For discussion on
13 February 2018

Task Force on Land Supply
Paper No. 04/2018

TASK FORCE ON LAND SUPPLY

Housing Development above Transport Infrastructure

PURPOSE

This paper is to broadly review the proposal of making use of land occupied by transport infrastructure for topside housing development and identify the key considerations that need to be taken into account when further exploring the practicability and desirability of such land supply proposal.

BACKGRUOND

2. Hong Kong Countryside Foundation submitted to the Chief Executive a paper dated 1 August 2017 regarding the land for public low cost housing and elderly accommodation. The paper sets out the hierarchy for selecting land and suggests including the option of making use the potential podiums above infrastructure, utilities, highways, railways and roadside, under the category of brownfield sites. A member of the public has recently submitted another paper to the Task Force on Land Supply following up the suggestion as set out in the aforesaid paper to take up the option of securing land for housing by making use of "potential podiums above infrastructure, utilities, highways, railways and roadside areas" ("the Proposal"). The paper elaborates the concept of co-use of existing transport infrastructure and housing development on the same footprint.

3. The Proposal has named the following potential sites with their locations shown at **Annex A**.

Potential Site	Location
A	Pat Heung Railway Depot
B	Coastal strip above the highways at Ma Liu Shui near the Chinese University of Hong Kong
C	Road interchange in Yau Ma Tei
D	Road junction south-east of Mei Foo Sun Chuen
E	Road network between Mei Foo Sun Chuen and Container Port

DEVELOPMENT CONSIDERATIONS

4. Housing development above transport infrastructure, like railway stations and depots, public transport interchanges and highway structures, is challenging in Hong Kong. Due to high degree of integration, the general approach is that the planning, design and construction of topside housing development and transport infrastructure are carried out in an integral and coordinated manner under the same project. This is conducive to achieving a feasible scheme meeting all functional requirements of both topside development and transport infrastructure, and resolving complex interface problems. However, if the transport infrastructure was constructed some time ago, the transport infrastructure itself would become constraints to the planning, design and construction of subsequent topside development. Equally important, impacts to the transport infrastructure underneath the topside development should also be carefully reviewed.

5. The Proposal is to make use of the potential podiums above existing infrastructure, utilities, highways, railways and roadside areas for housing development. The challenge is to overcome the constraints imposed by the existing transport infrastructure the design of which has not taken any consideration for the construction of future topside development.

Planning Considerations

6. From the perspective of better utilising our precious land resources, topside development over transport infrastructure could be explored as a land

supply option. In fact, the Government has been actively exploring with MTRCL the development potential of railway stations and related sites along existing and future rail lines. Amongst others, topside residential development will be implemented on MTRCL's Yau Tong Ventilation Building Site with capacity to provide around 500 flats. We are also considering the feasibility of topside developments over the existing railway depots, including those at Pat Heung and Siu Ho Wan. For the Siu Ho Wan Depot Site, MTRCL's studies demonstrate that the site can provide no less than 14 000 residential flats in the medium to long term. The development will require re-provisioning of the existing railway depot while maintaining the operations of the depot in providing stabling, maintenance and supporting services for railway operations at all times. The relevant District Councils have been consulted on the preliminary draft of the Outline Zone Plan (OZP), which will be submitted to the Town Planning Board for further consideration before statutory gazettal.

7. In general, topside housing development above transport infrastructure would be very challenging, involving various planning and technical issues. The feasibility of topside development could only be assessed on a case-by-case basis, taking into account all site-specific opportunities and constraints. There would be major planning considerations that need to be dealt with, including land use compatibility, visual and air ventilation impact, environmental and traffic implications, and infrastructural capacities. Visual impact would be a particular concern as elevated podium and supporting structures are required to support the topside development above the transport infrastructure. The level of elevated podium, particularly podium above elevated roads or flyovers, will be well above ground level. The massive elevated podium will probably induce visual impact on and affect the air ventilation of the nearby communities.

8. Planning and engineering studies would be warranted to confirm the feasibility of proposed topside development and recommend appropriate mitigation measures to minimise the impacts.

Environmental Implications

9. As part and parcel of the planning and engineering feasibility study on the Proposal, a statutory Environmental Impact Assessment (EIA)[1] and/or an Environmental Review will be required to address the potential environmental impacts (e.g. noise, air quality, sewerage constraints, landscape and visual) on the existing and planned environmental sensitive receivers, including the proposed housing development.

10. As the proposed housing development will deck over the transport infrastructure, there may be concerns on the noise and air quality impacts on the sensitive receivers nearby. With implementation of appropriate mitigation measures, such as provision of ventilation and air purification systems, it is considered that the concerns on environmental issues arising from the proposed decking over the existing transport infrastructures (e.g. railway/traffic noise and vehicular emission impacts) could be addressed.

Land Issues

11. Apart from planning and environmental implications, the legal interest/titles of the owners of the topside housing development over the existing infrastructures, such as those involving the management and maintenance liabilities/obligations of the infrastructures, will make things complicated. Also, the disposal method for the development rights atop the existing transport infrastructure and the opportunity for redevelopment of the topside housing development when the circumstance warrants should also be addressed at the planning stage.

Traffic Impact

12. The proposed housing development will generate additional traffic. A traffic impact assessment should be carried out. In addition, the feasibility of providing adequate connections to public roads to serve the vehicular and

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[1] Possible Schedule 2 &3 Designated Projects elements include Item 1 of Schedule 3 of the Environmental Impact Assessment Ordinance (EIAO): "*Engineering feasibility study of urban development projects with a study area covering more than 20 ha or involving a total population of more than 100 000*" and Item A.9, Part I of Schedule 2 of the EIAO: "*A road fully enclosed by decking above and by structure on the sides for more than 100m.*".

pedestrian traffic arising from the development should be examined. There will be a need for provision of access road linking existing public road network to the elevated podium of topside housing development. Access roads branching from the nearby existing public road network will be required. The spatial requirements and the availability of spaces for the construction and subsequent maintenance of such access roads should be reviewed. The constructability of the ingress/egress of the topside development should also be carefully examined as the sites are surrounded by high speed roads.

Buildability

13. An elevated podium and supporting structures including columns and piled foundation would have to be constructed to cater for topside development over the existing transport infrastructure. Construction of the supporting structures, the elevated podium and the topside developments over the existing infrastructures will be subject to various site constraints. Amongst other major buildability issues, to cater for the live and heavy traffic underneath, the construction of massive and complex podium will be very challenging.

Design Issues

14. Fire safety is one of the major design considerations of having housing development above heavily trafficked transport infrastructure. Existing transport infrastructure such as public roads and highway structures are not designed for being decked or even fully enclosed by subsequent topside developments. The fire safety issues to be addressed may include additional fire service installations for both the topside development as well as for the decked transport infrastructure. High fire load vehicles like dangerous goods (DG) vehicles may be prohibited from using the decked transport infrastructure. Compared to open road system which is unmanned during normal operation, more stringent management, operation and maintenance requirements may be imposed.

15. Special considerations need to be given to the fire safety of the elevated topside developments such as means of access for firefighting and rescue including emergency vehicular access. Means of escape may need to be provided from the elevated podium down to an ultimate place of safety

connecting directly with a street.

16. Furthermore, the requirements of equipment/installation for fire safety and environmental mitigation measures should be examined during the early design stage of the topside housing development above transport infrastructure. Such equipment/installation, such as water tank, ventilation and air purification systems, may be spacious. Allowance should be made in the design of the topside housing development to cater for the systems.

17. Large numbers of columns supporting the massive podiums and topside developments located in the close vicinity of public roads and highway structures may affect the sight distances of road users. The columns should be carefully positioned and assessed against the required standard of sight distances in order not to undermine the road safety.

Financial implications

18. Financial implication will be one of the major considerations. The following elements, among others, will contribute to the overall construction cost of the Proposal.

(i) To support the topside housing development, a massive and extensive podium structure is required. The heavily trafficked transport infrastructure directly underneath the topside development will be constraint to the design and construction of the podium structure. To overcome this constraint, part of the podium structure may comprise of long span structures to straddle over existing roads.

(ii) It is unlikely that the design of the foundation and columns of the podium, which is constrained by the existing transport infrastructure, can match the footprint of the topside housing blocks. As such, transfer plates will likely be required in order to re-distribute the loadings of the topside housing blocks to the podium columns.

(iii) Provision of access roads linking the elevated podium and public roads, emergency vehicular accesses (EVA) on the elevated podium and associated pedestrian facilities such as lifts, stairs and escalators will be required.

(iv) Provision of effective measures to address issues of fire safety and environmental impacts, mainly including ventilation system, smoke extraction system, sprinkler system and air purification system.

(v) Precautionary measures to address adverse impacts on the existing structures of the trunk road and railway lines and to safeguard the normal operation of the live traffic and railway lines underneath the topside development including maintenance of the existing roads and highway structures.

Development Potential and Timeframe

19. The development potential of the Proposal for different sites will be affected by the above-mentioned development considerations to different extents, taking into account the actual site constraints in each case. Maximum building height restriction of the topside development and level of the elevated podium are major factors affecting the development potential.

20. Sizeable interchanges normally comprise major trunk roads of substantial widths, over which construction of foundation and columns for the elevated podium is not feasible and the elevated podium will need to be long span structures. The construction cost of the elevated podium will be further increased if the topside housing blocks rest wholly or partially on these long span structures, affecting the financial viability of the Proposal.

21. Topside development above transport infrastructure may have implications on surrounding buildings and sites. The decking over of public streets may affect the development potential of surrounding sites as they have to rely on these public streets for site classification. The surrounding buildings may also be relying on these streets for compliance with the requirements on natural lighting and ventilation as well as the permeability requirement of the Sustainable Building Design Guidelines.

22. The Proposal will need further studies and, if viable, will need to go through necessary statutory processes from its initial planning to realization. For implementation of a topside housing development above transport infrastructure, a feasibility study including a site search and preliminary

assessment on the technical feasibility of the identified sites may be required. Upon selection of suitable site(s) for further investigation, a planning and engineering study for each of the selected site(s) should be carried out, with major tasks including planning review, statutory EIA and/or Environmental Review, traffic impact assessment and other various impact assessments, as well as public engagement exercise.

23. Existing transport infrastructure would normally be shown as "Road" on the OZP, the Proposal will involve OZP amendments under the Town Planning Ordinance. Gazetting under the Road (Works, Use and Compensation) Ordinance (Cap 370) may also be required. If the elevated podium and associated works are funded by the Government as enabling works to support the topside housing development, necessary fund should be sought through the public works funding application process. In view of the scale and complexity of the elevated podium and the associated works, the construction of the elevated podium and the associated works will inevitably result in a longer construction period. Full or partial closure of existing roads under the topside development may be unavoidable during the construction. The construction works may need to be carried out in stages so as to minimise the traffic impact and overcome other buildability problems, leading to lengthened construction period. The potential programme benefits of the Proposal will need to be weighed against the necessary lead time for the planning, design and construction of housing development above transport infrastructure.

24. In view of above, development potential and timeframe of topside housing development above transport infrastructure should be critically assessed on a case-by-case basis, taking into account all site constraints.

CASE STUDY

25. We note that there are cases where the topside development was implemented after transport infrastructure underneath, such as railway stations and depots. Further, there are proposals for development atop Pat Heung Railway Depot (i.e. Potential Site A) as well as Siu Ho Wan Railway Depot. Among the five sites suggested in the Proposal, the site area of Pat Heung Railway Depot is the largest and its development feasibility is being studied by

the Government. The next largest site is the Road Interchange in Yau Ma Tei (YMT) (i.e. Potential Site C), which is selected as the case study for this paper to illustrate various factors to be considered for topside housing development above existing transport infrastructure.

The Yau Ma Tei Road Interchange Site

26. A desktop review on the Yau Ma Tei Road Interchange Site ("the Site") (**Annex B)** is conducted and the preliminary findings, which are subject to further study for validation, are depicted in the ensuing paragraphs.

Site Context

27. The Site, with an area of about 10 hectares in an irregular shape with, is shown as 'Road' on the approved South West Kowloon OZP No. S/K20/30 (**Annex C**). The Site is currently occupied by major transport infrastructure, such as the existing West Kowloon Highway and its associated slip roads (including sections of highway within the tunnel area of Western Harbour Crossing), Lin Cheung Road, Hoi Po Road and Nga Cheung Road[2] (**Annex D**) as well as the existing Airport Express and Tung Chung Line passing underneath the eastern portion of the Site. The Site also encroaches onto the tunnel area of the Western Harbour Crossing and the Mong Kok West Ventilation Building of the Hong Kong section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL). The tunnels of the West Rail Line in operation and the Hong Kong section of the XRL under construction are in the close proximity of the Site.

28. Upon the commissioning of the proposed Central Kowloon Route (CKR) in 2026, some slip roads of the existing YMT Interchange will be converted as the starting point of the western approach roads of CKR. The YMT Ventilation Building under CKR project is also to be built within this interchange for accommodating the tunnel ventilation system, air purification system and the associated ventilation shafts[3], among other electrical and

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[2] The highest road level of the interchange at Site C is about +18 metres above the Hong Kong Principal Datum (mPD). At the interchange, West Kowloon Highway, Lin Cheung Road and Hoi Po Road are 3 lane dual carriageway, 2 lane dual carriageway, and 1 lane single carriageway with the highest road level of 5.5mPD, 11.9mPD and 6.2mPD respectively.

[3] The roof level of ventilation building will be at about +26mPD and there is specific

mechanical installations for the CKR tunnel. The works to be constructed under the CKR project within the Site are shown at **Annex E**.

Planning Considerations

29. The proposed residential development at the Site requires rezoning. As with other rezoning proposals, the proposed topside development should be supported by technical assessments to demonstrate that it would not bring about adverse urban design, visual, air ventilation, traffic, environmental and infrastructure capacity impacts to the surrounding areas. According to the Air Ventilation Assessment by Expert Evaluation for South West Kowloon Area conducted in 2012, there are two major air corridors running through the Site, namely the north-south breezeway along West Kowloon Highway and the east-west breezeway along Waterloo Road. The proposed topside development with massive podium deck and above-ground structures will block the westerly wind and sea breeze from entering into the inner urban area, thus undermining the function of the air corridors. To take forward the topside development, mitigation measures will be required to minimise its impact to the two major air corridors. The visual impact of the massive podium and building bulk of the topside development should be carefully assessed, particularly from the viewpoint of those nearby residents in the hinterland and pedestrians at street level. Since the Site falls within the harbourfront areas, the residential development should be assessed against its compatibility with the harbourfront setting in terms of land use, development intensity, building height and accessibility to the waterfront, amongst others.

30. We estimate that the podium level of any topside development at the Site will be at about 35mPD[4] (i.e. about 30m above existing ground level). Apart from the height of the podium level, the development potential will hinge on the maximum building height recommended for the Site and whether there is the requirement of adopting a stepping down design towards the

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requirement of air-exchange, which should be catered for during the planning of topside development.

[4] The highest road level of the interchange with the Site is about 18mPD. To allow for a headroom of 7m for road traffic, 3-5m depth long span structure to support topside development and one-storey base floor of 7m for car park, including loading and unloading bays, plant room and retails, the podium level of residential buildings is at about 35mPD.

harbourfront. For reference, the current maximum building height of nearby residential developments in the hinterland generally ranges from 70mPD to 130mPD.

Environmental Considerations

31. On environmental aspect, the Site is in close proximity to a number of schools (including Yaumati Catholic Primary School, HKMA David Li Kwok Po College and PolyU West Kowloon Campus) and a few residential developments (such as Charming Garden, The Coronation and Man Cheong Building), which are air sensitive receivers (ASRs) and noise sensitive receivers (NSRs). Upward dispersion of vehicle emission will be blocked by the podium structure and re-directed sideway to the nearby developments at the peripheral of the Site. To address the potential air quality and noise impacts to the nearby ASRs/NSRs, with the nearest ones about 90 metres from the eastern portion of the Site, the elevated podium may need to be partially or fully enclosed at its sides, and provided with large-scale ventilation and air purification systems. The public cargo working area which is located right next to the Site and has no relocation programme might further pose environmental constraints to the use and layout of the Site, in particular for residential development.

Technical Considerations

32. The existing transport infrastructure on the Site and in the surrounding areas will pose severe constraints to the planning, design and construction of the proposed topside development to be supported by a massive podium. As far as the elevated podium is concerned, the span length of the podium structure will substantially increase to about 60m at locations above the West Kowloon Highway and the construction of the long-span structural elements is challenging, in particular at the locations congested with other existing and planned transport infrastructures, leading to problems of site accessibility and limited working space. Since the West Kowloon Highway is an urban trunk road, it will be difficult to impose traffic control / restriction on high fire load vehicles such as DG vehicles. Should the design of deck structure cause an existing road to become a road tunnel or alike, vehicles conveying Category 1, 2 & 5 DG shall be prohibited from using the road tunnel.

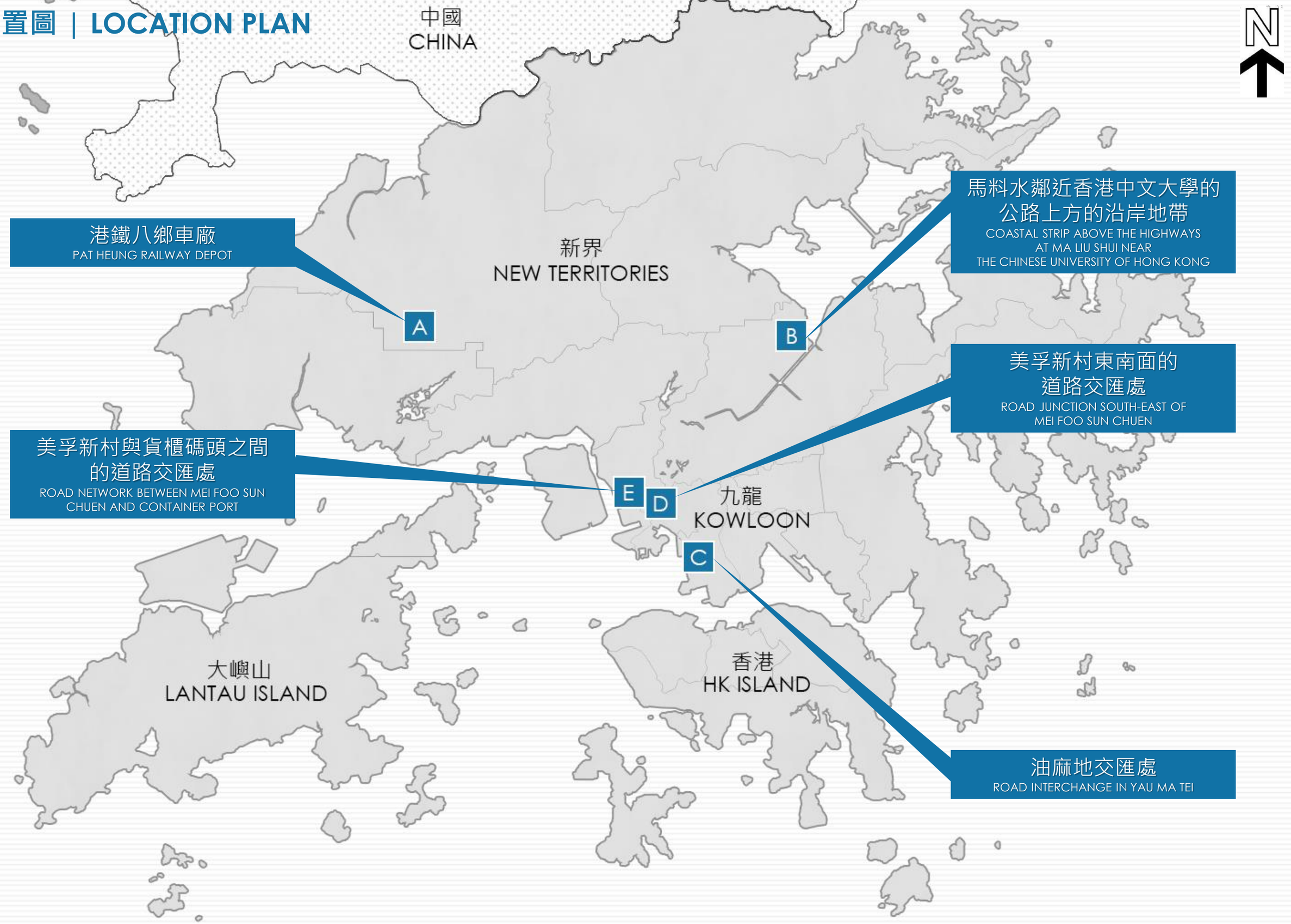
33. In view of the above, the utilization of the Site are mainly constrained by high elevated podium level (i.e. about +35mPD), maximum building height restriction (by making reference to the nearby residential development in the hinterland), major air corridors running through the Site, environmental mitigation measures to be implemented (such as possible requirements for installation of large-scale ventilation and air purification systems) and the presence of numerous highway structures and railway tunnels underneath. These issues may critically affect the development potential. The case study reveals that topside housing development above transport infrastructure involves various complex planning and other technical issues which need to be reviewed and resolved, which may be a time-consuming process. As such, the Proposal may only regard as a medium to long term land supply option. If the Proposal is to be proceeded, a feasibility study should be carried out so as to address the planning implications and technical concerns.

ADVICE SOUGHT

34. Members are invited to note and offer comments on the potential development challenges in the planning, design, operation and maintenance of erecting housing development above transport infrastructure.

Development Bureau
February 2018

位置圖 | LOCATION PLAN



港鐵八鄉車廠
PAT HEUNG RAILWAY DEPOT

馬料水鄰近香港中文大學的公路上方的沿岸地帶
COASTAL STRIP ABOVE THE HIGHWAYS AT MA LIU SHUI NEAR THE CHINESE UNIVERSITY OF HONG KONG

美孚新村東南面的道路交匯處
ROAD JUNCTION SOUTH-EAST OF MEI FOO SUN CHUEN

美孚新村與貨櫃碼頭之間的道路交匯處
ROAD NETWORK BETWEEN MEI FOO SUN CHUEN AND CONTAINER PORT

油麻地交匯處
ROAD INTERCHANGE IN YAU MA TEI

油麻地避風塘
NEW YAU MA TEI TYPHOON SHELTER

用地 C
面積: 約10公頃
SITE C
AREA: ABOUT 10 HECTARES

油麻地公眾貨物裝卸區
YAU MA TEI PUBLIC CARGO WORKING AREA

西九龍公路 WEST KOWLOON HIGHWAY

海寶路 HOI PO ROAD

海寶路 HOI PO ROAD

油麻地交匯處 YAU MA TEI INTERCHANGE

連翔道 LIN CHEUNG RD

LIN CHEUNG RD

連翔道

西九龍公路 WEST KOWLOON HIGHWAY

機場快線 AIRPORT EXPRESS LINE

東涌線 TUNG CHUNG LINE

鐵路保護區 MTR PROTECTION ZONE

民眾安全服務處總部
CAS HEADQUARTERS

擎天半島
SORRENTO

消防處西九龍救援訓練中心
FSD WEST KOWLOON RESUE TRAINING CENTRE

高鐵 XRL

西鐵線 WEST RAIL LINE

連翔道

LIN CHEUNG RD

麗翔道 LAI CHEUNG RD

富榮花園
CHARMING GARDEN

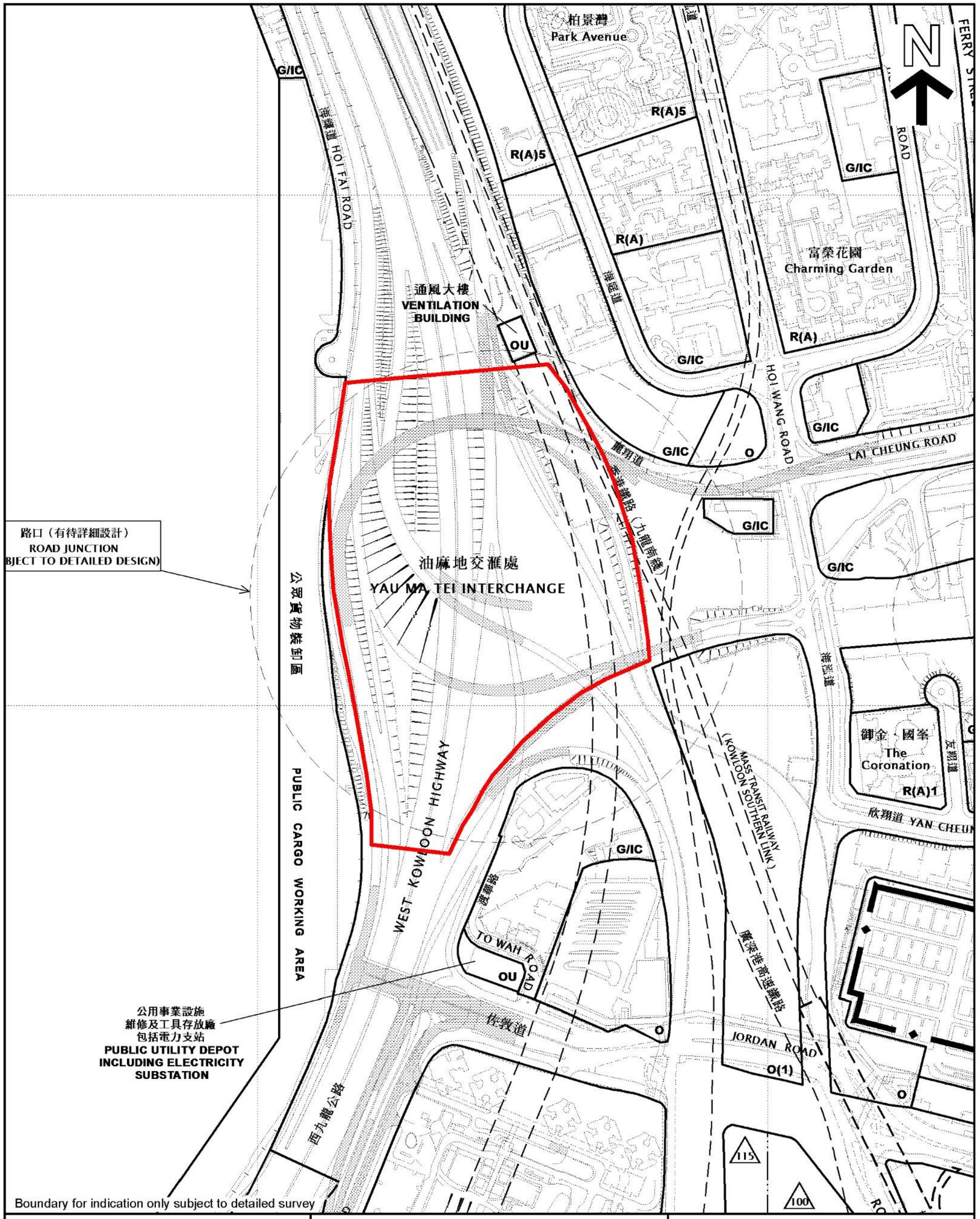
香港管理專業協會李國寶中學
HKMA DAVID LI KWOK PO COLLEGE

油蔴地天主教小學
YAUMATI CATHOLIC PRIMARY SCHOOL

擬議中九龍幹線通風大樓
PROPOSED VENTILATION BUILDING FOR CENTRAL KOWLOON ROUTE

海泓道
HOI WANG RD

附件B | ANNEX B



Extracted from

OZP No.: S/K20/30
Exhibition Date: 03 October 2014

Date: 31 January 2018

Yau Ma Tei Interchange

Scale 1:5,000

METRES 50 0 50 100 150 200 METRES

Tsuen Wan and
West Kowloon
District Planning Offices

PLANNING DEPARTMENT

Reference No.

PLAN

現有油麻地交匯處 | EXISTING YAU MA TEI INTERCHANGE

N

海寶路 HOI PO ROAD

YAU MA TEI INTERCHANGE

LIN CHEUNG ROAD

WEST KOWLOON HIGHWAY 西九龍公路

SLIP ROAD OF WEST KOWLOON HIGHWAY 西九龍公路支路

連翔道

油麻地交匯處

+6.2 +13.4 +10.8 +16.8 +9.4 +7.2 +10.2 +8.2 +5.5 +2.9 +17.9 +11.9 +4.6 +13.3 +12.1 +7.0 +15.0 +17.0 +14.0 +5.6

圖例
LEGEND

+17.9 主水平基準以上17.9米
17.9 METRE ABOVE PRINCIPAL DATUM

附件D | ANNEX D

將於中九龍幹線項目建造的道路工程 | ROADWORKS TO BE CONSTRUCTED UNDER CENTRAL KOWLOON ROUTE PROJECT

圖例
Legend:

- 擬建地下隧道 Proposed Underground Tunnel
- 擬建高架道路/地面道路 Proposed Viaduct/At-grade Road
- 擬建低於地面道路及地下通道 Proposed Depressed Road and Underpass
- 擬建綠化平台 Proposed Landscaped Deck
- +19.0 主水平基準以上19.0米 19.0 METRE ABOVE PRINCIPAL DATUM

用地 C
SITE C

擬建油麻地通風大樓
Proposed Yau Ma Tei Ventilation Building

現有油麻地交匯處
Exising Yau Ma Tei Interchange

West Kowloon Highway 西九龍公路
海庭道
Hoi Ting Road
Hoi Wang Road
麗翔道
Lai Cheung Road
Hau Cheung Street 巧翔街
連翔道
Lin Cheung Road
友翔道
Yau Cheung Road
欣翔道
Yan Cheung Road

+5.9
+9.0
+26.0
+4.5
+13.2
+19.0
+17.5

附件E | ANNEX E