparing the estimated sewage flows from the proposed WKCD development with the sewage flows allowed in the West Kowloon and Tsuen Wan Sewerage Master Plan Review, it is found that the existing sewer system in West Kowloon has sufficient capacity to cater for the sewage generated from the Project. The peak sewage flow generated from WKCD is estimated to be 157.50 L/s, which is less than 210 L/s allowed in the SMP Review.

A sewerage system is proposed to collect the sewage from WKCD and convey the sewage to the upgraded branch sewer at Austin Road West. A sewerage system is proposed in the Park for collecting the sewage generated from different venues and buildings and conveying to the proposed pumping facilities at the Freespace venue. The impact assessment shows that the proposed sewerage system has sufficient capacity to cater for the sewage flow from WKCD.

3.5 Waste Management Implications

3.5.1 Construction Phase

The major waste types generated by the construction activities of the Project will include construction and demolition (C&D) materials from excavation works for the proposed WKCD 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. It is estimated that a total of about 1,910,200 m^3 of inert C&D materials would be generated from 2013 to 2020, the majority of which would be from excavation for the WKCD basement. Part of this total amount of inert C&D materials would be reused on-site or off-site by two identified potential projects and also other potential projects will be continuously explored. The remaining amount of inert C&D materials would be disposed of at the Government's Public Fill Reception Facilities (PFRF) for beneficial use by any other projects in Hong Kong. About 108,300 m^3 of C&D materials would be generated from general site clearance, in which any inert materials would be segregated as far as practicable for on-site reuse or off-site disposal at the PFRF and the non-inert materials would be disposed of at the designated landfill sites. All general refuse, with the maximum daily amount of 975 kg, would be properly disposed of at the landfill sites. Any chemical waste (roughly few cubic meters per month) will be properly handled, stored, labelled and disposed of in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

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.

3.5.2 Operation Phase

The key waste types generated during the operation phase will include general refuse from the CACFs and OACFs operation, residential, office, hotel, retail and restaurant activities; as well as chemical waste from regular servicing and maintenance activities for different electrical and mechanical equipment. It is preliminarily estimated that around 38,300 kg per day of general refuse would be generated by the WKCD. It is difficult to quantify the amount of chemical waste that will arise from the Project at this stage since it will be dependent on the equipment maintenance requirements and the amount of equipment utilised. Provided that all these wastes are handled, transported and disposed of in strict accordance with the relevant legislative requirements and the recommended mitigation measures are properly implemented, no adverse environmental impact is expected during the operation phase.

3.6 Land Contamination

Based on the existing and historical land uses in the Project area, review of relevant records and reports as well as the site reconnaissance findings, adverse land contamination impacts associated with the construction works of the WKCD Project are not anticipated except for demolition of the two underground fuel oil storage tanks and associated pipes at the existing Tsim Sha Tsui (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 contamination assessment report (CAR) and where necessary a remediation action plan (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 construction 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.

The planned land uses within WKCD will mainly include arts and cultural facilities, public open space, commercial establishments, retails, hotels and residential developments. There will be no industrial activities taking place at the Project area during operation phase. Therefore, no contaminated land issue is anticipated.

3.7 Ecological Impact

The findings from the field survey and desktop review indicated that the major terrestrial habitat in the Study Area for WKCD is developed area, while the rest is small amounts of open field, plantation and 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 insignificant. The indirect disturbance impact to offsite habitat is considered to be insignificant in both construction and operation phases, since the Project Area is surrounded by urbanized area.

Since no significant ecological impact will arise from the proposed Project, no residual impact is expected and no specific ecological mitigation measures will be required. The plantation and landscape planting included in the WKCD development plan would have potential positive contribution to the local ecology.

3.8 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 areas. Due to the scale and the location of the proposed WKCD development, it is considered that potential impacts on both landscape and visual amenity are unavoidable. The major sources of impacts include various construction activities during construction phase. Potential impacts have been considered during the preliminary design stage to avoid direct impacts on significant landscape resources and the VSRs.

There are 58 landscape resources (LRs), 14 landscape character areas (LCAs) and 43 representative visual sensitive receivers (VSRs) identified within the assessment area that may be affected by the proposed WKCD development. As the Project is a large scale development, there will be moderate adverse to substantial adverse impacts on some of the LRs, LCAs and VSRs at close proximity to the WKCD site during construction phase. However, impacts during construction phase are temporary only.

The proposed WKCD development will be undertaken in a phased manner, and there will be a transition period when temporary ventilation shafts for the WKCD basement and the underpass road may be seen in the eastern part of the WKCD site. However, upon the completion of the remaining WKCD facilities, the ventilation shafts will form part of the individual WKCD buildings. The buildings will be well designed to visually hide these ventilation shafts and they will no longer be visible as individual structures.

As a world class integrated arts and cultural district for public enjoyment, the proposed WKCD development is expected to be a place which showcases distinctive architectural and landscape design in response to its planning intentions and its prime waterfront location. Despite the proposed WKCD development will initially create adverse visual impacts during construction phase, the visual amenity of the site will be significantly improved upon its completion through the approaches of the innovative design of the buildings and provision of green spaces at various locations within the WKCD, including the Park, the Avenue and piazzas. In addition to creating new visual resources, the extensive planting at the Park and along the waterfront, and the undulating landscape design of the Park will lessen the adverse impacts derived by the existing WHC and MTR ventilation buildings. Ornamental plants will be used at various locations including along the waterfront promenade, in the Park and the terrace gardens etc. for their aesthetic characteristics, which add visual interest to these areas and further improve the visual amenity of the WKCD.

Well designed low to medium rise buildings will achieve the urban design goals for this prime waterfront site. The low to medium rise buildings with dynamic building height profile will give an interesting contrast to the high rise developments located to the north of the site, and this would enhance the visual composition with the proposed WKCD development in the foreground when viewed from the south, the southeast and the west of the WKCD.

To promote sustainable energy, it is proposed to install wind turbines along the western and northern sections of the Park, and solar panels on the roof top of some WKCD buildings. Compared to the scale of the proposed development, the wind turbines appear relatively small particularly when viewed from various locations across the harbour. Particularly with the adoption of natural colour tones for the wind turbines to make them look more compatible with the surrounding areas and less visually dominant.

Potential reflective glare is one of the visual impacts derived from the installation of solar panels. This could be addressed by appropriate positioning and angling of the solar panels to avoid significant visual impacts on the VSRs located at upper levels in close proximity. The proposed green roof and terrace gardens to be adopted at various buildings can also provide visual relief which help to mitigate the industrial look of the

solar panels. It is important to note that the installation of solar panels and wind turbines are minor components of the WKCD development, and the visual impacts derived by these renewable energy facilities are reversible.

As the existing WKCD site is largely undeveloped, reclaimed land with minimal landscape resources, it is considered that the proposed WKCD development would enhance the existing landscape character and visual amenity by providing extensive planting at the Park and introducing landscape design and treatments such as ornamental planting along the water's edge and green roof/terrace gardens. The overall residual landscape impact associated with the construction and operation phases of the proposed development is anticipated to be generally beneficial with the implementation of appropriate mitigation measures and various good design features. In terms of visual impact, some VSRs will experience blockage of view. However, with the implementation of appropriate mitigation measures, the overall residual visual impact is anticipated to be acceptable and even slightly beneficial subject to the detailed design of the WKCD buildings

3.9 Impacts Summary

A summary of environmental impacts for each individual impact in the EIA report is presented in **Table 3.2**.

Table 3.2: Summary of Environmental Impacts of WKCD Development

Assessment Points	Results of Impact Prediction	Relevant Standards / Criteria	Extent of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts after Mitigation
Air Quality Impact – Construction Phase						
ASRs within 500m from the WKCD Project site boundary	With the average background TSP level of 68.4 µg/m³, the maximum cumulative hourly, daily and annual TSP concentrations at all the ASRs would be respectively up to 438 µg/m³, 257 µg/m³ and 79 µg/m³. Therefore, it is anticipated that there would be no exceedence of the hourly TSP limit (500 µg/m³), the AQO for daily TSP (260 µg/m³) or the AQO for annual TSP (80 µg/m³) at any of the ASRs throughout the entire construction period provided the recommended mitigation measures are in place	Air Pollution Control Ordinance (APCO); Air Pollution Control (Construction Dust) Regulation; Environmental Impact Assessment Ordinance (EIAO); Technical Memorandum on Environmental Impact Assessment Process issued under EIAO (EIAO-TM; relevant Guidance Notes under EIAO	Not applicable	Not applicable	Relevant requirements as stipulated in the Air Pollution Control (Construction Dust) Regulation and good practices for dust control Water spraying at active construction areas with a frequency of 12 times a day or once every hour Relevant best practices as given in EPD's Guidance Note on the Best Practicable Means for Cement Works (Concrete Batching Plant) BPM 3/2(93)	No residual impacts are anticipated with the mitigation measures in place.
Air Quality Impact – Operation Phase						
ASRs within 500m from the WKCD Project site boundary	The predicted cumulative maximum RSP, SO_2 and NO_2 concentrations at all ASRs can be summarised as follows: Air Pollutant — Range of Maximum Concentrations (µg/m³) Daily RSP: 114.5 – 117.7 Annual RSP: 42.8 – 51.7 Hourly SO_2: 84.7 – 619.1 Daily SO_2: 31.5 – 89.0 Annual SO_2: 7.9 – 16.2 Hourly NO_2: 259.7 – 314.9 Daily NO_2: 108.0 – 150.3 Annual NO_2: 45.0 – 79.7 All the ASRs would comply with the corresponding AQOs for daily RSP (180 µg/m³); annual RSP (55 µg/m³); hourly SO_2 (800 µg/m³); daily SO_2 (350 µg/m³); annual SO_2 (80 µg/m³); and annual NO_2 (80 µg/m³). The predicted maximum hourly or daily NO_2 levels at some of the ASRs would exceed the corresponding AQO (respectively 300 µg/m³ and 150 µg/m³) for up to once per year, which is still within the allowable numbers of exceedance for hourly NO_2 (3 times per year) and for daily NO_2 (once per year). Therefore, the AQO for hourly and daily NO_2 would be complied with at all ASRs. With the recommended improvement measures for NYMTTS in place, the potential odour impacts on all the ASRs within WKCD would be reduced to 1.5-8.9 ou/m³ for residential ASRs and to 1.2-13.7 ou/m³ for non-residential ASRs. Significant odour impact due to odour emission from the optional waste facility (i.e., automatic waste collection facility) on the nearby ASRs is not anticipated.	APCO; EIAO; EIAO-TM; relevant Guidance Notes under EIAO	Four existing ASRs would be subject to exceedance of the AQO for hourly NO_2 (i.e., 300 µg/m³) by about 3.7-14.9 µg/m³ (or about 1.2%-5.0% of the relevant AQO) for once a year, and two planned ASRs would be subject to marginal exceedance of the AQO for daily NO_2 (i.e., 150 µg/m³) by about 0.2-0.3 µg/m³ (or about 0.1%-0.2% of the relevant AQO) for once a year. However, the numbers of exceedances are within the allowable limits (3 times per year for hourly NO_2 and once per year for daily NO_2), and therefore the AQO for hourly/daily NO_2 would be complied with at these six ASRs. With the improvement measures in place, the odour criterion (5 ou/m³) would be exceeded at 2-21 residential ASRs and 60-351 non-residential ASRs for respectively up to 33 hours per year (or up to 0.4% of the time in a year) and up to 213 hours per year (or up to 2.4% of the time in a year).	The optional waste facility should be located at basement levels to avoid any potential odour issues.	The government's planned measures to improve the interception of effluent discharge into NYMTTS via the Cherry Street and Jordan Road Box Culverts should be implemented. These measures include construction of a new DWFI for the Cherry Street Box Culvert as well as improvement of the existing DWFIs upstream of the Cherry Street and/or Jordon Road Box Culverts. Odour containment and control measures should be implemented to substantially confine and reduce the potential odour emission from the optional waste facility.	No residual impacts on NO_2, SO_2 or RSP due to vehicle and marine emissions are anticipated for any ASRs. With the improvement measures for NYMTTS in place, residual odour impacts would be anticipated at 2-21residential ASRs and 60-351 non-residential ASRs. However, such impacts have been assessed to be acceptable in view of the nature, magnitude, duration and frequency of the impacts as well as the conservative odour modelling results. With the impact avoidance and mitigation measures in place, no residual odour impacts from the optional waste facility on the nearby ASRs are anticipated.
Noise Impact – Construction Phase						
NSRs within 300m from the WKCD Project site boundary	The noise impact of unmitigated construction activities from this project would cause exceedance of the relevant daytime construction noise criteria. Residual construction noise impacts are predicted at one residential development at Austin Road West and two representative NSRs of educational use at Canton Road. The two	Noise Control Ordinance (NCO); EIAO; EIAO-TM; relevant Guidance Notes under EIAO; TM on Noise from Construction Work other than Percussive Piling (GW-TM);	One residential development subject to exceedance of the relevant noise criteria by 1 dB(A) for a duration of 1 month. One educational NSR subject to exceedance of the noise criteria by 1-2	Good site practice to limit noise emissions at source as follows: • 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	Selection of quieter plant Use of movable noise barrier Use of noise enclosure/ acoustic shed Use of noise insulating fabric	Potential construction phase residual impacts at the residential development and the two educational NSRs are assessed to be acceptable in view of the nature, magnitude, duration, and frequency of the noise impacts as well as the conservative assessment results.

Assessment Points	Results of Impact Prediction	Relevant Standards / Criteria	Extent of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts after Mitigation
	NSRs have already implemented noise insulation works and therefore significant noise impacts are not anticipated.	TM on Noise from Construction Work in Designated Areas (DA-TM)	dB(A) for 5 months during normal school periods and exceedance by 1-5 dB(A) for 27 months during examination periods Another educational NSR subject to exceedance of the noise criteria by 1-6 dB(A) for 19 months during normal school periods and exceedance by 1-11 dB(A) for 25 months during examination periods.	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 • Material stockpiles and other structures to be effectively utilised, where practicable, to screen noise from on-site construction activities • Scheduling of construction works outside school examination periods		
Noise Impact – Operation Phase						
NSRs within 300m from the WKCD Project site boundary	For road traffic noise, noise levels of NSRs within WKCD including Parcels 3, 5, 9, 24, 27, 28 and 29 were found exceeding the relevant noise criteria. With implementations of the proposed at-receivers noise mitigation measures, residual traffic noise impact is not anticipated; For fixed plant noise, the impact noise levels at all planned NSRs complied with the relevant noise criteria for the daytime, evening time and night time periods. With the adoption of the proposed maximum allowable SWLs of the proposed fixed plant, residual fixed plant noise impact is not anticipated; The predicted open air entertainment noise levels at all selected NSRs complied with the relevant noise criteria for the daytime, and evening time periods. Since no operation of Outdoor Theatre will be anticipated at night-time period, significant open air entertainment noise impact to the existing NSRs is not anticipated; The potential ground-borne noise impact to the designated performing arts venues in the vicinity of the existing and planned railways operating underground is expected due to the stringent criteria for art performances. With mitigation such as building isolation and box-in-box installation in place, residual ground-borne noise impact is not anticipated; The helicopter noise would comply with the relevant noise criteria of residential and commercial development on the WKCD. Given the activities to be conducted in the outdoor theatre, such as popular music concerts, will rely on public address (PA) system and are expected to have high sound levels and that helicopter noise would be just noticeable and transient, adverse helicopter noise impact to the Outdoor Theatre is not anticipated.; Although no objective noise standard for marine traffic noise is proposed in this EIA, potential marine traffic noise impact at planned Parcels 2, 3, 10, 11, 13, 21, 26 and 32 located close to the south boundary of WKCD is anticipated. With implementation of the proposed at-receiver noise mitigation measures, residual marine traffic noise impact is not anticipated. In addition, the noise impact from the operation of	Noise Control Ordinance (NCO); EIAO; EIAO-TM; relevant Guidance Notes under EIAO; TM for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM).	For road traffic noise, noise levels of NSRs within WKCD including Parcels 3, 5, 9, 24, 27, 28 and 29 were found exceeding the relevant noise criteria; The potential ground-borne noise impact to the planned NSRs in the vicinity of the existing and planned railways operating underground is expected due to the stringent criteria for art performances; The potential marine traffic noise impact at planned Parcels 2, 3, 10, 11, 13, 21, 26 and 32 located close to the south boundary of WKCD is anticipated.	With consideration of noise-sensitive uses within the WKCD, locating such uses away from nearby sources of noise emissions such as Western Harbour Crossing and New Yau Ma Tei Typhoon Shelter wherever practicable. Locating the vehicular network within the site to the basement level which protects the existing and planned NSRs within and surrounding the WKCD from traffic noise impact.	Recommended noise reduction measures for fixed plant noise are as follows: • Choose quieter plant such as those which have been effectively silenced • Include noise levels specification when ordering new plant (including chiller and E/M equipment) • Locate fixed plant/louver 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 louvers 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 For potential ground-borne noise, building isolation and box-in-box installation would be integrated into structural and foundation design of the relevant art performance venues including Xiqu Centre, M+ (Phases I & II), Lyric Centre and CCP. For road traffic noise, sound-absorbing materials should be installed at 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. At-receiver noise mitigation measures such as balcony should be adopted at Parcels 3, 5, 9, 24, 27, 28 & 29. For potential marine traffic noise nuisance, it is suggested to avoid sensitive façade with openable window facing the noise source at Parcels 2, 3, 10, 11, 13, 21, 26 & 32.	Adverse traffic noise impact is not anticipated; Adverse fixed plant noise impact is not anticipated; Adverse open air entertainment noise impact is not anticipated; Adverse ground-borne noise impact is not anticipated; Adverse helicopter noise impact is not anticipated. Adverse marine traffic noise impact is not anticipated. No adverse noise impact from the New Yau Ma Tei Typhoon Shelter is anticipated.

Assessment Points	Results of Impact Prediction	Relevant Standards / Criteria	Extent of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts after Mitigation
	the typhoon shelter would be minimal.					
Water Quality Impact – Construction Phase						
Victoria Harbour, Western Buffer and Eastern Buffer Water Control Zones (WCZs) and all areas within 500m from the WKCD Project boundary	The key issue during the construction phase of the Project would be the potential for release of effluent into coastal waters from construction site runoff and drainage as well as the potential for release of suspended solids into the surrounding water from excavation and backfilling for modification of seawall and construction of cooling water discharge/outfalls; landing steps and possible piers/viewing platform. With implementation of the recommended mitigation measures, no unacceptable water quality impacts are anticipated.	Water Pollution Control Ordinance (WPCO); Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS); Water Supplies Department (WSD) Water Quality Criteria; Practice Note for Professional Persons on Construction Site Drainage	Not applicable	Not applicable	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; Sand/silt removal facilities such as sand/silt traps and sediment basins should be provided; All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained; Measures should be taken to minimize the ingress of site drainage into excavations; 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; Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms; Manholes (including newly constructed ones) should be adequately covered and temporarily sealed; Precautions should be taken at any time of the year when rainstorms are likely; Bentonite slurries used in piling or slurry walling should be reconditioned and reused wherever practicable; Silt curtains should be deployed to completely enclose the modification of seawalls and marine pile installation works; Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site where necessary to handle sewage from the workforce.	No residual water quality impact is anticipated
Water Quality Impact – Operation Phase						
Victoria Harbour, Western Buffer and Eastern Buffer Water Control Zones (WCZs) and all areas within 500m from the WKCD Project boundary	With properly designed drainage system and oil interceptors, no unacceptable impacts due to surface runoff from the proposed WKCD development and associated local road networks are anticipated. No adverse sewage impact is anticipated as all sewage and effluents from the WKCD Project will be connected to the proposed foul sewerage system. Thermal impact due to sea water discharge from the DCWS and two independent cooling systems on the harbour water is predicted to be localized and minor, and the impact from any residual chlorine of the sea water discharge is also predicted to be localized and confined in area close to the outfall.	Water Pollution Control Ordinance (WPCO); Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS); Water Supplies Department (WSD) Water Quality Criteria; Practice Note for Professional Persons on Construction Site Drainage; District Cooling Water System (DCWS) Cooling Water Intakes Water Quality Criteria	Not applicable	Not applicable	The road drainage should be provided with adequately designed silt trap and oil interceptors, as necessary; Domestic sewage generated during operation phase of the proposed WKCD development should be diverted to the foul sewer; A two hour emergency storage capacity should be provided within the optional sewage pump sump; Dual power supply or emergency generator with sufficient capacity (100%) should be provided; Standby pumps with sufficient capacity (100%) should be provided to the optional sewage pump sump; An alarm should be installed to signal emergency high water level in the wet well of the optional sewage pump sump; Should the optional sewage pump sump is unmanned, a remote monitor system connecting the optional sewage pump sump with the control station through telemetry	No residual water quality impact is anticipated

Assessment Points	Results of Impact Prediction	Relevant Standards / Criteria	Extent of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts after Mitigation
					system should be provided	
Sewerage and Sewage Treatment Implications – Construction Phase						
Sewage generated by workers on construction sites within WKCD	Comparing the latest estimated sewage flows from the WKCD development plan and the sewage flows allowed in the SMP Review, the existing sewer system in West Kowloon has sufficient capacity to cater for the sewage generated from the proposed development of WKCD.	Sewerage Manual published by Drainage Services Department (DSD); Guidelines for Estimating Sewage Flows for Sewerage Infrastructure Planning Version 1.0 by EPD; North and South Kowloon Sewerage Master Plan (SMP)	Not applicable	Not applicable	No mitigation measures and upgrading works to the existing local sewer is required for the proposed development	Not applicable
Sewerage and Sewage Treatment Implications – Operation Phase						
Planned sewerage networks and sewage pumping facilities	A sewerage system is proposed to collect the sewage from WKCD and convey the sewage to the upgraded branch sewer at Austin Road West. A sewerage system is proposed in the Park for collecting the sewage generated from different venues and buildings and conveying to the proposed pumping facilities at the Freespace venue. The impact assessment shows that the proposed sewerage system has sufficient capacity to cater for the sewage flow from WKCD	Sewerage Manual published by Drainage Services Department (DSD); Guidelines for Estimating Sewage Flows for Sewerage Infrastructure Planning Version 1.0 by EPD; North and South Kowloon Sewerage Master Plan (SMP)	Not applicable	Not applicable	No mitigation measures and upgrading works to the existing local sewer is required for the proposed development	Not applicable
Waste Management Implications – Construction Phase						
WKCD Project area	Major waste types to be generated 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.	Waste Disposal Ordinance (WDO); Waste Disposal (Chemical Waste) (General) Regulation; Waste Disposal (Charges for Disposal of Construction Waste) Regulation; Public Health and Municipal Services	No exceedance	Plan the use of construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste	Good site practices; Sort C&D materials to recover any recyclable portions such as metal; 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; 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”	Residual impacts are not expected for construction phases
Waste Management Implications – Operation Phase						
WKCD Project area	The key waste types generated during the operation phase will include general refuse from the CACFs and OACFs operation, residential, office, hotel, retail and restaurant activities; as well as chemical waste from regular servicing and maintenance activities for different electrical	Ditto	Not applicable	Not applicable	General refuse should be collected on daily basis and delivered to the refuse collection point accordingly. A reputable waste collector should be employed to remove general refuse regularly to avoid odour nuisance or pest/vermin problem. Sufficient recycling	Residual impacts are not expected for operation phases

Assessment Points	Results of Impact Prediction	Relevant Standards / Criteria	Extent of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts after Mitigation
	and mechanical equipment				containers are recommended to be provided at suitable locations of the WKCD site;	
Land Contamination – Construction Phase						
Potential land contamination sites with the WKCD Project area	Adverse land contamination impacts associated with the construction and operation of the WKCD 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.	EIAO; EIAO-TM; Guidance Note for Contaminated Land Assessment and Remediation; Guidance Manual for Use of Risk-Based Remediation Goals for Contaminated Land Management (RBRGs Guidance Manual); Practice Guide for Investigation and Remediation of Contaminated Land	Potential land contamination issues during future demolition of the two underground fuel oil storage tanks and associated pipes at the existing TST Fire Station within the WKCD site, subject to further site investigation work to be conducted after obtaining access to the Fire Station. The site investigation findings should be documented in a contamination assessment report (CAR) and where necessary a remediation action plan (RAP) should also be prepared for submission to EPD for approval.	If contaminated land is identified (e.g., during decommissioning of fuel oil storage tanks) after the commencement of works, the following avoidance measures for excavation and transportation of contaminated material should be adopted: • 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	If contaminated land is identified (e.g., during decommissioning of fuel oil storage tanks) after the commencement of works, the following mitigation measures for excavation and transportation of contaminated material should be adopted: • 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 • 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, Waste Disposal (Chemical Waste) (General) Regulation and obtain all necessary permits where required • Maintain records of waste generation and disposal quantities and disposal arrangements.	Any residual impact in relation to land remediation is subject to the future site investigation findings to be presented in CAR/RAP.
Land Contamination – Operation Phase						
The planned land uses within WKCD will mainly include arts and cultural facilities, public open space, commercial establishments, retails, hotels and residential developments. There will be no industrial activities taking place at the Project area during operation phase. Therefore, no contaminated land issue is anticipated.						
Ecological Impact (Terrestrial) – Construction & Operation Phases						
Study area covering 500m from the WKCD Project site boundary and the areas likely to be affected by the Project	Direct ecological impact on loss of habitat and indirect disturbance impact to offsite habitat are considered to be of insignificant.	Forests and Countryside Ordinance; Wild Animals Protection Ordinance; Protection of Endangered Species of Animals and Plants Ordinance; EIAO; EIAO-TM; relevant Guidance Notes under EIAO; Town Planning Ordinance; Hong Kong Planning Standards and Guidelines Chapter 10	No exceedance	Not applicable	No specific mitigation measures are required.	No adverse impacts are anticipated.

Assessment Points	Results of Impact Prediction	Relevant Standards / Criteria	Extent of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts after Mitigation
Fisheries Impact						
As there will be no dredging work associated with the construction of the possible piers/viewing platform for the Project, assessment of fisheries impact is not required.						
Landscape and Visual Impact – Construction Phase						
Landscape – 500m from the WKCD Project site boundary Visual - the visual envelope which is the viewshed formed by natural or man made features such as ridgeline or building blocks.	The major landscape impact that will arise from the proposed development is the existing trees would be felled within site boundary during construction phase; Major direct visual impacts including blockage of views to the Victoria Harbour, degrading of visual quality of existing views, and visual incompatibility of the works with the surrounding visual context during construction phase, and visual incompatibility of the temporary standalone ventilation shafts with the surroundings during the transition period	EIAO; EIAO-TM; relevant Guidance Notes under EIAO; West Kowloon Cultural District Authority Ordinance	Not applicable	Provision of new open space and the north-south oriented non-buildings areas (NBAs)/ visual corridors are incorporated in the design of the proposed WKCD development as avoidance measures for the potential visual impacts; Buildings of various heights and diversity in building mass are encouraged for the proposed WKCD development to avoid a monotonous harbourfront image; Avoidance of unduly tall buildings with wall effect and enhancement of visual permeability from the harbour by lowering of building height at waterfront locations	Mitigation measures will be used to lessen any visual impacts of the construction works such as the use of decorative screen hoarding/boards, early introduction of landscape treatments and control of night time lighting; During the transition period, the temporary ventilation shafts for the basement will adopt a light colour to make them less visually dominant and more compatible with the surroundings. The use of greenery such as grass cover for the temporary open areas will help achieve the visual balance and soften the hard edges of the structures. Mitigation measures will be used during construction phase to lessen the landscape impacts include: Trees should be retained in situ on site as far as possible; 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; Buffer trees for screening purposes to soften the hard architectural and engineering structures and facilities. 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. 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. Sensitive streetscape design should be incorporated along all new roads and streets; Structure, ornamental planting shall be provided along amenity strips to enhance the landscape quality; Landscape design shall be incorporated to architectural and engineering structures in order to provide aesthetically pleasing designs; Minimize the structure of marine facilities to built on the seabed and foreshore in order to minimize the affected extent to the waterbody	The residual impacts on landscape resources and landscape character area are generally moderate adverse to substantial adverse during construction phase. VSRs located immediately adjacent to the WKCD site will be generally subject to substantial adverse visual impacts during construction phase before implementation of mitigation measures. The residual visual impacts will be reduced to moderate with the use of mitigation measures such as the use of decorative screen /boards and the early introduction of landscape treatments. However, for the residential VSRs in close proximity to the WKCD site, the residual impacts are still considered to be substantial even with the implementation of mitigation measures, in particular VSR 10, VR 11 and VSR 21 at lower levels
Landscape and Visual Impact – Operation Phase						
Landscape – 500m from the WKCD Project site boundary Visual - the visual envelope which is the viewshed formed by	Impacts on landscape resources and landscape character area during operation phase would be subject to modifications of the Development Plan for the WKCD; The visual impacts derived by the proposed WKCD development before mitigation will	*Environmental Impact Assessment Ordinance (Cap. 499, Section 16);* *EIAO Guidance Note No. 8/2010: Preparation of Landscape and Visual*	Not applicable	The proposed WKCD development will incorporate a series of good design features aimed to avoid unacceptable visual impacts. In particular, control of development heights and massing, provision of open space at different levels and scale, and distinctive	Mitigation measures will be used during operation phase to lessen the landscape impacts include: Provide proper planting establishment works, including watering, pruning, weeding, pest control and replacement of dead plants, etc	It is expected that the residual landscape impacts during operation phase would mostly be beneficial. The loss of greenery can easily be replaced with tree planting of better quality. The beneficial effect shall increase with time as the trees mature and public acceptance

Assessment Points	Results of Impact Prediction	Relevant Standards / Criteria	Extent of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts after Mitigation
natural or man made features such as ridgeline or building blocks.	mostly be attributed to the blockage of views by the proposed WKCD development and the hard edges of the built structures	*Impact Assessment under the Environmental Impact Assessment Ordinance;* *West Kowloon Cultural District Authority Ordinance - Chapter 601*		architectural design etc are essential for the WKCD to be developed into a world class integrated arts and cultural district and contribute to significant improvement of the visual amenity of the WKCD site; Provision of new open space, the north-south oriented non-buildings areas (NBAs) are incorporated in the design of the proposed WKCD development as good design measures for the potential visual impacts; Buildings of various heights and diversity in building mass are encouraged for the proposed WKCD development to avoid a monotonous harbourfront image; Other good design features include: avoidance of unduly tall buildings with wall effect and enhancement of visual permeability from the harbour by lowering of building height at waterfront locations	on the new planting areas to enhance the aesthetic design degree. 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 enjoyment. A number of design measures have been incorporated in the urban design and landscape design concepts of the proposed WKCD development, such as human scale design for the WKT Plaza and the intersection of Canton Road and Austin Road West and aesthetic design of roads and streetscapes There are different approaches for mitigation measures for the visual detractors, including solar panels, wind turbines and existing MTR and WHT ventilation buildings. The visual impacts derived by the solar panels will be addressed by appropriate positioning and angling of the solar panels to avoid significant visual impacts on the VSRs located at upper levels in close proximity. The undulating topography with intense treescape will help integrate existing MTR and WHC ventilation buildings into the Park and help mitigate the visual impacts associated with the ventilation buildings. The use of natural colour tones (e.g. green colour) is a mitigation measure which makes the wind turbines visually more compatible with the surroundings. One of the mitigation measures for the potential night time visual impacts include lighting control measures Many of the landscape mitigation measures are also visual mitigation measures.	towards the new public spaces improves with time; The adverse residual visual impacts during operation phase are expected to be slight/insubstantial or even slightly beneficial with the implementation of the appropriate mitigation measures and good design features

4. Summary of the Key EIA Findings for Underpass Road

4.1 Air Quality Impact

4.1.1 Construction Phase

The existing and planned representative Air Sensitive Receivers (ASRs) that could be affected by the underpass road Project within 500 m from its site boundary have been identified. The key air pollutant of concern from the construction activities is total suspended particulate (TSP). 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 predicted that with the average background TSP level of 68.4 µg/m³ the maximum cumulative hourly, daily and annual TSP concentrations at all the ASRs would be respectively up to 438 µg/m³, 257 µg/m³ and 79 µg/m³. Therefore, it is anticipated that there would be no exceedence of the hourly TSP limit (500 µg/m³), the AQO for daily TSP (260 µg/m³) or the AQO for annual TSP (80 µg/m³) at any of the ASRs throughout the entire construction period provided the recommended mitigation measures are in place.

4.1.2 Operation Phase

All the identified ASRs are subject to cumulative air quality impact during the operation phase of the underpass road. It should be noted that majority of the vehicular emission sources and all marine emission sources are due to respectively the nearby current and 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, operation of the underpass road alone would only have very minor contribution to the predicted air quality impacts at the ASRs.

According to the modeling results, the predicted cumulative maximum respirable suspended particulate (RSP), sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) concentrations at all ASRs together with the maximum numbers of any predicted exceedances in a year can be summarized in **Table 4.1**. It can be seen from the Table that 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.

Table 4.1: 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
	1 year	55	0	42.8 – 51.7	0
SO_2	1 hour	800	3	84.7 – 619.1	0
	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
	24 hours	150	1	108.0 – 150.3	0 – 1
	1 year	80	0	45.0 – 79.7	0

However, four existing ASRs 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

would be subject to marginal exceedance of the AQO for daily NO_2 (i.e., 150 μg/m^3) by about 0.2-0.3 μg/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. Analysis of such NO_2 exceedances shows that majority (some 81%-94%) of the hourly/daily NO_2 concentrations at the six ASRs would be from the background concentrations plus the surrounding marine traffic emissions, with the remaining 6%-19% from the nearby road traffic emissions. As the underpass road project would only contribute to some road traffic emissions, it is not the key contributor to the exceedance of hourly or daily NO_2 limits (only once in a year) at the six ASRs.

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

4.2 Noise Impact

4.2.1 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 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 residential parcel 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. However, the two NSRs have already been implemented with noise insulation works and therefore significant noise impact is not anticipated.

4.2.2 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.

4.3 Water Quality Impact

4.3.1 Construction Phase

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. 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.

4.3.2 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

4.4 Sewage 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. The underpass road alone 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.

4.5 Waste Management Implication

4.5.1 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.

4.5.2 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.

4.6 Land Contamination

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.

4.7 Ecological Impact

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 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 insignificant. Since the proposed underpass road is surrounded by urbanized area, the indirect disturbance impact on offsite habitat is considered to be insignificant in both construction and operation phases. The plantation and landscape planting included in the development plan would have potential positive contribution to the local ecology.

4.8 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.

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.

5. Summary of the Key EIA Findings for Flyover

5.1 Air Quality Impact

5.1.1 Construction Phase

The existing and planned representative Air Sensitive Receivers (ASRs) that could be affected by the flyover road Project within 500 m from its site boundary have been identified. The key air pollutant of concern from the construction activities is total suspended particulate (TSP). 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 predicted that with the average background TSP level of 68.4 µg/m³ the maximum cumulative hourly, daily and annual TSP concentrations at all the ASRs would be respectively up to 413 µg/m³, 257 µg/m³ and 79 µg/m³. Therefore, it is anticipated that there would be no exceedence of the hourly TSP limit (500 µg/m³), the AQO for daily TSP (260 µg/m³) or the AQO for annual TSP (80 µg/m³) at any of the ASRs throughout the entire construction period provided the recommended mitigation measures are in place.

5.1.2 Operation Phase

All the identified ASRs are subject to cumulative air quality impact during the operation phase of the flyover road. It should be noted that 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 flyover road itself. Therefore, the flyover road alone would only have very minor contribution to the predicted air quality impacts at the ASRs.

According to the modeling results, the predicted cumulative maximum respirable suspended particulate (RSP), sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) concentrations at all ASRs together with the maximum numbers of any predicted exceedances in a year can be summarized in **Table 5.1**. It can be seen from the Table that 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.

Table 5.1: Summary of Predicted Cumulative RSP, SO_2 and NO_2 Concentrations for All ASRs

Air Pollutant	Averaging Time	AQO (µg/m^3)	Allowable Exceedances in a Year	Range of Maximum Concentrations (µg/m^3)	Maximum No. of Exceedance in a Year
RSP	24 hours	180	1	114.5 – 117.7	0
	1 year	55	0	42.8 – 51.7	0
SO_2	1 hour	800	3	84.7 – 619.1	0
	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
	24 hours	150	1	108.0 – 150.2	0 – 1
	1 year	80	0	45.0 – 79.7	0

However, two existing ASRs would be subject to exceedance of the AQO for hourly NO_2 (i.e., 300 µg/m^3) by about 3.7-14.9 µg/m^3 (or about 1.2%-5.0% of the relevant AQO) for once a year, and one planned ASRs would be subject to marginal exceedance of the AQO for daily NO_2 (i.e., 150 µg/m^3) by about 0.2 µg/m^3 (or

about 0.1% 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 three ASRs. Analysis of such NO_2 exceedances shows that majority (some 82%-91%) of the hourly/daily NO_2 concentrations at the three ASRs would be from the background concentrations plus the surrounding marine traffic emissions, with the remaining 9%-18% from the nearby road traffic emissions. As the flyover project would only contribute to some road traffic emissions, it is not the key contributor to the exceedance of hourly or daily NO_2 limits (only once in a year) at the three ASRs.

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

5.2 Noise Impact

5.2.1 Construction Phase

Noise generated from various construction activities is the primary concern during the construction phase. The construction phase noise impact assessment has been made based on the best available information. The construction noise levels at all representative NSRs are predicted to comply with the noise standards stipulated in the EIAO-TM. Residual construction noise impact is not anticipated.

5.2.2 Operation Phase

The potential road traffic noise impacts have been assessed based on the peak traffic flows in 2032. The noise levels predicted at the representative NSRs would range from 69 to 72 dB(A). Road traffic noise is predicted to be dominant by the existing and committed Road Works at West Kowloon road sections nearby. The noise contributions from the Project's proposed flyover are estimated to be less than 1.0 dB(A) and the road traffic noise levels of the proposed roads are all below the noise criterion of 70 dB(A). Adverse traffic noise impact is not anticipated.

5.3 Water Quality Impact

5.3.1 Construction Phase

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 flyover boundary. The key issue in terms of water quality during the construction phase of the flyover 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 flyover 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.

5.3.2 Operation Phase

Surface runoff from the proposed flyover may be contaminated by oils leaked from passing vehicles. It is considered that impacts upon water quality will be acceptable provided that the proposed flyover 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*.

5.4 Sewage and Sewage Treatment Implication

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

5.5 Waste Management Implication

5.5.1 Construction Phase

The major waste types generated by the construction activities will include inert C&D materials from minor excavation at piers and abutments 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.

5.5.2 Operation Phase

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

5.6 Land Contamination

The flyover is located at the west side of the WKCD site, where no previous evidence of land contamination was found according to the land contamination assessment for the WKCD site. There is no potential land contamination issues associated with the flyover.

5.7 Ecological Impact

The Study Area for impact assessment of terrestrial ecology covers all the areas within 500m from the flyover site boundary and the areas likely to be affected by the flyover. 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

flyover is surrounded by urbanized area. The plantation and landscape planting included in the development plan would have potential positive contribution to the local ecology.

5.8 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, with accessibility from and connectivity to the neighbouring community considered essential to integrate the arts and cultural facilities in the WKCD with its neighbouring areas. The flyover serves one of the key connections to facilitate the accessibility and connectivity of the overall WKCD development. The location of flyover is to the northwest of the WKCD, which is currently occupied by Western Harbour Crossing (WHC) and its toll plaza, as well as the existing West Kowloon Waterfront Promenade on the eastern side of the WHC.

It is considered that potential impacts on both landscape and visual amenity are unavoidable. The major sources of impacts include various construction activities and removal of existing trees during construction phase. Potential impacts have been considered during the preliminary design stage to avoid direct impacts on significant landscape resources and VSRs.

There are 13 LRs, 10 LCAs and 9 representative VSRs identified within the assessment area that may be affected by the construction of flyover. As the size of the flyover is relatively small in scale, 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 to situating in an urban setting, the transport corridor type of landscape character of the project site comprising the West Harbour Crossing Toll Plaza and carriageways contribute to its high compatibility with the site and its surrounding areas.

Due to the scale of flyover is small, the overall residual landscape and visual impacts associated with the construction and operation phases of the flyover are anticipated to be acceptable with the implementation of appropriate mitigation measures and in the long term, the Project will be beneficial to the accessibility requirement of the planning context for the WKCD development.

6. Environmental Monitoring and Audit

An environmental monitoring and audit (EM&A) programme to check the effectiveness of the recommended mitigation measures and compliance with relevant statutory requirements should be implemented. Details of the EM&A works are given in the separately prepared EM&A Manual for the Project, with the specific EM&A requirements highlighted as follows:

Air

- dust monitoring during construction phase;
- odour patrol during operation phase;

Noise

- noise level monitoring during construction phase;
- commissioning (noise level) test on major fixed plant within WKCD prior to the operation phase;

Water

- water quality monitoring during marine construction works;
- monitoring of the spent cooling water discharge from DCWS during operation phase;

Waste

- regular site inspections to determine if wastes are being managed in accordance with the Waste Management Plan;

Land Contamination

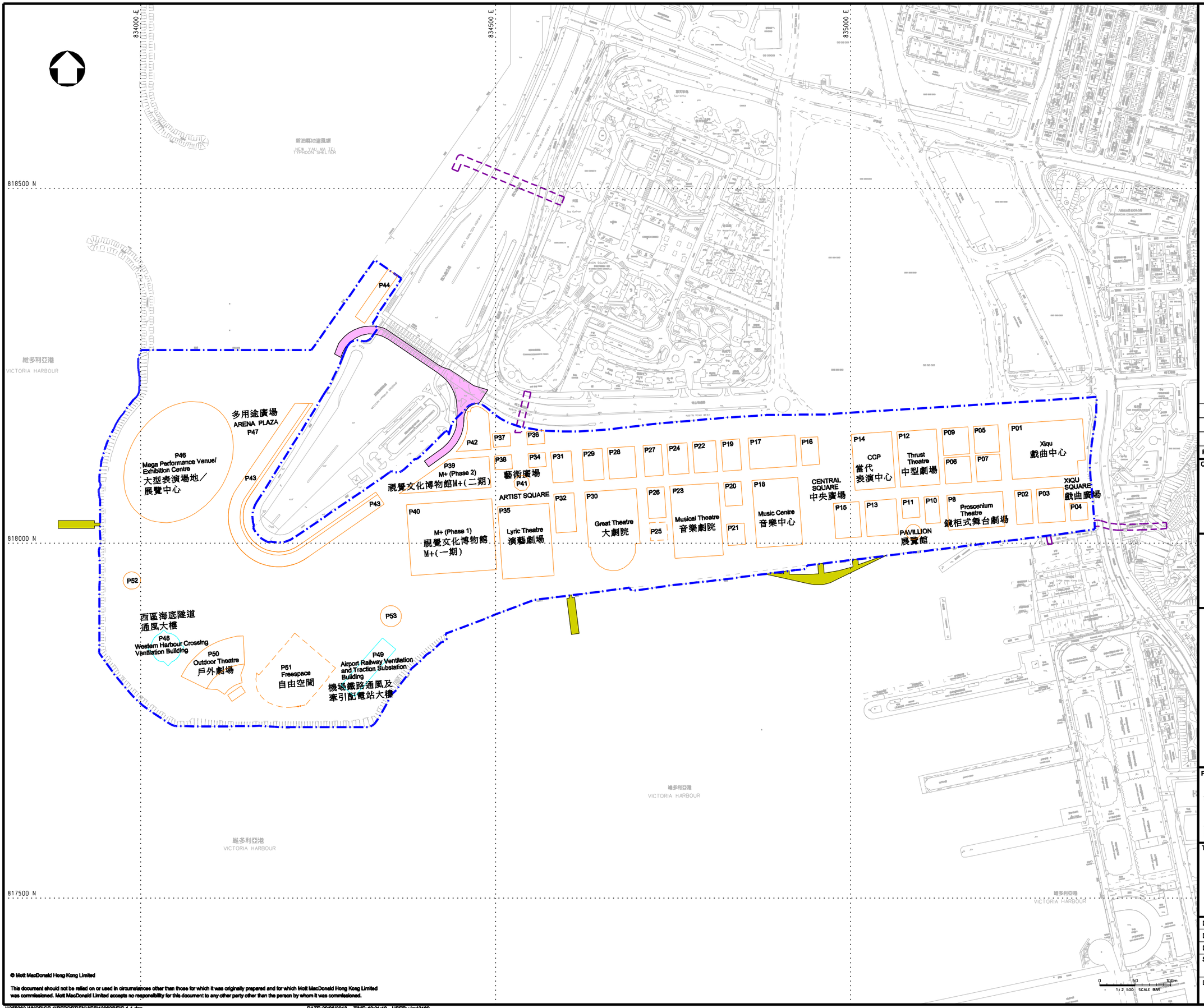
- regularly auditing all related procedures and facilities for handling or storage of chemicals and chemical wastes to make sure they are in order and intact and reported in the EM&A reports as such; and

Landscape and Visual

- checking implementation of the landscape and visual mitigation measures during construction and operation phases.

7. Conclusion

This EIA study has identified and assessed the potential environmental impacts that may arise from construction and operation of the Project in accordance with the guidelines of the EIAO-TM and the EIA study brief. Based on the results of the assessments, the EIA study concludes that the Project would be environmentally acceptable and in compliance with the environmental legislation and standards. With the implementation of the recommended environmental mitigation measures, no significant adverse residual impacts from the Project are anticipated. A comprehensive environmental monitoring and audit programme should be implemented to check the implementation of mitigation measures and environmental compliance.



LEGEND: 圖例:

- PROJECT BOUNDARY 項目邊界
- FOOTBRIDGE * 行人天橋 *
- FLYOVER * 行車天橋 *
- POSSIBLE PIER / VIEWING PLATFORM * 可能興建的碼頭／觀景平台 *
- PROPOSED FOOTPRINT BOUNDARY 擬議界線
- EXISTING FACILITIES 現有設施

REMARK: 備註:

* INDICATIVE SUBJECT TO FUTURE DESIGN & ARRANGEMENT
* 指示性質，須視乎將來的設計及安排

Rev	Date	Drawn	Description	Ch'k'd	App'd
P3	JUN 13	MING	GENERAL REVISION	HY	AFK
P2	MAY 13	MING	GENERAL REVISION	HY	AFK
P1	APR 13	MING	FIRST ISSUE	EC	AFK

Client

WEST KOWLOON CULTURAL DISTRICT AUTHORITY
西九文化區管理局

Mott MacDonald
20/F Two Landmark East
100 How Ming Street
Kwun Tong, Kowloon
Hong Kong
T +852 2828 5757
F +852 2827 1823
W www.mottmac.com.hk

ARTEC · IMG Artists · Lord Cultural Resources · TFP FARRELLS · GHK · creative thinking positive solutions · ecosse earthasia limited · MVA · DONNELL · LD ASIA · BMT

Project

PROJECT CONSULTANCY STUDY FOR WEST KOWLOON CULTURAL DISTRICT DEVELOPMENT PLAN
西九文化區發展計劃－項目顧問研究

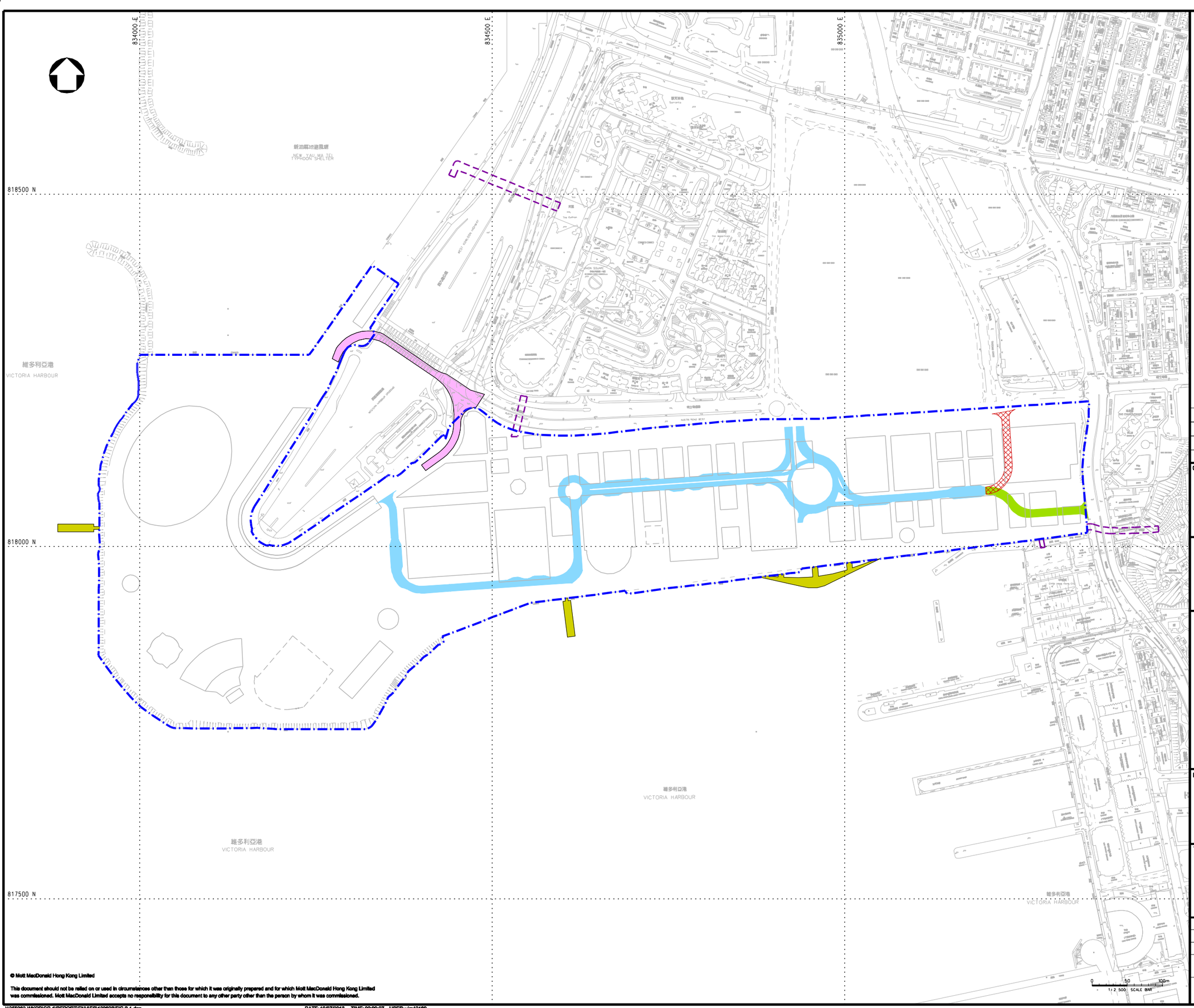
Title

PROJECT AREA AND LAYOUT
項目範圍及佈局

Designed	AM		Eng check	EC	
Drawn	MING		Coordination	EC	
Dwg check	AM		Approved	AFK	
Scale at A1 1:2500		Status PRE		Rev P3	

Drawing Number

FIGURE 1.1 圖1.1



LEGEND: 圖例:

- PROJECT BOUNDARY 項目邊界
- FOOTBRIDGE # 行人天橋 #
- FLYOVER # 行車天橋 #
- POSSIBLE PIER / VIEWING PLATFORM # 可能興建的碼頭／觀景平台 #
- UNDERGROUND ROAD NETWORK 地下道路網絡
- UNDERGROUND ROAD ALIGNMENT (AFTER RELOCATION OF FIRE STATION) 地下道路走線（消防局搬離後啓用）
- UNDERGROUND ROAD ALIGNMENT (BEFORE RELOCATION OF FIRE STATION) 地下道路走線（消防局搬離前啓用）

REMARK: 備註:

INDICATIVE SUBJECT TO FUTURE DESIGN & ARRANGEMENT
指示性質，須視乎將來的設計及安排

Rev	Date	Drawn	Description	Ch'k'd	App'd
P3	JUL 13	MING	GENERAL REVISION	HY	AFK
P2	MAY 13	MING	GENERAL REVISION	HY	AFK
P1	APR 13	MING	FIRST ISSUE	EC	AFK

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WEST KOWLOON CULTURAL DISTRICT AUTHORITY
西九文化區管理局

Mott MacDonald
20/F Two Landmark East
100 How Ming Street
Kwun Tong, Kowloon
Hong Kong
T +852 2828 5757
F +852 2827 1823
W www.mottmac.com.hk

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Project

PROJECT CONSULTANCY STUDY FOR WEST KOWLOON CULTURAL DISTRICT DEVELOPMENT PLAN
西九文化區發展計劃－項目顧問研究

Title

LOCATION OF DESIGNATED PROJECTS
指定工程項目位置

Designed	DC		Eng check	EC	
Drawn	MING		Coordination	EC	
Dwg check	DC		Approved	AFK	
Scale at A1	1:2500	Status	PRE	Rev	P3

Drawing Number

FIGURE 2.1 圖2.1