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Environmental Impact Assessment Ordinance (Cap. 499)

Environmental Impact Assessment Report **Expansion of Hong Kong International Airport** **into a Three-Runway System**

PURPOSE

This paper presents the key findings and recommendations of the Environmental Impact Assessment (EIA) report on the proposed Expansion of Hong Kong International Airport into a Three-runway System (hereafter known as “the Project”), submitted under Section 6(2) of the Environmental Impact Assessment Ordinance (EIAO) (Application No. EIA-223/2014). The Airport Authority Hong Kong (AAHK) (the Applicant) and their consultants will present the EIA report at the meeting of the EIA Subcommittee (EIASC).

ADVICE SOUGHT

2. Members’ views are sought on the findings and recommendations of the EIA report. The Environmental Protection Department (EPD) will take into account comments from the public and the Advisory Council on the Environment (ACE) in deciding whether or not to approve the EIA report under Section 8(3) of the EIAO.

BACKGROUND

3. The existing Hong Kong International Airport (HKIA) was constructed to replace the original airport at Kai Tak and has been in operation since 1998. According to the Applicant, HKIA is now reaching its maximum handling capacity

within the existing airport island footprint. To meet increasing demand, the Applicant proposes to expand HKIA into a Three-Runway System (i.e. 3RS) to be fully operational in 2023.

4. The Applicant has submitted the EIA report for the Project and EPD considers that the EIA report meets the requirements of the EIA Study Brief and the Technical Memorandum on EIA Process (EIAO–TM), for the purpose of exhibiting the report for public inspection, under Section 7(4) of the EIAO.

NEED FOR THE PROJECT

5. The Applicant has advised that the maximum handling capacity of HKIA was originally designed to meet the air traffic demand of 376 000 air traffic movements (ATMs) per year. However, the latest air traffic demand at HKIA is forecast to reach approximately 620 000 ATMs per year by 2032. In the absence of the Project, HKIA will have to be operated under a constrained mode with adverse consequences. The impacts would be far-reaching and would lead to a reduction in the city's status as an international aviation hub and the overall competitiveness of Hong Kong. To avoid these consequences, the Applicant considers that the Project is the best option.

ENVIRONMENTAL BENEFITS

6. The EIA report assessed that the Project will fully comply with the EIAO requirements with no adverse residual environmental impacts. There are also opportunities, at the Project's design, construction and operation stages, for incorporating positive environmental elements into the Project. These include minimisation of night-time operations at the South Runway; increased flexibility on preferential use of flight tracks to minimise aircraft noise impact to populated areas; decreased aircraft taxiing and holding times to reduce aircraft emissions; beneficial use of fill materials generated by other projects; and incorporation of energy efficiency, water conservation and waste recycling at airport buildings and facilities.

DESCRIPTION OF THE PROJECT

7. The Project will primarily consist of a new third runway with associated taxiways, aprons (or aircraft stands), as well as new passenger concourse buildings and expansion of the existing Terminal 2 (T2) building. The Project covers the

following key components. The final preferred airport layout option is shown in **Figure 1**.

- (i) **Land Formation:** The proposed 650 ha land formation works will mainly include ground improvement and seawall construction.
- (ii) **Airfield Facilities:** The airfield facilities will mainly include:
 - (a) construction of the third runway, taxiways, aprons, aviation fuel supply network and other associated facilities and
 - (b) modification of the existing airfield facilities including the existing North Runway, taxiways and aprons in the Midfield area.
- (iii) **Passenger Facilities:** The proposed passenger facilities will mainly include:
 - (a) the third runway passenger concourse (TRC);
 - (b) expansion of the existing passenger T2;
 - (c) extension of the Automated People Mover (APM) and associated depot and maintenance/stabling areas; and
 - (d) expansion of the Baggage Handling System (BHS).
- (iv) **Ancillary Facilities:** New ancillary facilities will be provided to support the operational needs of the expanded airport, including utility buildings, airport support developments, air cargo staging, catering, aircraft maintenance, aircraft engine run-up (engine testing) facilities and other ground supporting facilities.
- (v) **Infrastructures:** New and expanded infrastructures and utilities will mainly include expansion of road networks, drainage and sewerage system, and other supporting utilities.

8. By virtue of Item B.1 under Part I, Schedule 2 of the EIAO, i.e. “*An airport (including its runway and the development and activities related to aircraft maintenance, repair, fueling and fuel storage, engine testing or air cargo handling)*”, the Project is classified as a Designated Project. Other project components that constitute Designated Project items under the EIAO are mainly summarized as follows:-

- (i) Item A.1: A road which is a primary distributor road or district distributor road including new roads, and major extensions or improvements to existing roads;
- (ii) Item A.2: A railway and its associated stations;
- (iii) Item A.4: A railway siding, depot, maintenance workshop, marshalling yard

- or goods yard;
- (iv) Item A.7: A road or railway tunnel more than 800m in length between portals;
 - (v) Item A.8: A road or railway bridge more than 100m in length between abutments;
 - (vi) Item C.1: Reclamation works more than 5 ha in size;
 - (vii) Item F.4: An activity for the reuse of treated sewage effluent from a treatment plant;
 - (viii) Item H.2: A submarine gas pipeline or submarine oil pipeline;
 - (ix) Item K.5: A cement works or concrete batching plant with a total silo capacity of more than 10 000 tonnes in which cement is handled and manufactured;
 - (x) Item K.11: A sand depot with a site area of more than 1 ha in size; and
 - (xi) Item Q1: A project including earthworks, dredging works and other building works partly in an existing marine park.

CONSIDERATION OF ALTERNATIVE/OPTIONS

9. The EIA report has considered alternative options for the development of the Project including alignments, airport layouts, land formation and marine infrastructure facilities, etc. to avoid and minimize environmental impacts. The environmental benefits and dis-benefits of the options have been evaluated. The recommended options of various project items have taken into account environmental considerations, site constraints, other factors such as operational requirements, and engineering considerations and comments received during the public engagement exercises. The key considerations and outcomes are highlighted below.

Avoidance and Minimisation of Impacts

10. Key approaches recommended in the EIA report include:

(i) Avoiding/minimising construction phase impacts

- (a) optimizing the land formation footprint to strike a balance among various key environmental factors, operational efficiency considerations and engineering constraints. Land formation area has practicably been optimized to 650 ha with a view to minimising associated impacts on marine habitat and its marine life including Chinese White Dolphins (CWD);
- (b) adopting Deep Cement Mixing (DCM) for soft ground improvement to avoid dredging at the contaminated mud pits (CMP) areas. This

technique will substantially reduce the potential impacts to surrounding marine water quality and marine ecology;

- (c) adopting Horizontal Directional Drilling (HDD) for construction of the submarine fuel pipelines from the airport island to Sha Chau to avoid dredging of seabed, thus eliminating impacts on marine water quality and marine ecology including impacts on the Sha Chau and Lung Kwu Chau Marine Park; and
- (d) using water jetting method to lay new submarine 11kV cables to minimise the generation and disposal of marine sediment and avoid disturbance to the seabed.

(ii) minimising Airport-operation related Emissions and the associated potential Health Impact:

- (a) enforcing the use of fuel-efficient airside vehicles through mandatory requirement in the licensing process;
- (b) promoting increased use of electric vehicles and electric ground services equipment (GSE) at HKIA by increasing the charging stations to a total of 290 by end 2018;
- (c) replacing all airside saloon vehicles as electric vehicles by end 2017;
- (d) continuing to ban all idling vehicles on the airside except under safety and operational considerations;
- (e) providing the cleanest diesel and gasoline at the airfield and requiring all of the AAHK's diesel vehicles to use biodiesel; and
- (f) providing liquefied petroleum gas (LPG) fuelling points for airside vehicles and GSE.

(iii) minimising Aircraft Noise and its potential Health Impact:

- (a) putting the existing South Runway as standby mode wherever practicable during the night-time period between 2300 and 0659 to minimise noise impacts to residents on North Lantau;
- (b) requiring departure flights to take southbound route via West Lamma Channel during east flow at night from 2300 to 0659, subject to acceptable operational and safety considerations;
- (c) introducing the use of a new Required Navigation Performance (RNP) arrival track for night-time flight operations between 2300 and 0659 via West Lamma Channel to approach HKIA during west flow such that under suitable conditions, appropriately equipped aircraft may fly over

- water instead of straight-in tracks over populated areas;
- (d) implementing a preferential runway use programme when wind conditions allow such that west flow is used when departures dominate while east flow is used when arrivals dominate during night-time to reduce aircraft noise impact to urbanized regions on the east side; and
 - (e) continuing to implement the current two runway system (i.e. 2RS) noise avoidance good practices which include the use of noise abatement take-off procedures stipulated by International Civil Aviation Organization (ICAO) for aircraft departing to the northeast so long as safety flight operations permit, and all aircraft on approach to the HKIA from the northeast between 2300 and 0659 are encouraged to adopt the Continuous Descent Approach.

SPECIFIC ENVIRONMENTAL ASPECTS TO HIGHLIGHT

Air Quality Impact

11. Cumulative air quality impacts at Air Sensitive Receivers (ASRs) within 500m and 5km from the project boundary have been assessed for the construction and operation stages respectively. Dust impact is the main concern during the construction stage whilst various air pollution impacts based on the highest aircraft emission scenario during operation have been modelled.
12. During construction, with the implementation of mitigation measures including water spraying and covering dusty stockpiled materials, the dust levels at the identified ASRs would comply with the criteria of hourly Total Suspended Particulates (TSP), and daily & annual Respirable Suspended Particulates (RSP) and Fine Suspended Particulates (FSP).
13. AAHK will implement a number of initiatives aimed at reducing air emissions from operational activities mentioned in paragraph 10(ii) above.
14. During operation, cumulative impacts of Nitrogen Dioxide (NO₂), RSP, FSP, Sulphur Dioxide (SO₂) and Carbon Monoxide (CO) have been assessed. With introduction of green initiatives as mentioned in paragraph 10(ii), the EIA has predicted that the cumulative NO₂, RSP, FSP, SO₂ and CO concentrations for all the identified ARSs would comply with the Air Quality Objectives (AQOs).

Noise Impact

Aircraft Noise

15. Potential aircraft noise impacts arising from the operation of the Project together with the prevailing situation have been assessed. Noise exposure forecast (NEF) 25 contours have been evaluated based on the following four scenarios:

- (i) prevailing situation in 2011 reflecting the operation of the existing airport ;
- (ii) the worst operation mode representing maximum noise emission scenario is identified as 2030, with ATM of 607 480;
- (iii) interim phase operation mode representing the phase during which the existing north runway is closed for maintenance whilst the proposed third runway is in operation with the existing south runway from 2021 to 2023, with ATM of 420 000; and
- (iv) full operation of the three runway system (i.e. 3RS) at design capacity in 2032, with ATM of 620 000. The total ATM in 2032 is only about 2% higher than in 2030 but with improved aircraft technology engine noise emission would be reduced with time and therefore aircraft noise would decrease.

16. To alleviate the aircraft noise, the applicant will implement direct mitigation measures including flight path optimization and quieter arrival/departure arrangement as mentioned in paragraph 10(iii) above.

17. According to the EIA, all existing village houses along the North Lantau shoreline affected by the aircraft noise within NEF 25 of the existing 2RS operation will have been offered the provision of indirect noise mitigation measures in the form of window insulation and air-conditioning by AAHK before the operation of the 3RS. No new existing noise sensitive receivers (NSRs) will be within the NEF 25 contour of the 3RS operation. A small southern part of a site zoned “Comprehensive Development Area” (CDA) at Area 59 in Lok On Pai, Siu Lam is predicted to be within the NEF 25 contour of the 3RS operation. Adverse aircraft noise impact to this site could be avoided when developing the Master Layout Plan by ensuring no noise sensitive uses of the development would be situated within the NEF 25 contour. No adverse residual aircraft noise impact is identified in the operation of the project.

Noise from Fixed Noise Source, Construction Noise, Road Traffic Noise and Marine Traffic Noise

18. The EIA assessed that noise from all fixed noise sources during the operation phase including aircraft taxiing, operation and maintenance of APUs and

engines, operation of APM, etc., complies with the noise criteria at all NSRs. No adverse residual noise impact from fixed noise sources on existing and planned NSRs is anticipated.

19. With the implementation of construction noise mitigation measures in the form of quiet plant, use of movable barriers and enclosures, the construction noise levels at all NSRs are predicted to comply with the noise standards stipulated in the EIAO-TM. No adverse residual construction noise impact on existing NSRs is anticipated.

20. No NSR is identified within the assessment boundary for road traffic noise and marine traffic noise associated with the operation of the 3RS Project. No adverse road and marine traffic noise impact associated with airport activities is anticipated.

Health Impact (Toxic Air Pollutants, TAP)

21. A three-tiered approach has been adopted to short-list the key TAP, from which 31 TAP were identified:

- (i) Tier 1: Screening based on calculation of emission quantities and toxicity levels;
- (ii) Tier 2: Reference to International Agency for Research on Cancer (IARC) Group 1 (Carcinogenic to humans) Chemicals; and
- (iii) Tier 3: Reference to TAP identified in other airport-related studies

22. The short-term and long-term TAP concentrations due to the operation of the Project at all potential human receptors would comply with the respective acute and chronic non-carcinogenic criteria. The highest carcinogenic health risk due to TAP from operation of the Project is within the acceptable limit and thus the Project would not result in any unacceptable risk.

23. For short-term exposure to the AQO (criteria) pollutants, the increase of incremental unit risk of all-cause premature deaths per annum (short-term mortality) due to the operation of the Project is found to be insignificant. In addition, the maximum increases of annual concentrations of criteria pollutants and the associated long term mortality risk are small.

Health Impact (Aircraft Noise)

24. A thorough literature review on health impact due to aircraft noise was conducted and revealed that annoyance, self-reported sleep disturbance and effects on cognitive performance of children in school environment are the main concerns.

25. Five noise sensitive populated districts/regions namely Sha Lo Wan, Tung Chung, Northern Lantau, Ma Wan and Siu Lam, which are all located adjacent to the NEF 25 contour line in 2030, are identified as the locations of interest for a quantitative comparison of the 3RS scenario with the 2RS scenario with respect to potential health effects.

26. The findings indicate that there will be overall reductions of about 10% and 50% population being affected for annoyance and self-reported sleep disturbance respectively in the assessment area. This is a result of the 3RS airport design and planned operation procedures such as putting south runway in standby mode during night time as possible and the measures as mentioned in paragraph 10(iii). With regard to the cognitive effect on children by aircraft noise, no significant effect is found.

27. There will be overall improvements with respect to both annoyance and self-reported sleep disturbance by implementation of the 3RS. Cognitive effect arising from the operation of the Project is not identified to be significant. Thus the health impact associated with aircraft noise from the Project is considered acceptable.

Ecological Impact (Marine)

28. Major potential impacts on marine ecology arising from the construction and operation of the Project are permanent loss of marine water and seabed of about 650 ha and 672 ha respectively, which are home to various marine organisms including the CWD.

29. With the following mitigation measures in place, the study considers that the potential marine ecological impacts due to construction and operation of the Project would be reduced to acceptable levels.

- (i) through design: minimised land formation footprint, adoption of non-dredging method in land formation by DCM technique, use of construction methods with minimal disturbance by HDD and phasing of land formation works to minimise

impacts;

- (ii) during construction: dolphin exclusion zones for marine works, water jetting works for submarine cables diversion, acoustic decoupling for marine construction equipment, speed restrictions for construction vessels, avoid bored piling for the new runway landing lights and beacons during the peak CWD calving season, establish a spill response plan as precautionary measure, diversion of Sky Pier High Speed Ferries (HSFs) for minimising impacts on CWD;
- (iii) during operation: the firm commitment by the Administration to seek to designate a marine park of 2 400 ha which not only serves as a protected area for various marine species including the CWD, but also provides critical linkages among the proposed Brothers Island Marine Park, the existing Sha Chau and Lung Kwu Chau Marine Park and the Hong Kong International Airport Approach Area (HKIAAA) marine exclusion zone (**Figure 2**). Environmental enhancement measures including research and education programmes will be set up and an Environmental Enhancement Fund will be established to support these activities.

Ecological Impact (Terrestrial)

30. The assessment concluded that the potential impacts to the terrestrial habitats, flora and fauna species in North Lantau including airport island would be low to negligible during both construction and operation phases of the Project. As part of the submarine aviation fuel pipeline diversion works, the construction of the pipeline emerging point by HDD method at Sheung Sha Chau Island would potentially affect the Sha Chau egretty with moderate degree of impact. In order to protect the egretty, an alternative HDD emerging point away from the Sha Chau Egretty is recommended. In addition, the nesting vegetation used by breeding egrets will be preserved and construction activities at Sheung Sha Chau during night-time and the breeding season of egrets from April to July will not be allowed.

Water Quality

31. Release of Suspended Solids (SS) is the main concern on water quality during construction. Avoidance approach has been adopted by using various advanced construction techniques. Potential construction phase water quality impacts are substantially reduced by the adoption of non-dredging methods for land formation and the HDD method for submarine aviation fuel pipeline construction

which avoids disturbance to the seabed. The adoption of the DCM method for ground improvement at the CMPs avoids the need for removal of the contaminated sediment during land formation and provides an environmentally friendly way of preparing the CMP area for future beneficial use as part of the Project.

32. The assessment has shown that with an application of a minimum 200m leading seawall prior to marine filling activities and the implementation of double silt curtains at critical locations, the SS levels would comply with the criteria at all Water Sensitive Receivers (WSRs). No adverse residual water quality impact arising from the construction of the Project is anticipated.

33. Potential water quality impact during operation phase would cause changes in direction and speed of tidal flows due to the permanent new landform. Quantitative assessment of potential water quality impact arising from “with project” and “without project” scenarios were undertaken. 2026 was adopted as the assessment year to represent the worst case pollution loading, taking into account the proposed planned/committed concurrent projects in the study area. The assessment findings show that implementation of the Project would not result in adverse hydrodynamic and water quality changes in the study area.

Waste Management

34. Consideration has been given to avoid or reduce the volume of waste generated through the application of alternative design options and/or construction methods. Non-dredging methods are proposed for ground improvement to completely avoid bulk removal and disposal of any dredged materials. The proposed sloping seawall option would allow for the reuse of rock armour from the existing northern seawall. The HDD method proposed for the diversion of submarine aviation fuel pipelines would avoid dredging of the seabed, hence eliminating the need for removal and disposal of any dredged materials and the associated impacts on marine environment. Similarly, the water jetting method proposed for the diversion of submarine 11 kV cables would avoid the generation and disposal of marine sediment.

35. Majority of the marine sediments generated by various construction activities will be treated and reused on-site. In addition, the Project involves reclamation to form 650 ha of land and hence requires substantial amount of public fill material to be imported.

Other Environmental Impacts

36. Other environmental impacts including land contamination, fisheries, hazard to life, sewerage, landscape and visual, and cultural heritage impacts have also been addressed in the EIA report. With the implementation of recommended mitigation measures, the Project will comply with the relevant requirements under the TM.

ENVIRONMENTAL MONITROING AND AUDIT

37. The EIA report includes an Environmental Monitoring and Audit (EM&A) Manual which recommends the EM&A programme during the construction and operational phases of the Project. Key recommended EM&A requirements cover aircraft noise, ecology (terrestrial and marine), fisheries, water, air quality and dust.

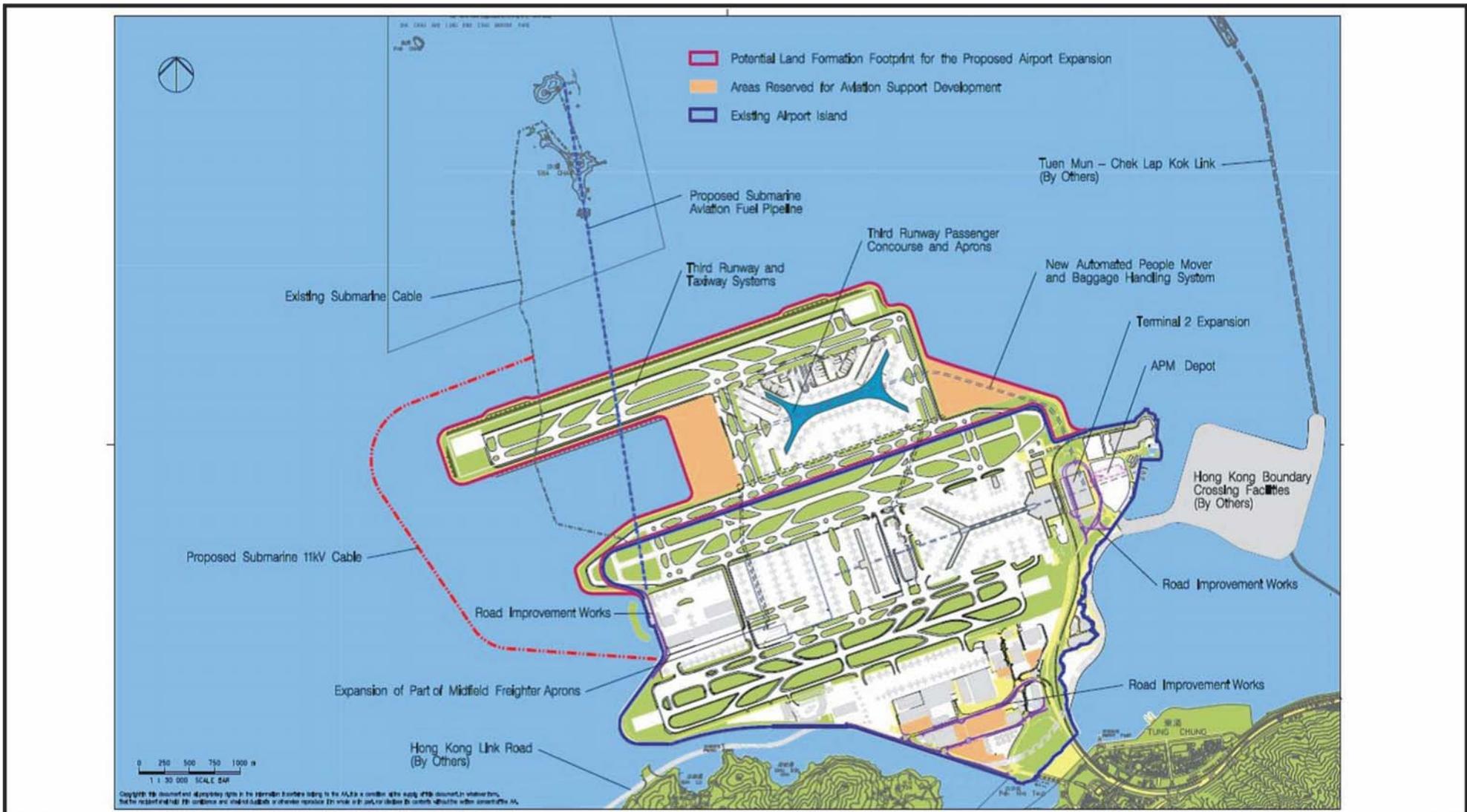
PUBLIC CONSULTATION

38. The applicant has made the EIA report, EM&A Manual and Executive Summary available for public inspection under the EIAO from 20 June 2014 to 19 July 2014. During this inspection period, over 28 000 sets of public comments were received by EPD. The exact number of the public comments and main concerns will be summarized in a gist to be provided separately.

**Environmental Assessment Division
Environmental Protection Department
July 2014**

Abbreviation List

ACE	Advisory Council on the Environment	HSFs	High Speed Ferries
AAHK	Airport Authority Hong Kong	HKIA	Hong Kong International Airport
AQOs	Air Quality Objectives	HDD	Horizontal Directional Drill
ASRs	Air Sensitive Receivers	IARC	International Agency for Research on Cancer
ATM	Air Traffic Movements	ICAO	International Civil Aviation Organization
APM	Automated People Mover	LPG	Liquefied Petroleum Gas
BHS	Baggage Handling System	MP2030	Master Plan 2030
BCF	Boundary Crossing Facilities	NO ₂	Nitrogen Dioxide
CO	Carbon Monoxide	NEF	Noise Exposure Forecast
CWD	Chinese White Dolphins	PFRF	Public Fill Reception Facilities
CDA	Comprehensive Development Area	RNP	Required Navigation Performance
C&D	Construction and Demolition	SO ₂	Sulphur Dioxide
CMP	Contaminated Mud Pits	SS	Suspended Solids
DCM	Deep Cement Mixing	TM	Technical Memorandum on EIA Process
EPD	Environmental Protection Department	T2	Terminal 2
DASO	Dumping at Sea Ordinance	TRC	Third Runway Passenger Concourse
EIA	Environmental Impact Assessment	3RS	Three-Runway System
EIAO	Environmental Impact Assessment Ordinance	TAP	Toxic Air Pollutants
EM&A	Environmental Monitoring and Audit	2RS	Two-Runway System
FSP	Fine Suspended Particulates	WSRs	Water Sensitive Receivers



Project Title: Expansion of Hong Kong International Airport into a Three-Runway System

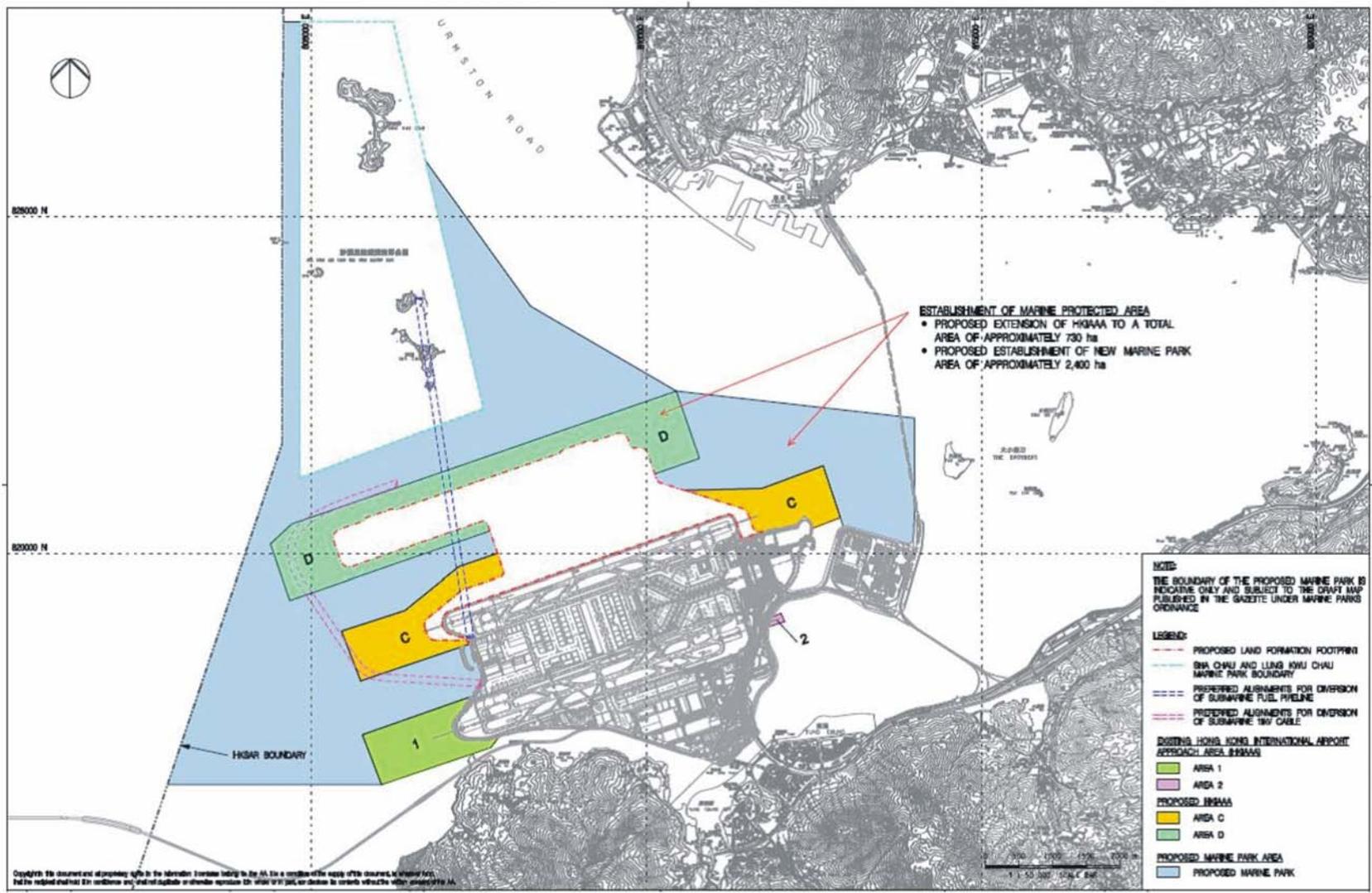
(This Figure reproduced from Drawing No. MCL/P132/ES/3-001 of the Executive Summary of the EIA Report)

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Final Preferred Airport Layout Option

Figure 1



Project Title: Expansion of Hong Kong International Airport into a Three-Runway System

(This Figure reproduced from Drawing No. MCL/P132/ES/5-11-001 of the Executive Summary of the EIA Report)

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Proposed Marine Park and Eco-enhancement Measures

Figure 2