For discussion
on 25 February 2008

Legislative Council Panel on Economic Development

Proposed Development of Government Helipad at the Hong Kong Convention and Exhibition Centre

Purpose

This paper briefs Members on the results of the technical feasibility study regarding the proposed government helipad at the north-eastern corner of the Hong Kong Convention and Exhibition Centre ("HKCEC") and the way forward.

Background

2. Following the closure of the Central Helipad at Lung Wui Road in January 2004 to make way for the implementation of the Central Reclamation Phase III works, the Government Flying Service ("GFS") has relocated its operation to the present temporary helipad at the former Wan Chai Public Cargo Working Area pending the re-provisioning of a permanent helipad. After a thorough site search, the site at the north-eastern corner of the HKCEC is considered the most suitable site for a permanent government helipad for the GFS to provide emergency and other essential flying services.

3. At a joint meeting held on 28 February 2005, the Panel on Economic Services[1] and Panel on Planning, Lands and Works[2] passed a motion urging "the Government to expedite the provision of a permanent commercial heliport and associated facilities in the central business district of the Hong Kong Island, and, under the principle of no unlawful reclamation, allow the heliport at the HKCEC to accommodate both commercial uses by helicopter operators and government uses". Taking account of the motion, the Administration proposed that the spare capacity of the proposed helipad would be made available for the provision of commercial helicopter services at a charge to be determined by the Government, on condition that

[1] Subsequently renamed the Panel on Economic Development

[2] Subsequently renamed the Panel on Development

government emergency and other essential flying services must have absolute priority at all times in using the helipad.

4. On 24 October 2005, the Administration informed the joint Panel that a technical feasibility study ("the study") would be conducted to take forward the shared-use proposal.

The technical feasibility study

5. The objective of the study is to determine the technical feasibility of the proposed helipad, which comprises three pads (namely one landing/take-off pad, one take-off pad and one parking pad) with supporting facilities (including a passenger terminal cum control tower and underground refuelling facilities as suggested by the industry). The study, which covers the assessment of the noise impact, the downwash effect, the potential hazard of the proposed underground refuelling facilities and the appropriate general layout of the helipad, was completed in December 2007. The executive summary of the consultant's report is at the **Annex**. The consultant's key findings and recommendations are summarised in paragraphs 6 to 11 below.

Noise impact

6. Since no noise sensitive receivers fall within 300 metres of the proposed helipad, the helipad is not a Designated Project under the Environmental Impact Assessment Ordinance and therefore an environmental impact assessment of the helipad under the Ordinance is not required. This notwithstanding, the study has examined the noise impact that would be caused by the helicopter operations at the helipad on the surrounding areas and recommended the necessary mitigation measures. The study has concluded that with suitable mitigation measures, the noise generated by helicopters would be kept within acceptable levels.

7. Specifically, the noise impact on Causeway Centre (which is the nearest residential building 450 metres from the helipad) and the Golden Bauhinia Square ("GBS") has been examined. The estimated highest noise level at Causeway Centre is 74 dB(A) which is below the noise criteria specified in the Hong Kong Planning Standards and Guidelines ("HKPSG") issued by the Planning Department[3]. For the GBS, the estimated highest noise levels are around 96 dB(A) (generated by GFS's helicopters) and 92

[3] According to the HKPSG, the noise criteria for helicopter noise are a maximum of 90dB(A) for offices and 85dB(A) for domestic premises, hotels, hostels, educational institutes, places of public worship, hospitals and clinics during 0700 to 1900 hours. These criteria apply to premises that rely on opened windows for ventilation.

dB(A) (generated by commercial helicopters)[4]. Such noise levels are below the threshold discomfort level of 120 dB(A) under the World Health Organization guidelines. In addition, as helicopter noise is transient and members of the public normally stay at the GBS for a relatively short period of time, the noise impact is considered tolerable. Nevertheless, to lessen such noise impact, the study has recommended the installation of a six-metre high noise barrier along the landward side of the boundary of the proposed helipad site. The noise barrier, made of 900-millimetre-high acoustic louvers at the bottom and topped by a 5.1-metre-high solid transparent panel, could reduce the noise levels generated by helicopters operating at the proposed helipad on the GBS to below 80dB(A). The study has also recommended a noise-mitigating landscaped buffer zone to be integrated with the existing planter boxes along the existing HKCEC Promenade.

Downwash effect

8. Helicopters in operation generate strong winds in their vicinity, which could cause discomfort to persons nearby. According to the classical Beaufort Scale for Wind Speed Applied to Urban Setting, a wind speed of 10.7 metres per second would cause force felt on the body and is the limit of agreeable wind. With the installation of the proposed barrier mentioned in paragraph 7 above, the wind speed generated by such downwash would be reduced to an acceptable level of around 5 metres per second right outside the boundary of the helipad site or at the GBS.

9. The study further assesses that the wind speed generated by the downwash of a helicopter operating at the outer pad of the proposed helipad would dissipate to the open sea area between the Promenade and the outer pad under the two most usual wind conditions (i.e. easterly and westerly wind). Therefore, members of the public at the Promenade are unlikely to be exposed to adverse downwash from helicopter operations at the outer pad of the helipad.

Hazard assessment of underground refuelling facilities

10. The refuelling facilities at the proposed helipad will consist of a 30 000-litre underground aviation refueling tank and other equipment such as delivery pipelines and dispensers. The study has included a hazard assessment of such facilities, conducted in accordance with the methodology

[4] For comparison, the maximum noise level that may be experienced on the platform of an underground station is around 100 dB(A). It is common that many people have been exposed to this environment and generally accept this situation when it lasts for a short period of time.

described in "Dispensing Petrol – HS(G)146"[5] and concluded that the risks would be low.

Helipad layout

11. The study examined three options of the general layout of the proposed helipad, with the above-mentioned mitigation measures incorporated. Taking account of the general operational requirements, the impact on pedestrian linkage and the visual impact, we recommend the helipad layout as shown in Figure 6 at the **Annex**.

Public consultation

12. We have consulted the helicopter industry on the findings and recommendations of the study. The industry generally supports the findings and the recommendations of the study, and has raised some issues relating to the modus operandi of the helipad under the future shared-use arrangement. Taking into account the issues raised, the Administration will continue to work closely with the industry and draw up the detailed operational procedures for the helipad. In addition, in view of the concerns expressed by the Wan Chai District Council ("WCDC") about the proposed commercial helicopter services at the helipad at the joint-Panel meeting held on 24 October 2005, the Administration plans to brief the WCDC on the findings and recommendations of the study in March 2008.

13. Meanwhile, having considered the public views on the proposed helipad gathered through the public engagement programme entitled "Harbour-front Enhancement Review – Wan Chai, Causeway Bay and Adjoining Area" (HER), the Town Planning Board ("TPB") endorsed the inclusion of the helipad site in the draft Wan Chai North Outline Zoning Plan ("OZP") No. S/H25/1 which was gazetted on 27 July 2007. In January 2008, the TPB heard and rejected further objections to the helipad site. The OZP will be submitted to the Chief Executive in Council for approval in due course.

[5] "Dispensing Petrol – HS(G)146" is an internationally accepted guidance document recommended by Health and Safety Executive (HSE). HSE is an internationally recognized enforcing authority for health and safety regulations in Britain. HS(G)146 has been used for evaluation of risk of petrol and other flammable liquid in refueling facilities, and is applicable to hazard assessment for helicopter refueling facilities.

Way Forward

14. After briefing the WCDC and with the approval of the OZP by the Chief Executive in Council, we will seek Members' support for the funding proposal for the proposed helipad before submitting the project to the Public Works Subcommittee and the Finance Committee for funding approval by mid-2008.

Transport and Housing Bureau
Security Bureau

February 2008

Annex

土木工程拓展署
Civil Engineering and
Development Department

Agreement No. HKI 02/2006

Development of a Government Helipad at the Hong Kong Convention and Exhibition Centre Detailed Helipad Assessment

EXECUTIVE SUMMARY

February 2008

MAUNSELL CONSULTANTS ASIA LTD

Agreement No. HKI 02/2006

DEVELOPMENT OF A GOVERNMENT HELIPAD AT THE HONG KONG CONVENTION AND EXHIBITION CENTRE DETAILED HELIPAD ASSESSMENT

EXECUTIVE SUMMARY

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1 INTRODUCTION

1.1 Project Background

1.1.1 The original Central Helipad at Lung Wui Road, which accommodated both Government Flying Service (GFS) flights and domestic commercial helicopters services, was closed in January 2004 to make way for the implementation of the Central Reclamation Phase III (CRIII) works. The GFS has since then relocated its operation to the present temporary helipad at the former Wan Chai Public Cargo Working Area (PCWA) pending the re-provisioning of a permanent helipad. After a thorough site search, the Hong Kong Convention and Exhibition Centre (HKCEC) site is considered the most suitable site for a permanent helipad because of its appropriate location and proximity to the Police Headquarters.

1.1.2 For helipad for commercial domestic helicopter services, the Government has conducted site searches since 1998 to identify a suitable site for developing a permanent domestic helipad in the Central Business District (CBD). The difficulties in finding a suitable site stem mainly from the scarcity of available land within the CBD and the need to meet stringent safety-related requirements that the site must be at surface-level along the waterfront and with unobstructed flight paths.

1.1.3 On 28 February 2005, a motion was passed by the relevant Panels of the Legislative Council (LegCo). It states "that, the Panel on Economic Services and the Panel on Planning, Lands and Works urge the Government to expedite the provision of a permanent commercial heliport and associated facilities in the central business district of the Hong Kong Island, and, under the principle of no unlawful reclamation, allow the heliport at the HKCEC to accommodate both commercial uses by helicopter operators and government uses."

1.1.4 In the light of the LegCo motion passed, the Government has undertaken a comprehensive review of all available Government sites along the harbour-front stretching from Sheung Wan in the west to the eastern end of the CRIII. Other than the site in front of the Western Park Sports Centre in Sheung Wan, no suitable site within the CBD could be identified. However, the Sheung Wan site lies only on the fringe of CBD but not within the CBD. It was not preferred by the helicopter service-industry.

1.1.5 After taking into account the motion passed by the relevant Panels of the LegCo and the views of the industry, the Administration agreed to allow commercial helicopter operators to share the use of the permanent helipad with the Government for providing domestic helicopter services, on condition that the operations of the GFS shall have priority to use the helipad at all times.

1.1.6 Maunsell Consultants Asia Ltd (MCAL) was commissioned on 30 November 2006 by the Civil Engineering and Development Department (CEDD) to conduct a detailed helipad assessment for the proposed development of a Government helipad with 3 pads and supporting facilities at the HKCEC under Agreement No. HKI 02/2006. The three-pad layout has included the necessary supporting facilities (including passenger terminal, control tower, underground refueling facilities) suggested by the Hong Kong Regional Heliport Working Group (HKRHWG).

1.1.7 The proposed helipad under the current study will be used by both GFS and commercial operators on the principle that Government shall have absolute priority in the use of the helipad over commercial operations at all times (i.e. no other helicopter shall be at the proposed helipad when GFS carry out their operations). GFS will carry out emergency services and other Government tasks such as casualty evacuation, search and rescue operations, secured helicopter transport for dignitaries, etc. Commercial operators will operate for public transport and deliver domestic helicopter services. These domestic helicopter services comprise mainly local sightseeing flights, business charters, and special-purpose flights for airlifting, aerial surveying and photography.

1.1.8 The location of the proposed helipad is shown in **Figure 1**.

1.2 Objective of the Assignment

1.2.1 The objective of the Assignment is to determine the feasibility of the proposed Government helipad at HKCEC incorporating the three-pad proposal (layout at **Appendix A**) in respect of noise impact and downwash effects of helicopters, a hazard assessment of the proposed underground refueling tank and the general layout of the helipad prior to the detailed design.

1.2.2 This Executive Summary presents the summary of findings of the above assessments on the three-pad proposal of helipad and the recommendations on the helipad layout.

2 HELIPAD IMPACT ASSESSMENT

2.1 Noise Impact Assessment

Introduction

2.1.1 In Hong Kong, criteria for evaluating helicopter noise impact are given in the Hong Kong Planning Standards and Guidelines (HKPSG) issued by Planning Department as well as the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) issued by Environmental Protection Department, which can be used as a reference for planning of various land uses and activities.

2.1.2 According to Table 4.1 of Chapter 9 "Environment" in the HKPSG and Table 1A of Annex 5 "Criteria for Evaluating Noise Impact" in the EIAO-TM, the noise criteria for helicopter noise is 90 dB(A) L_{max} [1] for offices and 85 dB(A) L_{max} for domestic premises, hotels, hostels, educational institutes, places of public worship, hospitals and clinics during 0700 to 1900 hours. The standards apply to uses that rely on opened windows for ventilation.

2.1.3 According to Item B.2 of Schedule 2 "Designated Projects Requiring Environmental Permits" of the Environmental Impact Assessment Ordinance (EIAO), a helipad within 300m of existing or planned residential development will be classified as a Designated Project (DP) which requires an Environmental Permit (EP) to be granted by Director of Environmental Protection (DEP) before it may be either constructed or operated. The proposed Government helipad at the HKCEC is more than 300m from any existing or planned residential development. The nearest residential building will be around 450m from the proposed helipad. Therefore, the proposed Government helipad at HKCEC is not a DP and an EP is not required for the Project. No noise sensitive receivers (NSRs) are identified within 300m of the proposed helipad.

2.1.4 Although the proposed helipad project is not a DP, and therefore noise from the proposed helipad is not subject to EIAO control, potential noise impacts to the residential or commercial development in the proximity and the adjacent waterfront areas are nevertheless assessed to determine any potential impacts to the nearby environment from the helicopter operations. The criteria for evaluating noise impact at sensitive uses as given in the above-mentioned HKPSG and EIAO-TM are used for reference.

Noise Assessment Points and Noise Criteria

2.1.5 According to the HKPSG and EIAO-TM, helicopter noise standard is applied on those assessment points relying on opened windows for ventilation. Buildings in the vicinity of the proposed helipad, including the Open Arena of HKAPA, Causeway Centre, Gloucester Road 169-170, Kam Kwok Building, Hyde Centre and Elizabeth House were assessed, with reference to the specified requirements in HKPSG and EIAO-TM, in this study. Among these noise assessment points, Causeway Centre is at the nearest distance from the proposed helipad (450m approximately).

[1] All environmental noise is measured using the A-weighted sound level dB(A). The following descriptors take the variability of the noise and the response to the community into account:
L_{eq} : Equivalent continuous sound level. A measure of energy level of a time-varying noise.
L_{max} : The maximum noise level during a designated time interval or a noise event.

2.1.6 The existing Golden Bauhinia Square (GBS) or the proposed expanded GBS (the Golden Bauhinia Plaza (GBP) as proposed under the current Wan Chai Development Phase II planning proposals) and the adjacent waterfront promenade along the north of HKCEC (HKCEC Promenade) are tourist attraction spots located next to proposed helipad. Although waterfront areas are not defined as NSRs according to the EIAO-TM and the pedestrians will not stay at a fixed location on the promenade for a long period of time (i.e. they are transient receivers), assessment points are added at the GBS and HKCEC Promenade to investigate the potential noise impacts from the helicopter operations on the pedestrians at the GBS and HKCEC Promenade in view of the importance of these tourist spots.

2.1.7 It is noted that waterfront areas are not defined as noise sensitive receivers (NSRs) according to the EIAO-TM and the pedestrians will not stay at a fixed location on the promenade for a long period of time (i.e. they are transient receivers). There are no specific criteria or requirements in HKPSG or EIAO-TM for noise impact assessment for waterfront / promenade users. In view of the transient nature of the receivers on the waterfront / promenade and that the helicopter operations are also transient, the noise impact assessment criteria stipulated in HKPSG or EIAO-TM are not applicable for noise assessment at the GBS and HKCEC Promenade.

2.1.8 Instead, similar maximum noise level that may be experienced on the platform of an underground station can be considered. This maximum noise level is around L_{max} 100 dB(A). It is common that many people have been exposed to this environment and generally accept this situation when it lasts for a short time period. This noise level is therefore considered as an acceptable maximum noise level for waterfront promenade users under normal transient conditions. In terms of upper boundaries of noise levels, according to the World Health Organisation (WHO) guidelines, the upper intensity limit of hearing, taken as the threshold discomfort, occurs at a sound pressure level of about 120dB(A) (independent of frequency). Painful feeling would be experienced at a level exceeding 140dB(A).

Field Measurement Results for Noise Impacts

2.1.9 Field measurements of noise had previously been undertaken under a separate study for two types of GFS helicopters, i.e. AS332-L2 and EC155-B1, at the GFS's Wan Chai helipad in October 2005. Under this Assignment, further field measurements were carried out to measure the noise from two selected commercial helicopters, i.e. MD-500E (single engine) and AS-355N (twin engines), as agreed with the Civil Aviation Department (CAD) and HKRHWG. The test was conducted at the GFS's Kowloon Bay Helipad on 1 February 2007.

2.1.10 The field measurements of noise were used for conversion of calculated L_{eq} values to L_{max} values in the noise modelling for comparison with noise criteria.

2.1.11 The measurements were based on the assumption that there is no simultaneous helicopter operation in the proposed helipad. Single helicopter operation in the proposed helipad is adopted in this Study.

Noise Modelling Results

2.1.12 Besides taking field measurements which measured helicopter noise at fixed distances, computational noise modelling was carried out to predict the noise impacts of the helicopter operations at the proposed helipad on the surrounding areas at various distances.

2.1.13 Heliport Noise Model (HNM Version 2.2), which is a computer programme developed by the Federal Aviation Administration (FAA) of U.S. Department of Transportation, was used in the assessment of potential noise impacts from helicopter operations. Noise modelling results were presented in plots of noise contours around the subject areas.

2.1.14 Based on the noise modelling results, noise contours from different helicopter operations amongst the largest GFS helicopter (AS332-L2) and largest commercial helicopter (AS-355N) along different flight paths at the proposed helipad are plotted against the nearby residential and commercial buildings relying on opened windows for ventilation. These contours represent the maximum noise level that points on the contour will experience during the entire approach or takeoff operations along the direction of flight path.

2.1.15 From these noise contours, the predicted noise level at the nearest residential building, Causeway Centre, in the worst-case scenario would be 74 dB(A), which is below the noise criteria as specified in the HKPSG and EIAO-TM (L_{max} 85 dB(A) for domestic premises).

2.1.16 Although the noise impact at the nearest sensitive uses, i.e. the Causeway Centre, is below the noise criteria given in the HKPSG and EIAO-TM, noise levels at the nearby GBS, proposed expanded GBS and HKCEC Promenade are also assessed in view of their proximity to the proposed helipad and their importance as tourist attraction spots.

2.1.17 Based on the noise modelling results, the maximum predicted noise levels at the GBS due to helicopter operations at the proposed helipad are around L_{max} 96 dB(A) for the GFS helicopter operating at the outer pad, around L_{max} 87 dB(A) and L_{max} 92 dB(A) for the commercial helicopters operating at the outer and inner pads respectively.

2.1.18 At the areas immediately outside the south-west boundary of the proposed helipad (i.e. proposed expanded GBS and HKCEC Promenade), the noise modelling results indicated that the maximum predicted noise levels are around L_{max} 100 dB(A) and L_{max} 104 dB(A) for the commercial helicopters operating at the outer and inner pads respectively. For the GFS helicopter which would operate at the outer pad under normal circumstances, the noise modelling results indicated that the maximum predicted noise levels are around L_{max} 106 dB(A).

2.1.19 It is considered that the predicted noise levels at the areas immediately outside the proposed helipad are relatively high as compared to the maximum noise level that may be experienced on the platform of an underground station (L_{max} 100 dB(A)) although it is still below the upper intensity limit of hearing as specified in WHO guidance (120 dB(A)). Noise mitigation measures are proposed to alleviate the potential noise impacts to the pedestrians at the immediate adjacent areas where practicable.

Proposed Noise Mitigation Measures

2.1.20 Typical noise mitigation measure in form of noise barriers are normally installed at the transmission path between the noise source and the receivers. The effectiveness of noise barriers depends on whether the noise barriers are installed at a location that can shield the noise source.

2.1.21 As hovering height for helicopters operating at the proposed helipad is about 2m above ground and the maximum height of commercial helicopters operating at the inner pad is around 3.15m, a 6m high noise barrier is recommended along the landward side of the helipad boundary to shield the noise source from the inner pad to the receivers (i.e. pedestrians at the HKCEC Promenade outside the boundary of the proposed helipad). Transparent noise barrier panels are recommended to reduce the visual impacts and to minimise the blockage of harbour view.

2.1.22 With reference to manufacturer's specifications, a typical solid noise barrier panel and an acoustic louvre could achieve about 32 dB and 25 dB reductions respectively in noise transmission. For a noise barrier composed of solid noise barrier and/or acoustic louvers, a reduction of not less than 25 dB in noise transmission could be achieved. The use of acoustic louvre will be further discussed in Section 2.2. Transparent noise barrier panels are recommended to reduce the visual impacts and to minimise the blockage of harbour view.

2.1.23 With the installation of proposed 6m high noise barrier along the landward side of the helipad boundary, the predicted maximum noise levels from the commercial helicopters operating at the inner pad to the receivers at the proposed expanded GBS and HKCEC Promenade outside the boundary of the helipad will be alleviated to around L_{max} 79 dB(A) (104-25=79 dB(A)).

2.1.24 For the helicopters operating at the outer pad, mitigation measure in the form of noise barrier is not recommended within the safety area of the outer pad in view of operational safety of the helipad. The possible location for installation of noise barrier would be along the waterfront of the HKCEC Promenade. However, in order to effectively shield the noise source from the helicopter to the receivers at the HKCEC Promenade, the height of the noise barrier has to be high enough to reach the transmission path, which depends on the height of the helicopter during the approach and takeoff operations at the outer pad. As the height of the helicopter during the approach or takeoff operations would have safety implications and the flight profiles cannot be restricted to a limited height above ground, no practicable height of noise barrier would be possible to effectively mitigate the noise impact from the helicopter operating at the outer pad to the nearby HKCEC Promenade. However, since the pedestrians would not stay at a fixed location on the promenade for a long period of time and given that the frequency of using the GFS helicopters which generate a higher noise level would be low (for emergency services and other Government tasks only), it is expected that the impact would be temporary and transient. In addition, installation of noise barriers along the waterfront promenade would have visual impacts and would block not only the harbour view but also the sea breeze to the pedestrians at the HKCEC Promenade and the GBS. In view of all the above, it is not recommended to install noise barrier along the waterfront of HKCEC Promenade.

2.1.25 Instead of noise barriers, a landscaped buffer zone in the affected area of HKCEC Promenade is recommended. The landscaped buffer zone can be integrated with the existing planter boxes along the existing HKCEC Promenade.

2.1.26 In summary, with the proposed noise mitigation measures, the noise impacts to pedestrians at the GBS, proposed expanded GBS and HKCEC Promenade would be reduced to acceptable levels; in particular, noise levels in the area immediately outside the helipad would be alleviated to a maximum of around L_{max} 79 dB(A). Taking into consideration the transient nature of the helicopter operations and that the pedestrians along the waterfront HKCEC Promenade and GBS are transient receivers, the noise impacts from the helipad to the waterfront areas are considered tolerable. It is also noted that the predicted noise levels at nearby residential or commercial buildings, which rely on opened windows for ventilation, due to the helicopter operations at the proposed helipad, would not exceed the noise criteria as specified in the HKPSG and EIAO-TM (i.e. below L_{max} 85 dB(A) for all domestic premises, hotels, hostels, educational institutes, places of public worship, hospitals and clinics and L_{max} 90 dB(A) for offices) and they are all located more than 300m from the proposed helipad.

2.2 Downwash Impact Assessment

Introduction

2.2.1 By conservation of momentum, helicopters need to push air downwards (downwash) in order to support their weight. When the helicopter is in close proximity to the ground, the downward flow is redirected into a horizontal sheet of around 1m thick. The air mass initially moving through the rotor plane is compacted into a thin disc spreading outwards from the position of the helicopter.

2.2.2 As the incremental volume of this disc increases proportional to the square of the distance from the helicopter and with the viscosity of air being an important factor in this near-ground flow, the air speed decreases rapidly away from the landing point of the helicopter.

2.2.3 Since the downwash flow is restricted to a thin layer near the ground and dissipated rapidly away from the landing pad, the concern is mainly about relatively light and mobile objects lying near the pad, such as litter items, which may become airborne. Further from the landing pad, human exposure to downwash is mainly a concern with regard to comfort.

2.2.4 The existing GBS, the proposed expanded GBS and the adjacent waterfront HKCEC Promenade are tourist attraction spots which are located next to proposed helipad. Downwash effects from the helicopter operations in the proposed helipad to the pedestrians nearby are assessed to investigate any adverse impacts to the area. Practical mitigation measures are identified and evaluated to check their effectiveness in alleviating the impacts.

Downwash Criteria

2.2.5 With reference to international wind scales, including the Beaufort scale and wind force criteria suggested by Murakami & Deguchi and by Soligo et al, a wind speed of 10m/s is considered to be an acceptable limit for downwash effect generated by the helicopter operation at the nearby pedestrians, in the context of this Study. It is noted that the helicopter operation is a temporary activity and the pedestrians are transient receivers. Any observer in the vicinity of a helipad would reasonably expect that the wind speed may be locally higher than in common urban situations.

Field Measurement Results for Downwash

2.2.6 Field measurements of downwash had previously been undertaken under a separate study for two types of GFS helicopters, i.e. AS332-L2 and EC155-B1, at the GFS's Wan Chai helipad in October 2005. Under this Assignment, further field measurements were carried out to measure the downwash from two selected commercial helicopters, i.e. MD-500E (single engine) and AS-355N (twin engines), at GFS's Kowloon Bay Helipad on 1 February 2007.

2.2.7 The measurements were based on the assumption that there is no simultaneous helicopter operation in the proposed helipad. Single helicopter operation in the proposed helipad is adopted in this Study.

2.2.8 The purpose of these field measurements was to collect data of the downwash effects of helicopters for assessing their impact to the pedestrians at the existing GBS or the proposed expanded GBS and to determine whether mitigation measures are required or not. The collected data was also used as the basis for checking the effectiveness of the proposed mitigation measures for downwash effects.

2.2.9 Field measurement results indicated that, without any barrier, for the various GFS and commercial helicopters, maximum wind speeds would exceed 10m/s in the immediate vicinity of the landing pad, with this exceedance occurring within varying distances from the landing pad (up to around 20m to 70m from the landing pad, approximately, depending on the helicopter).

Study of Mitigation Options of Downwash with Aid of Computer Model

2.2.10 Besides taking field measurements which measured helicopter downwash at fixed distances, computational fluid dynamics (CFD) modelling was carried out to assess a number of proposed barrier configurations and compare the wind speed in the adjacent waterfront areas and the recirculation effect on the helicopters.

2.2.11 As mentioned in para. 2.1.21, a 6m high transparent barrier is proposed along the landward boundary of the proposed helipad as noise mitigation measure. Although an entirely solid barrier will both alleviate noise impacts and block the downwash effect to pedestrians outside the helipad, which is beneficial to the pedestrians, the recirculation of the downwash may have an impact to the helicopters operating inside the helipad. A barrier with both noise barrier panels and acoustic louvres has been investigated to improve the recirculation effect to the helicopters. Acoustic louvres have been considered for reducing the recirculation within the helipad to some extent and, at the same time, minimising the noise that may leak through the louvres to the outside of helipad.

2.2.12 Three barrier configurations have been investigated by the CFD model:

- Configuration A: a solid barrier with transparent panels, of height 6 m;
- Configuration B: a barrier of height 6 m, constructed wholly of acoustic louvres; and
- Configuration C: a barrier constructed of acoustic louvres to a height of 900 mm, and of solid transparent panels up to a total height of 6 m.

2.2.13 Configuration A represents the highest protection against helicopter downwash with no consideration of improvement in recirculation within the helipad. Configuration B represents the highest improvement in recirculation within the helipad while the height of acoustic louvres in Configuration C is limited to 900mm in order that line-of-sight between the pedestrians and the helipad will not be blocked by the louvres if transparent panels are installed for the upper portion of the barrier (i.e. less visual blocking).

2.2.14 As the GFS helicopters will operate at the outer pad under normal circumstances and operations of commercial helicopters will be in the closest proximity to the HKCEC Promenade with pedestrians passing by outside the boundary of the proposed helipad, the worst-case helicopter type (the twin-engine Helicopter AS-355N) which will operate at the inner pad of the proposed helipad was adopted in the computational analysis for the three barrier configurations.

2.2.15 The modelling results of wind speed in the pedestrian area, which includes the existing GBS or proposed expanded GBS, HKCEC Promenade and surrounding open space, indicated that no barrier configurations result in significant exposure to wind speeds greater than 10m/s. A small percentage of area (less than 2%) is exposed to wind speeds greater than 10m/s, but this is mainly due to the open entrance of the helipad and can be mitigated by having a solid gate instead.

2.2.16 In addition, the modelling results on recirculation indicated that barrier configuration C offers an improvement in recirculation volume flow rate of around 16 to 18% compared with barrier configuration A.

2.2.17 As configuration C (i.e. a barrier constructed of acoustic louvres to a height of 900 mm, and of solid transparent panels up to a total height of 6m) does provide noticeable benefits in respect of recirculation of downwash (and therefore improved operational conditions for the helicopters), but does not result in unnecessary visual blockage (or visual impact), this barrier configuration was recommended for further consideration as downwash mitigation measure.

Proposed Downwash Mitigation Measures

2.2.18 Based on the findings of CFD modelling on the three barrier configurations, a recommended barrier configuration (Configuration C) was fabricated for further field measurement to investigate its effectiveness on mitigating downwash during different modes of helicopter operations.

2.2.19 Field measurements were carried out to measure the downwash from two commercial helicopters (AS-355N and MD-500E) and two GFS helicopters (AS332-L2 and EC155-B1) at GFS's Kowloon Bay Helipad on 20 March 2007. The collected data form the basis for comparing the effectiveness of the proposed mitigation measures for downwash effect.

2.2.20 The field measurement results showed that, with the installation of a barrier at the boundary of the proposed helipad, pedestrians standing or passing by immediately outside the boundary of the helipad site and pedestrians at the GBS would experience a magnitude of wind speed of around 5m/s (hair disturbed and clothing flaps) from different types of helicopter operations and would unlikely be subject to unacceptable wind speed of higher than 10m/s (force felt on body and limit of agreeable wind). The recommended barrier configuration C is considered effective in mitigation of downwash to the acceptable level of wind speed to below 10m/s.

2.2.21 The field measurement results suggested that pedestrians along the shoreline of HKCEC Promenade facing the outer pad may be subject to a wind speed of more than 10m/s during helicopter landing and taking off at the outer pad. However, the actual site configuration at the proposed helipad at HKCEC is different from the GFS's Kowloon Bay Helipad that was used for the field measurement. There is an open sea area between the HKCEC Promenade and the outer pad in which downwash wind speed will be damped down and dissipated over the water surface. The residual downwash, if any, will eventually reach and hit the existing seawall along the HKCEC Promenade. Furthermore, the two most probable wind conditions at the proposed helipad site are easterly wind and westerly wind, which account for almost 70% of the wind conditions at the proposed helipad site. Helicopter downwash under these wind conditions will dissipate towards the west in easterly winds and towards the east in westerly winds and will not affect the existing GBS or proposed expanded GBS and HKCEC Promenade. Therefore, the pedestrians along the HKCEC Promenade facing the outer pad are unlikely to perceive an adverse downwash effect from helicopter operations at the outer pad of the proposed helipad.

2.3 Hazard Assessment for Underground Refuelling Facilities

Introduction

2.3.1 The proposed helicopter refuelling facilities will consist of a 30,000-litre underground aviation refuelling tank and other equipment such as delivery pipelines and dispenser. The proposed location of underground refuelling tank is at the southwest corner of the helipad site, where the tank is founded in existing land. Installation of the underground refuelling tank behind the seawall provides better protection of the tank than mounting it underneath the piled deck structure of the helipad where it will be exposed to severe sea condition and frequent wave attack. This underground aviation refuelling tank will be double-skinned made of non-metallic material such as glass reinforced plastic (GRP) and is assumed to be filled to a maximum level of approximately 95% controlled by means of overfill cutover device.

2.3.2 Fuel dispenser and vent pipe will be installed in the south-east corner of the proposed helipad, where it is further away from the public promenade. By locating the fuel dispenser at the edge of the helipad site, obstruction to helicopter operation is minimised.

2.3.3 Aviation fuel will be delivered to the proposed underground aviation refuelling tank by road tankers. The aviation refuelling facilities will be used to serve for both GFS's helicopters and commercial helicopters of the proposed helipad.

Hazard Assessment Methodology

2.3.4 Aviation fuel will pose a hazard to people in the surrounding area only if a release occurs as a result of a failure of containment or as a result of faulty transfer procedures. To assess the hazard for these underground helipad refuelling facilities, a qualitative hazard assessment has been carried out in accordance with the methodology described in "Dispensing Petrol – HS(G)146" (HS(G)146).

2.3.5 HS(G)146 is an internationally accepted guidance document recommended by Health and Safety Executive (HSE). HSE is an internationally recognised enforcing authority for health and safety regulations in Britain. HS(G)146 has been used for evaluation of risk of petrol and other flammable liquid in refuelling facilities. Hazard assessments based on HS(G)146 have been conducted for a number of local petrol filling stations to evaluate the risk of petrol and diesel related operations and are accepted by the relevant government departments and authorities. As advised by the Association of Petroleum and Explosives Administration (APEA) referred by HSE, HS(G)146 is a methodology applicable to hazard assessment for helicopter refuelling facilities.

Hazard Assessment and Evaluation

2.3.6 The risk associated with the aviation fuel related operations in the proposed helicopter refuelling facilities was assessed by observing the four elements of the aviation refuelling tank operations: delivery and venting, storage, pipework system, and dispensing.

2.3.7 For each of the four elements, the level of risk was evaluated by determining the risk rating of that element, taking into account the characteristics of the aviation refuelling facilities such as annual throughput of the helipad and details of the aviation refuelling components such as age of jet fuel storage tank. There are three risk ratings assigned, namely Group A, Group B and Group C, where the risk increases from Group A to C.

2.3.8 Based on the hazard assessment, the risk ratings of storage, pipework system and dispensing were assessed to be Group A, whereas risk rating of delivery (and venting) was assessed to be Group B. It was found that operations associated with delivery and venting, storage, pipework systems and dispensing of aviation fuel of the proposed helicopter refuelling facilities would not impose high level of risk to the surroundings.

2.3.9 The generally low level of risk is due to a number of features of the design of the proposed helicopter refuelling facilities:

(a) The proposed aviation refuelling facilities are located in an open area.
(b) The proposed helicopter refuelling facilities are located away from residential accommodation and underground roads.
(c) The design of the proposed helipad allows helicopters to refuel within the helipad.
(d) The fuel storage tank and pipework systems to be installed are new.
(e) The fuel storage tank and pipework systems to be installed are double-skinned.
(f) The dispenser to be installed conform to a generally safe standard.
(g) The installation of overfill cutover device to avoid liquid fuel overfilling in road tanker delivery operation.
(h) The installation of drainage system to prevent leaked fuel spreading out of the helipad.

Further Risk-Reducing Measures and Good Practices

2.3.10 There are a number of risk-reducing measures and good practices identified in this study that would further reduce the risk levels imposed to the surroundings by the proposed helicopter refuelling facilities:

(a) The helicopters should not have passengers on board during refuelling.
(b) Consider installation of leak monitoring device at storage tank and pipework systems.
(c) Consider methods of liquid fuel inventory control in order to detect leaks from pipework systems at an early stage.
(d) Pipework lines shall be clearly marked to show which pump/tank they are related to.
(e) Valves of the pipework shall be clearly marked to show method of operation and purpose.
(f) Inspection/maintenance of dispenser/hoses on a regular basis for signs of wear and tear.
(g) Provide adequate illumination of dispensing area.

2.3.11 The operator shall prepare a management plan for incident registration and an operating manual before the commencement of refuelling facilities operation for review and endorsement by relevant parties as appropriate.

Summary of Findings

2.3.12 According to the hazard assessment, the risk levels of the proposed helicopter refuelling facilities were generally found to be low. The provision of aviation refuelling facilities in the proposed helipad was found to be feasible from the hazard assessment point of view.

2.3.13 Further, it is recommended to implement the further risk-reducing measures identified above in the detailed design and operation of the proposed helicopter refuelling facilities.

3 HELIPAD LAYOUT

3.1 Introduction

3.1.1 Based on the design guidelines and requirements, and the noise and downwash mitigation measures recommended above for the proposed helipad, three different options for the helipad layout have been derived. Details of the three helipad layout options are presented in the following paragraphs and the optimum helipad layout is recommended by comparing the three different options.

3.2 Design Guidelines, Requirements and Assumptions

3.2.1 Design of the flight route, helipad layout and its supporting facilities for the proposed helipad has made reference to the following international standards and guidelines:

(i) Heliport Manual (Doc 9261-AN/903), issued by the International Civil Aviation Organization (ICAO);
(ii) Guidelines issued by British Helicopter Advisory Board (BHAB); and
(iii) Advisory Circular (AC) No. 150/5390-2B, Heliport Design, issued by the Federal Aviation Administration (FAA) of U.S. Department of Transportation.

3.2.2 The layout design is based on the following types of helicopters as agreed with CAD, GFS and HKRHWG and tested in the field trials:

(i) GFS helicopter super puma AS332-L2 (twin engines);
(ii) GFS helicopter EC155-B1 (twin engines);
(iii) commercial helicopter MD-500E (single engine); and
(iv) commercial helicopter AS-355N (twin engines).

3.2.3 A summary of the helipad facility requirements based on the previous requirements of GFS and CAD set out in the previous Wan Chai Development Phase II Comprehensive Feasibility Study (WDIICFS) is given below. GFS's requirements are as follows:-

(i) maximum load of the takeoff and landing pad is 35,000 lbs;
(ii) provision of one waiting room to accommodate 16 passengers;
(iii) the helipad needs to be fenced off to prevent the public from accessing the pads for safety and security reasons;
(iv) provision of driveway access to the main gate, drop-off area for emergency services and a parking area for 4 cars; and
(v) provision of fire fighting facilities including a fire hydrant within 100m of the helipad site as well as on-site storage for 1,000 litres of water and storage for 45kg of dry chemical power, which would be contained in a small pump house building, incorporating the switch room.

3.2.4 HKRHWG's requirements for helipad facility as shown in their proposed 3-pad layout proposal which was tabled in a meeting with CEDD on 2 January 2007 is attached in **Appendix B**.

3.2.5 The driveway access to the main gate of the helipad is provided for emergency services and delivery of jet fuel etc. Commercial operators shall use the loading/unloading laybys along the Expo Drive East outside the helipad.

3.2.6 Existing public toilet facilities in the HKCEC finger pier will be re-provided on a like-for-like basis to the adjacent area in the proposed expanded GBS.

3.3 Operational Requirements

3.3.1 For operational safety concern, the proposed helipad for the use of GFS helicopters must meet the following requirements for helicopter access:

- two approach paths to be separated by not less than 150 degrees to the takeoff and landing area; and
- a radius of 200 metres on the seaward side of the helipad to be clear of moored vessels.

3.3.2 With reference to the revised Technical Feasibility Statement, GFS would operate from the outer pad under normal circumstance. As discussed with CAD and GFS in a meeting on 3 January 2007, the commercial helicopters would approach to the outer pad and then hover-taxi at around 2m above ground to the inner pad for landing. During takeoff, the commercial helicopters can either takeoff at the inner pad or hover-taxi back to the outer pad and then takeoff, depending on the wind direction and site conditions. However, the takeoff at the inner pad may require further operational assessment at a later stage.

3.3.3 Based on the wind availability data, direction of prevailing wind is generally from north-east (NE) to east (E) around the HKCEC area. Taking into consideration nearby structures and obstructions and wind data, obstacle limitation surfaces for the approach and takeoff flight paths at the outer pad, 150 degrees apart, should be orientated with bearing of 072º and 282º. The takeoff flight paths from the inner pad should be oriented with bearings of 040º and 090º.

3.3.4 Marine constraints are only that no permanent moorings should be located within 200 metres of the landing/takeoff pad on the seaward side. As noted by Marine Department previously, the water area off the Wan Chai shoreline is a designated inshore traffic zone, and it is not feasible to sterilise the areas off the helipad for marine vessel movements. However, mobile objects, such as boats, vessels or ferries, etc, may be regarded as obstacles at certain times, in which case it would only be necessary to delay helicopter operations momentarily until the mobile obstacle is clear of the obstacle limitation surfaces.

3.4 Helipad Layout Options and Comparison

3.4.1 Based on the above-mentioned design requirements, the flight paths, size of helipad and safety areas required by the international design guidelines and standards (graphically summarised in **Figure 2**), and the proposed mitigation measures for noise and downwash, three options of helipad layout have been examined.

Option 1

3.4.2 Option 1 (**Figure 3**) is based on the proposed helipad layout given in Study Brief as shown in **Appendix A**. It is basically a 3-pad layout with one landing/takeoff pad and one takeoff pad at northern end and southern end of the helipad respectively and a parking pad in between them. The passenger terminal, control tower and the entrance gate are adjacent to the parking pad. Emergency access to the helipad is through the west side of the site. A 6m high barrier is proposed along the boundary on the landward side of the helipad for mitigation of noise and downwash impacts. A landscaped area along the shoreline of HKCEC promenade facing the outer pad is proposed as noise buffer.

Option 2

3.4.3 Option 2 (**Figure 4**) is similar to Option 1 except that the entrance is relocated to the south of the helipad. This modification aims at minimising the noise and downwash impacts to the pedestrians at the existing GBS or the proposed expanded GBS even if typical drop gates are proposed at the entrance, similar to the provision for the existing GFS's Wan Chai helipad. The toilet block immediately adjacent to the entrance provides shielding effects against the noise and downwash from the entrance.

Option 3

3.4.4 Under Option 3 (**Figure 5**), the locations of inner takeoff pad and parking pad are swapped; the passenger terminal, control tower and 4 GFS car parks are moved to the south-west corner of the helipad.

Comparison of Options and Recommendations

3.4.5 By comparing the different options in respect of the operational requirements, impacts to the proposed expanded GBS, impacts on pedestrian linkage and visual impacts (details in **Appendix C**), Option 3 performs better with less impacts to the existing GBS or the proposed expanded GBS and less visual impacts as compared to Options 1 and 2, while providing for necessary operational requirements. It is therefore recommended to adopt Option 3 as the optimum helipad layout. The recommended layout of proposed government helipad at HKCEC (Option 3) is shown in **Figure 6**.

4 CONCLUSIONS

4.1.1 According to the noise impact assessment, the predicted noise levels at nearby residential or commercial buildings, which rely on opened windows for ventilation, due to helicopter operations at the proposed helipad, would not exceed the noise criteria as specified in the HKPSG and EIAO-TM.

4.1.2 Mitigation measures are recommended to mitigate the noise and downwash impacts from the helicopter operations within the helipad to the pedestrians standing or passing by immediately outside the boundary of the proposed helipad site, where practicable.

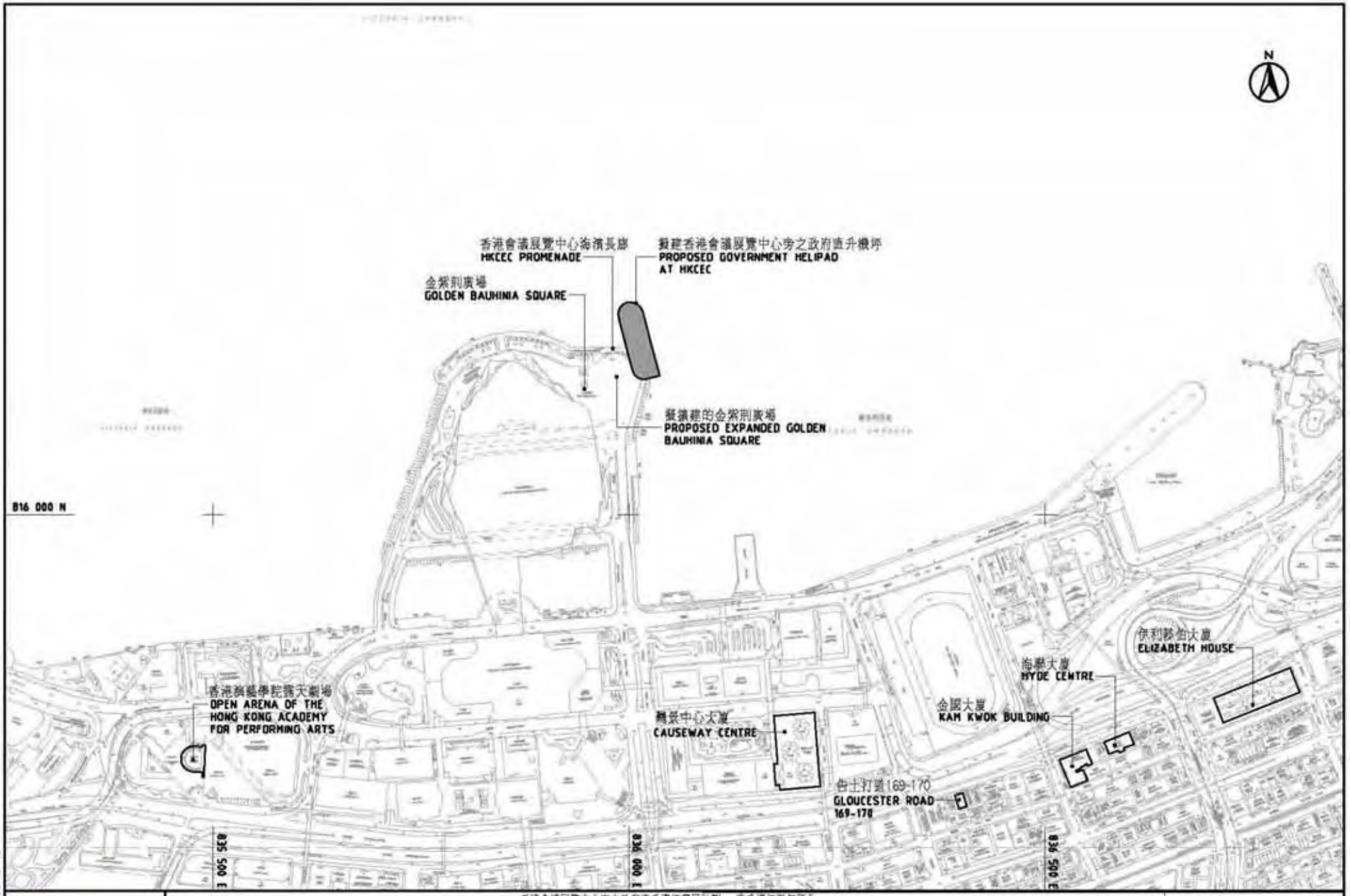
4.1.3 With the use of CFD analysis, further field measurement and noise modelling, a proposed barrier configuration C (i.e. a barrier constructed of acoustic louvres to a height of 900 mm, and of solid transparent panels up to a total height of 6 m) along the landward side of the boundary of the proposed helipad site would offer protection to pedestrians outside the boundary against noise and downwash effects from the inner pad of the proposed helipad as well as improvement in recirculation within the helipad for helicopter operations.

4.1.4 Considering the impracticable height of noise barrier to effectively mitigate the noise source from helicopters during approach and takeoff operations at the outer pad, the transient nature of helicopter operations, transient receivers of pedestrians at the HKCEC Promenade and GBS, and visual impacts, mitigation measures in terms of noise barrier are not recommended to be installed along the waterfront of HKCEC Promenade against noise impacts from helicopter operations at the outer pad of the proposed helipad. A landscaped area along the shoreline of HKCEC Promenade facing the outer pad is proposed as a buffer zone to mitigate the potential noise impact on the pedestrians of the HKCEC Promenade while maintaining the view of pedestrians to the harbour.

4.1.5 According to the hazard assessment, the risk levels of the proposed helicopter refuelling facilities are generally low. The provision of aviation facilities in the proposed helipad is found to be feasible from the hazard assessment point of view.

4.1.6 Taking into consideration the operational requirements, impacts to the existing GBS or the proposed expanded GBS, impacts on pedestrian linkage, visual impacts and incorporation of the above noise and downwash mitigation measures, helipad layout Option 3 as shown in the **Figure 6** is recommended as the optimal helipad layout.

Figures



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Maunsell Consultants Asia Ltd

香港會議展覽中心旁之政府直升機坪發展計劃 - 直升機坪詳細評估
DEVELOPMENT OF A GOVERNMENT HELIPAD AT HKCEC - DETAILED HELIPAD ASSESSMENT

位置圖
LOCATION PLAN

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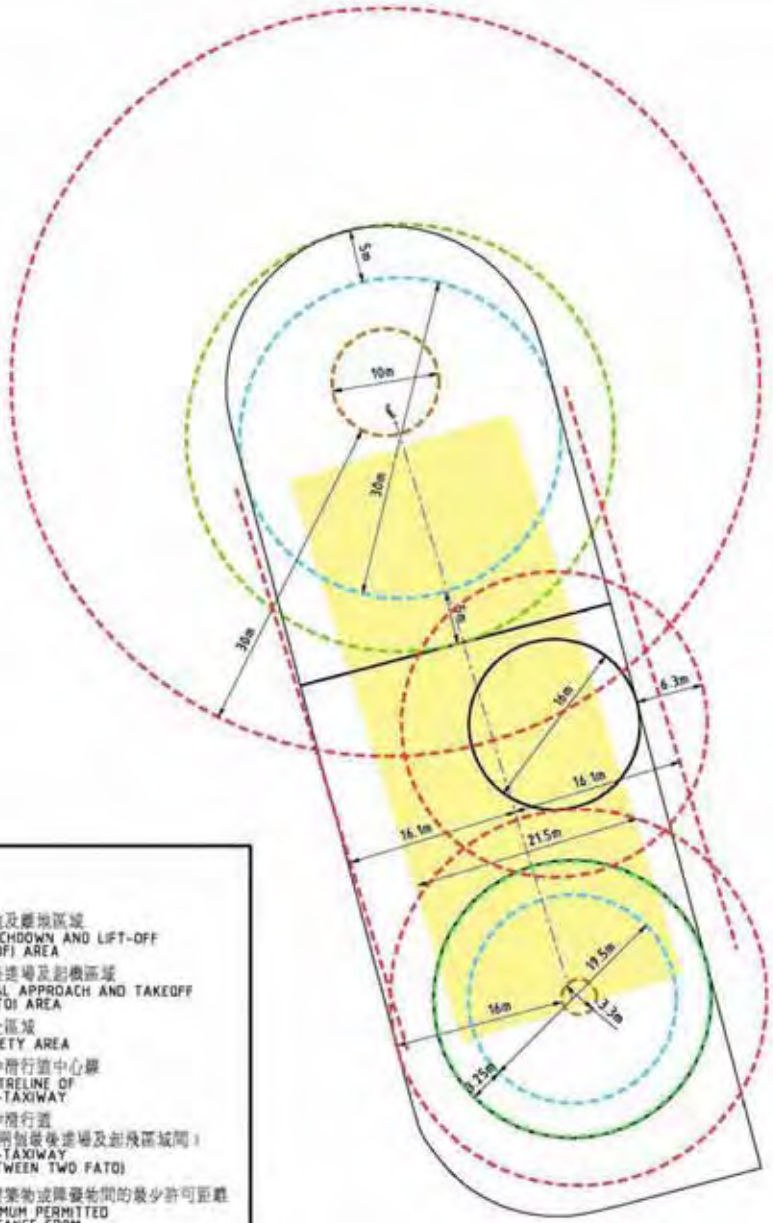
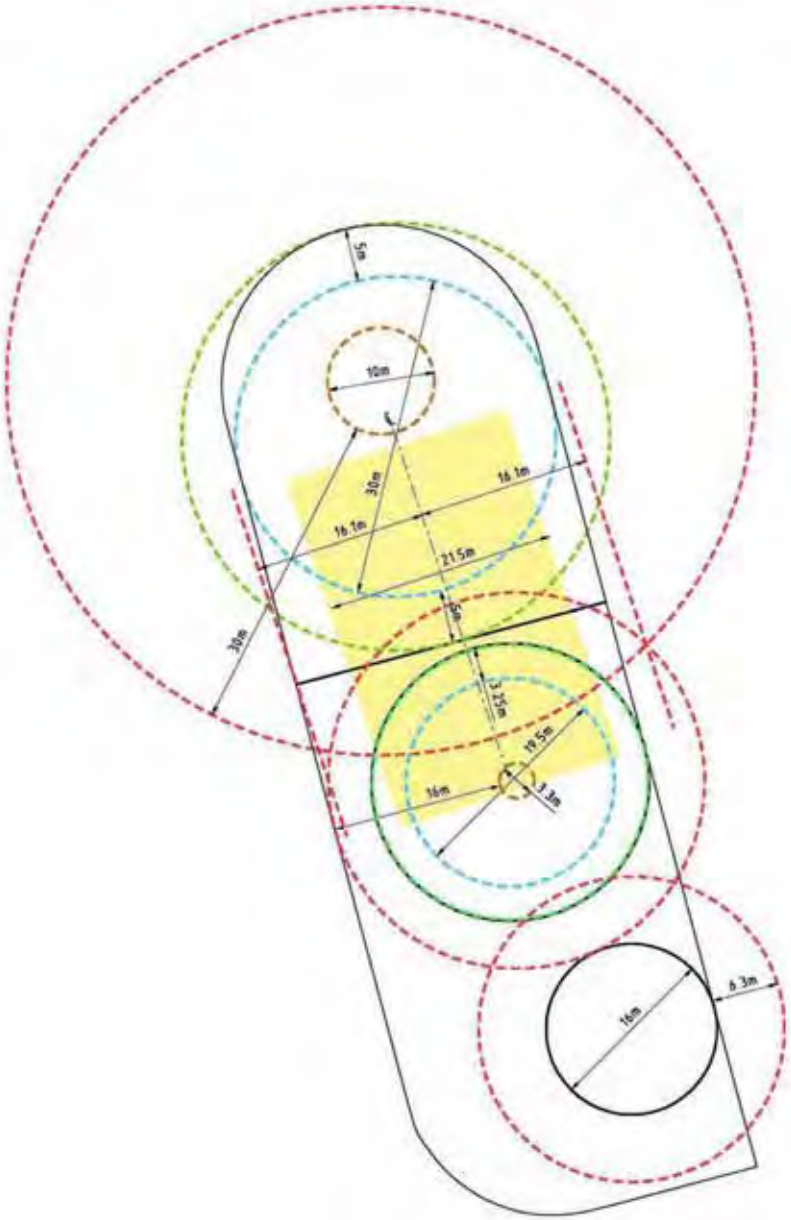
圖一
FIGURE 1

ISZOI P:\PROJECTS\97103\drawing\report\HELIPAD\ES\CHI\FIGURE 1.dgn



方案一和二
OPTION 1 & 2



方案三
OPTION 3

圖例：
LEGEND:

- 著地及離境區域 TOUCHDOWN AND LIFT-OFF (TLOF) AREA
- 最後進場及起飛區域 FINAL APPROACH AND TAKEOFF (FATO) AREA
- 安全區域 SAFETY AREA
- 空中滑行道中心線 CENTRELINE OF AIR-TAXIWAY
- 空中滑行道（在兩個最後進場及起飛區域間） AIR-TAXIWAY (BETWEEN TWO FATO)
- 與建築物或障礙物間的最少許可距離 MINIMUM PERMITTED DISTANCE FROM BUILDINGS/OBSTACLES
- 位置標記 POSITION MARKING

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DEVELOPMENT OF A GOVERNMENT HELIPAD AT HKCEC - DETAILED HELIPAD ASSESSMENT

直升機坪規劃限制圖
HELIPAD LAYOUT CONSTRAINTS

圖二
FIGURE 2

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P:\PROJECTS\97103\drawing\report\HELIPAD\ES\CHI\FIGURE 2.dgn

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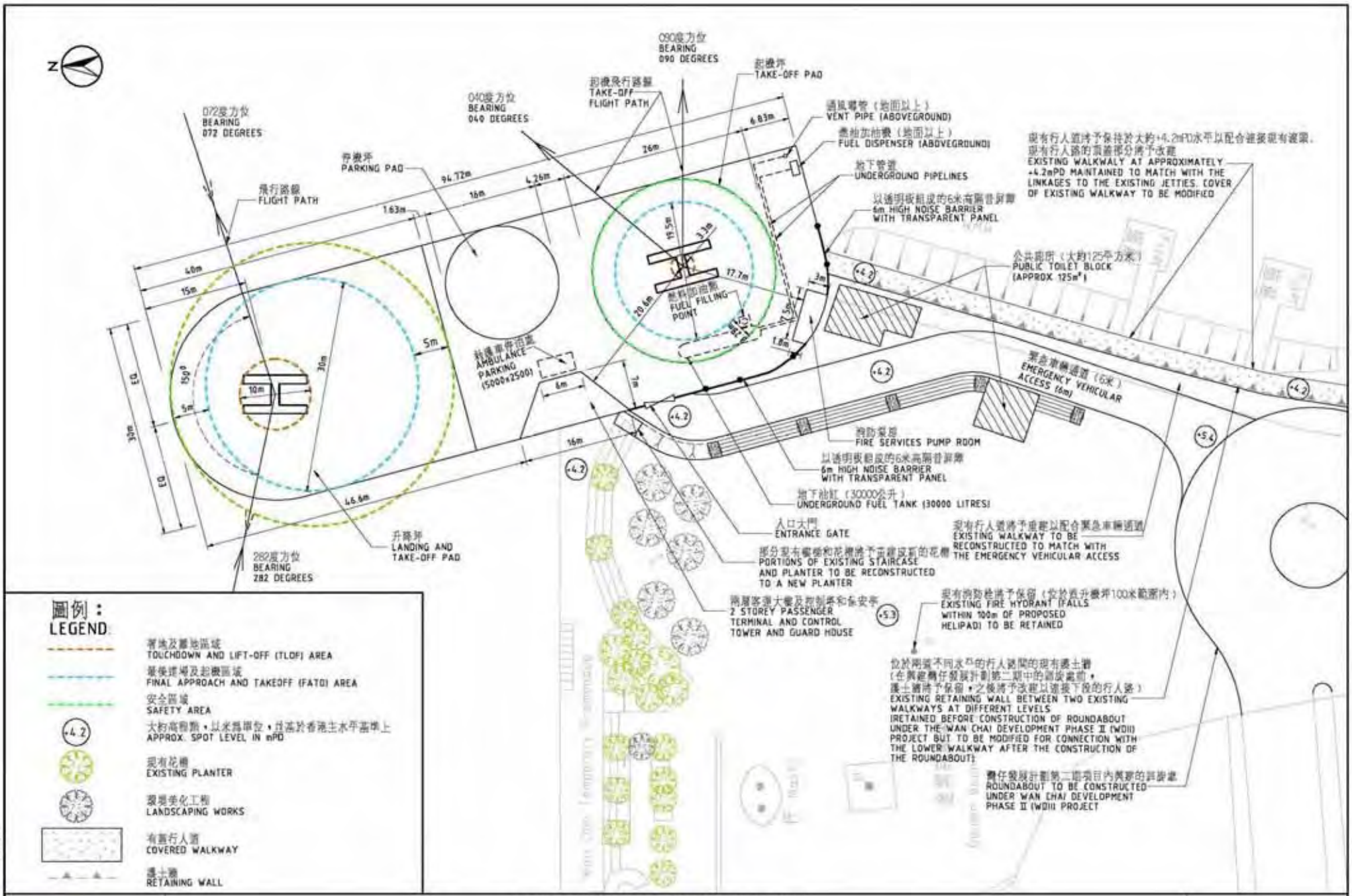

圖例：
LEGEND

- 著地及離地區域 TOUCHDOWN AND LIFT-OFF (TLOF) AREA
- 最後進場及起飛區域 FINAL APPROACH AND TAKEOFF (FATO) AREA
- 安全區域 SAFETY AREA
- +4.2 大約高程點，以米爲單位，並高於香港主水平基準上 APPROX. SPOT LEVEL IN mPD
- 現有花槽 EXISTING PLANTER
- 擬建美化工程 LANDSCAPING WORKS
- 有蓋行人道 COVERED WALKWAY
- 護土牆 RETAINING WALL

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擬建香港會議展覽中心旁之政府直升機坪平面圖（方案一）
PROPOSED LAYOUT OF GOVERNMENT HELIPAD AT THE HKCEC (OPTION 1)

圖三
FIGURE 3

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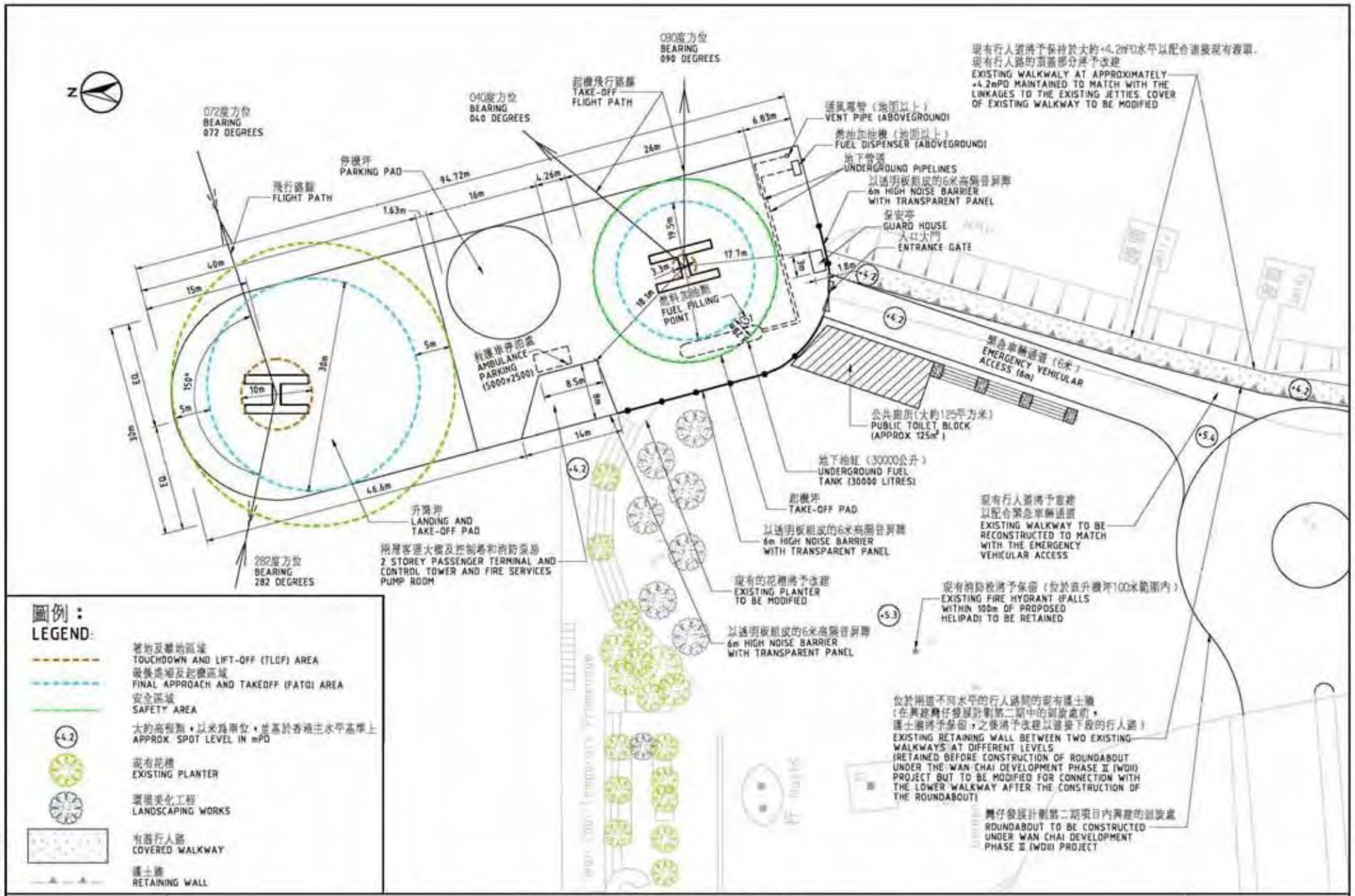
P:\PROJECTS\97103\drawing\report\HELIPAD\ES\CH\FIGURE 3.dgn



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DEVELOPMENT OF A GOVERNMENT HELIPAD AT HKCEC - DETAILED HELIPAD ASSESSMENT

擬建香港會議展覽中心旁之政府直升機坪平面圖（方案二）
PROPOSED LAYOUT OF GOVERNMENT HELIPAD AT THE HKCEC (OPTION 2)

圖四
FIGURE 4

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P:\PROJECTS\97103\drawing\rep.zrf\HELIPAD\ES\CH\FIGURE 4.dgn

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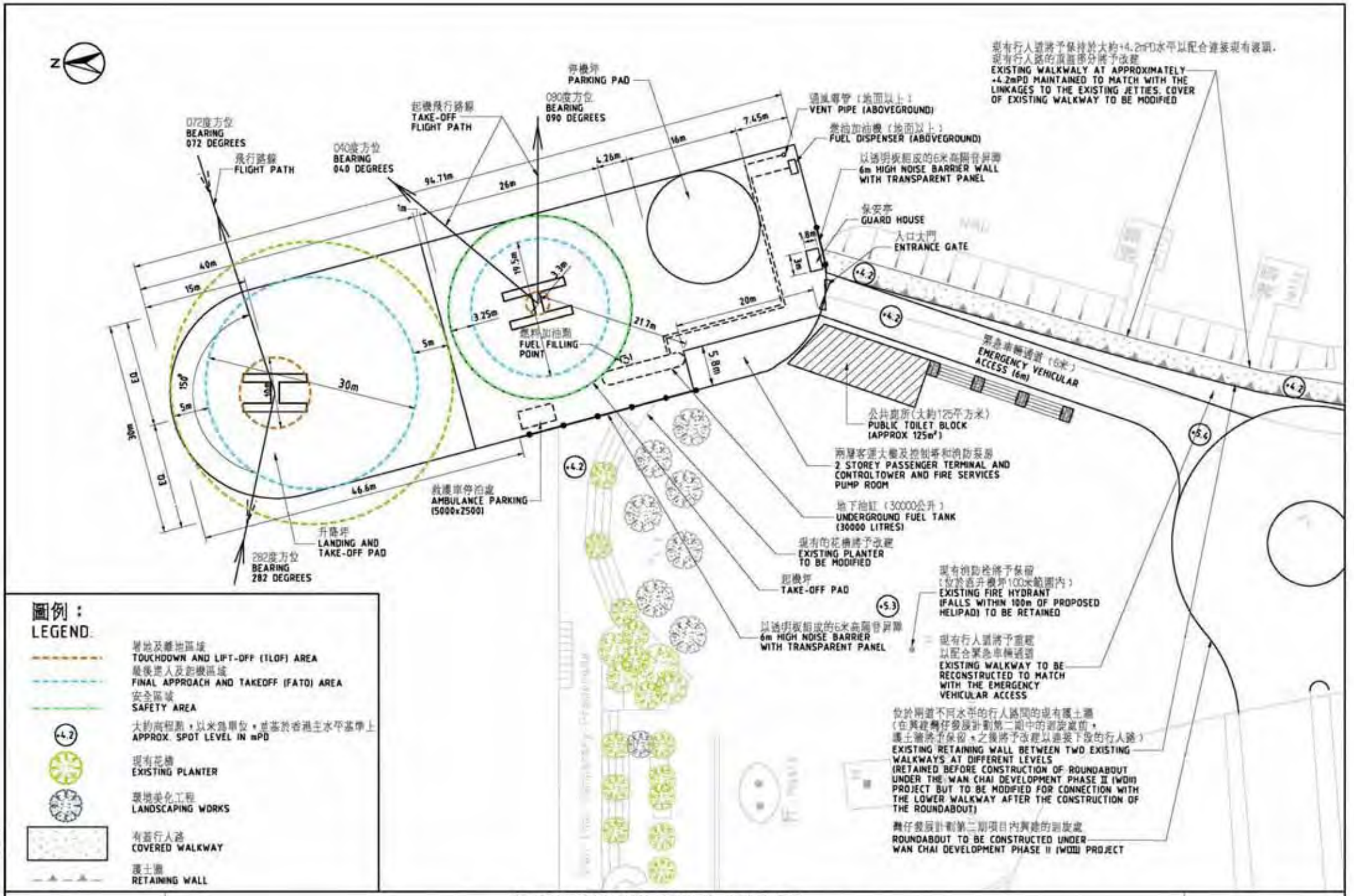

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DEVELOPMENT OF A GOVERNMENT HELIPAD AT HKCEC - DETAILED HELIPAD ASSESSMENT

擬建香港會議展覽中心旁之政府直升機坪平面圖（方案三）
PROPOSED LAYOUT OF GOVERNMENT HELIPAD AT THE HKCEC (OPTION 3)

圖五
FIGURE 5

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P:\projects\97103\drawing\report\HELIPAD\ES\CHI\FIGURE 5.dgn

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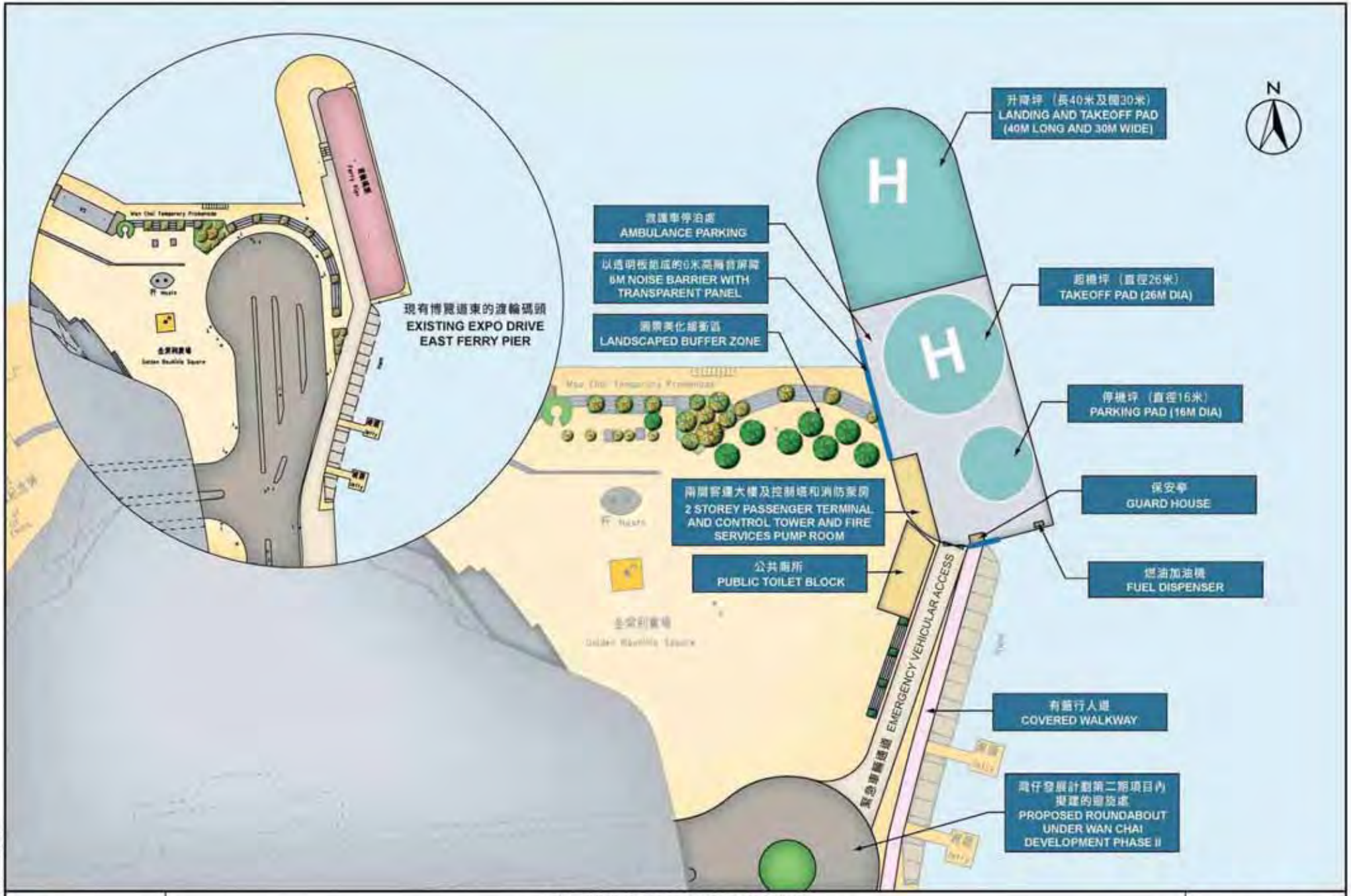

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DEVELOPMENT OF A GOVERNMENT HELIPAD AT HKCEC - DETAILED HELIPAD ASSESSMENT

建議的香港會議展覽中心旁之政府直升機坪平面圖
RECOMMENDED LAYOUT OF GOVERNMENT HELIPAD AT THE HKCEC

圖六
FIGURE 6

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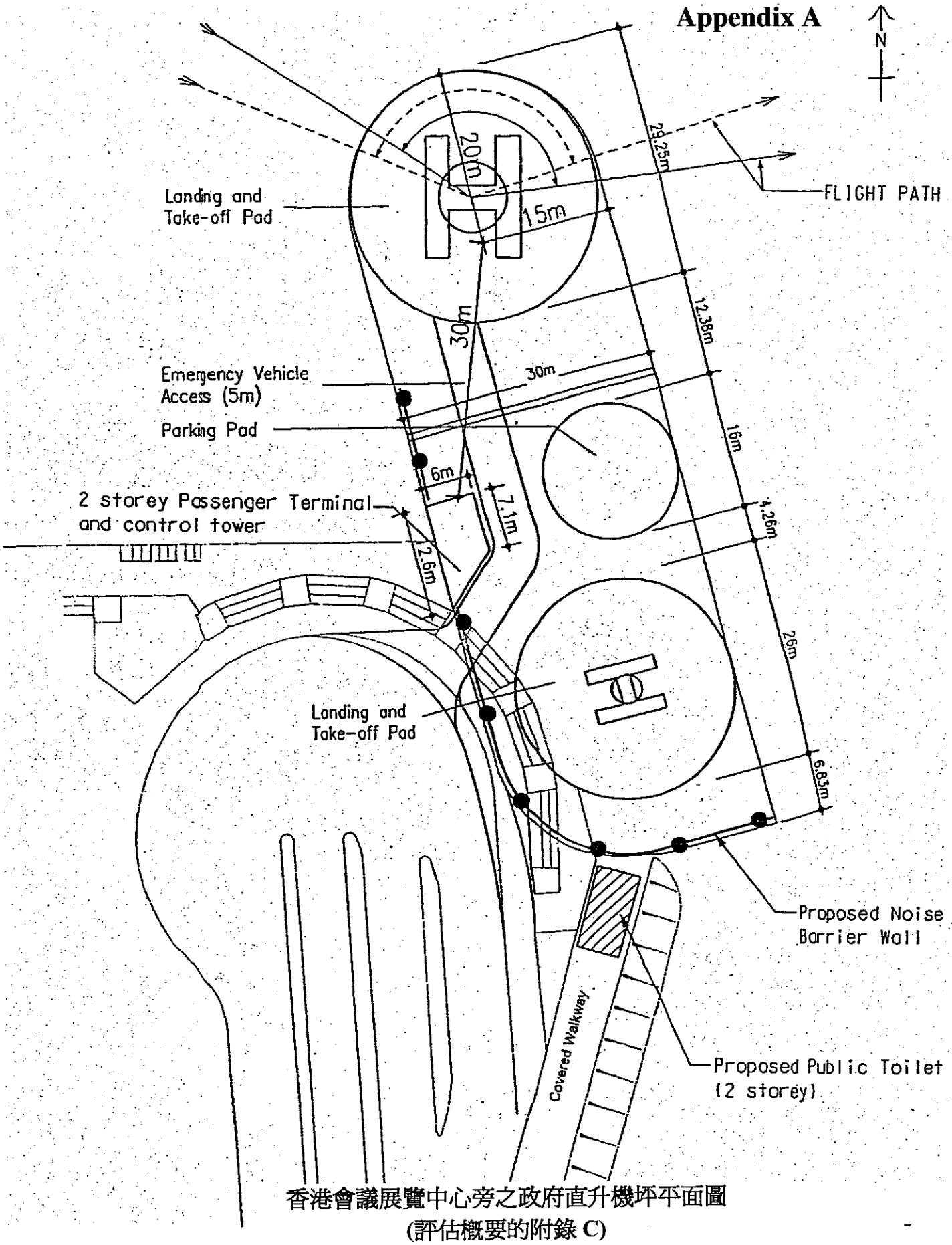
Appendix A

Layout of Government Helipad at the HKCEC
(Appendix C of the Study Brief)

附錄 A
Appendix A



香港會議展覽中心旁之政府直升機坪平面圖
(評估概要的附錄 C)

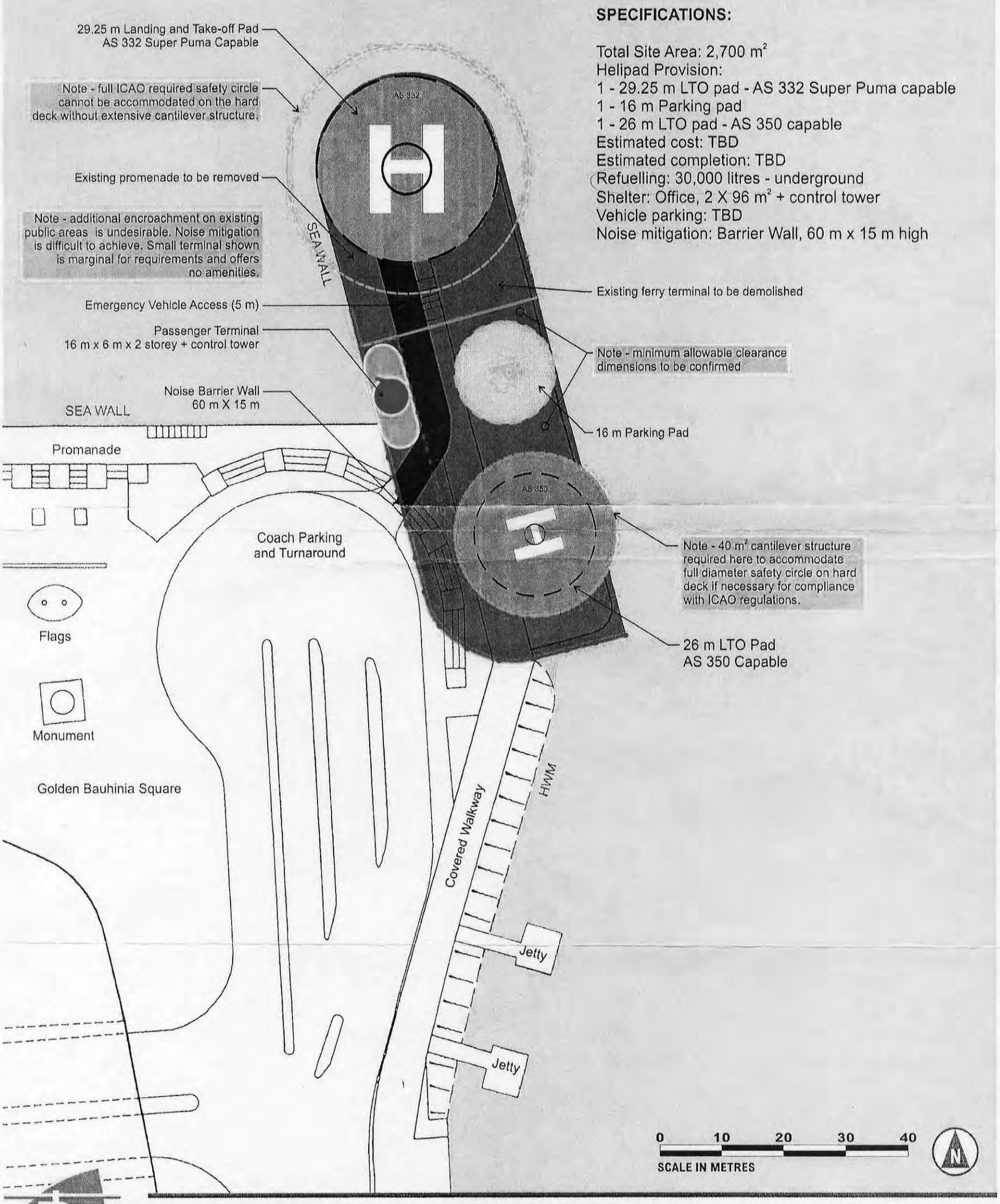
Layout of Government Helipad at the HKCEC
(Appendix C of the Study Brief)

Appendix B

HKRHWG's 3-pad Layout Proposal

Hong Kong Regional Heliport
at the
Convention and Exhibition Centre

Concept plan for a shared use government (GFS) and commercial heliport with three pads. Modification of the government proposal which would require no additional reclamation.



SPECIFICATIONS:

Total Site Area: 2,700 m²
Helipad Provision:
1 - 29.25 m LTO pad - AS 332 Super Puma capable
1 - 16 m Parking pad
1 - 26 m LTO pad - AS 350 capable
Estimated cost: TBD
Estimated completion: TBD
Refuelling: 30,000 litres - underground
Shelter: Office, 2 X 96 m² + control tower
Vehicle parking: TBD
Noise mitigation: Barrier Wall, 60 m x 15 m high

HONG KONG REGIONAL HELIPORT
WORKING GROUP

CONCEPT FOR SHARED USE 3-PAD HELIPORT
WITH NO ADDITIONAL RECLAMATION

HS-03-054-A
Cliff Dunnaway - 22 November 2005

香港區域直升機場工作組之三機坪方案

附錄 B
Appendix B

Appendix C

Comparison of Helipad Layout Options

Comparison of Helipad Layout Options

	Option 1	Option 2	Option 3
3-pad Arrangement	• The parking pad is between the landing/takeoff pad and the takeoff pad.	• Same as Option 1	• The inner pad is the parking pad. The outer and middle pads are landing/takeoff pad and takeoff pad respectively.
Location of Entrance & Corresponding Noise & Downwash Impacts	• Along the west boundary, facing the existing GBS or the proposed expanded GBS. • The gate has to be solid or made of acoustic material to mitigate the noise and downwash impacts to the nearby pedestrians. In view of the weight of the material, it is proposed to be an electrically operated gate. • There are gaps along the rail and periphery of the electric gate and the noise and downwash cannot be shielded properly.	• At the south boundary, shielded by the toilet block. • Typical drop gates are considered acceptable.	• At the south boundary, shielded by the toilet block. • Typical drop gates are considered acceptable. • The takeoff pad for the commercial helicopter is moved further away from the entrance, less noise and downwash impacts to the nearby pedestrians.
Operations of GFS helicopters within the helipad	• GFS helicopters would operate at the outer pad under normal circumstance. • The parking pad is for emergency use. • Unobstructed through road from the entrance at the west boundary to the ambulance parking lot is maintained within the helipad. • Passenger terminal and control tower is between the outer and inner pads, convenient to the users of both pads.	• GFS helicopters would operate at the outer pad under normal circumstance. • The parking pad is for emergency use. • Unobstructed through road from the entrance at the south boundary to the ambulance parking lot is maintained within the helipad. • Passenger terminal and control tower is between the outer and inner pads, convenient to the users of both pads.	• GFS helicopters would operate at the outer pad under normal circumstance. • The parking pad is for emergency use. • Unobstructed through road from the entrance at the south boundary to the ambulance parking lot is maintained within the helipad. • Passenger terminal and control tower is moved towards the south boundary by around 25m and further away from the outer pad as compared to Options 1 and 2. Less convenient to the users of the outer pad.

	Option 1	Option 2	Option 3
Operations of Commercial Helicopters within the helipad	• As shown in Figure 2 and Figure 3, the passenger terminal and control tower next to the parking pad and between the inner and outer pads would be within the minimum clearance required for the air-taxiway. In this case, no helicopter from the outer pad is allowed to hover-taxi to the inner pad. As both the commercial helicopters do not have their own wheels, the helicopters traveling to-and-fro the outer and inner pads and parking pad have to be moved manually by external trolley or similar accessories.	• Same as Option 1.	• After landing at the outer pad, the commercial helicopter can hover-taxi from the outer pad to the middle pad which is further away from the adjacent building as compared to Options 1 and 2. • Similar to Options 1 & 2, the passenger terminal and control tower would be next to the parking pad, helicopters in middle pad traveling to-and-fro the inner parking pad have to be moved manually by external trolley or similar accessories.
Restriction on the landing/takeoff pad and takeoff pad when parking pad is occupied	• As shown in Figure 2, if a helicopter is parking at the middle parking pad, this helicopter will be an obstacle within the minimum permitted distance for the outer landing/takeoff pad. It will restrict the use of the outer pad if there is a helicopter parking at the middle parking pad.	• Same as Option 1.	• As shown in Figure 2, if a helicopter is parking at the inner parking pad, it will be outside both the minimum permitted distance from obstacle for both outer landing/takeoff pad and middle takeoff pad. Nevertheless, if there is a helicopter at the middle pad, it will also be an obstacle to the outer pad and restrict the use of the outer pad.
Location of Ambulance and Car Parking	• According to the advice from GFS, there should not be any pre-assigned parking except for ambulance and special arrangement can be made to accommodate the vehicles on a case to case basis.	• Similar to Option 1.	• According to the advice from GFS, there should not be any pre-assigned parking except for ambulance and special arrangement can be made to accommodate the vehicles on a case to case basis.

	Option 1	Option 2	Option 3
	• Except ambulance parking, the potential parking lots are along south boundary of the helipad and are away from the passenger terminal, control tower and the entrance, which is less convenient to the users as compared to Option 3.		• All the potential parking spaces are next to the passenger terminal, control tower and the entrance, which is more convenient than Options 1 & 2.
Location of Passenger Terminal and Control Tower	• The building is located somewhere in the middle of the helipad and adjacent to the parking pad.	• Similar to Option 1	• The building is relocated to the southwest corner of the helipad and adjacent to the parking pad and toilet block. It is less visually obstructive to the pedestrian in the proposed expanded GBS viewing towards the harbour as compared to Options 1 & 2.
Impacts on the proposed Golden Bauhinia Plaza	• As the EVA is located along the south-west boundary of the proposed helipad, it occupies more open space at the proposed expanded GBS as compared to Options 2 & 3.	• EVA is shifted to the eastern periphery of the proposed expanded GBS and occupies less open space as compared to Option 1.	• Same as Option 2.
Impacts on Pedestrian Linkage	• The EVA is integrated with the whole waterfront promenade and the proposed expanded GBS design. No major impact to the pedestrian linkage is anticipated.	• Same as Option 1.	• Same as Option 1.
Visual Impacts	• The 2-storey passenger terminal and control tower and the massive electric gate are located at the middle of the helipad and intrude the view corridor of pedestrians on the existing GBS or the proposed expanded GBS towards the harbour partially.	• Same as Option 1.	• The 2-storey passenger terminal and control tower, together with the re-provisioned toilet block, are located at the southern part of the helipad. Visual intrusion to pedestrians on the existing GBS or the proposed expanded GBS towards the harbour is less than Options 1 & 2.

	Option 1	Option 2	Option 3
	• The noise barrier is transparent from 0.9m to 6m above ground with minimal visual impacts. • The landscaped buffer areas along the shoreline of the HKCEC promenade has no visual obstruction to the pedestrians.		• The noise barrier is transparent from 0.9m to 6m above ground with minimal visual impacts. • The landscaped buffer areas along the shoreline of the HKCEC promenade has no visual obstruction to the pedestrians.
Construction Cost	• If an electric gate has to be provided to mitigate the noise and downwash impacts from the helipad through the entrance, it is anticipated that the construction cost will be higher than Options 2 & 3.	• If a drop gate is provided at the entrance, the construction cost will be lower than Option 1.	• If a drop gate is provided at the entrance, the construction cost will be lower than Option 1. • As the elongated Passenger Terminal will form part of the perimeter wall of the helipad site, the length of the noise barrier to be installed will be shorter than the Options 1 & 2. The construction cost will be lower than Options 1 & 2.