

## Further Information in Response to Public Comments Received During Publication Period from 22 August to 12 September 2017

### Background

The Urban Renewal Authority (URA) submitted a planning application to the Town Planning Board (TPB) in April 2017 for a revised Master Layout Plan for the Kwun Tong Town Centre (KTTC) Project (Application No. TPB/A/K14/745). In view of land clearance and acquisition issues arising from illegal occupiers within Development Area 5 (DA5), and in order to facilitate the earlier implementation of Yue Man Square rest garden (YMSRG) within DA4 for public enjoyment and to better pedestrian connections between the MTR Kwun Tong station, DAs 1, 2, 3 & 4, and its larger hinterland, it was proposed to separate DAs 4 and 5 into two phases.

During the TPB's publication period from 22 August to 12 September 2017, apart from comments from various Government departments on the planning aspects, views on the detailed architectural and landscape design of the project were received from the Kwun Tong District Council (KTDC) and the community, covering among others, detailed design of the Government offices cum commercial development facing Hong Ning Road and Kwun Tong Road, as well as detailed landscape design of the public open space. In response to the public's views, URA decided to advance the detailed architectural and landscape design of the Project, supported by related technical assessments, with an aim to integrate these public aspirations into the design of the Scheme as far as practicable. These particularly included a landmark Government offices cum commercial building at DA5, stepped height profile for DA5 commercial building and cascading garden design with water and landscape features within the public open spaces at DAs 4&5, as well as enhanced connections to the MTR Kwun Tong Station.

### Public Engagement

In order to facilitate the preparation of detailed design and subsequent refinements in the S16 submission as mentioned above ("Proposed Scheme"), the URA has carried out a series of structured engagement exercises to consult the KTDC and other stakeholders in exchanging views and to gauge details of their comments. A summary of the engagement exercise conducted from September to December 2017 is provided in **Table 1**. As a result of the extensive engagement exercise, the KTDC has no objection in principle to the current Proposed Scheme. The key architectural and landscape design elements have been incorporated into the Proposed Scheme as appropriate, whilst other further detail design comments will be addressed in subsequent detailed design stage after TPB's processing, which will consider other compliances with relevant ordinances and regulations. (e.g. Buildings Ordinance). As

responded by URA at the KTDC meeting on 7 November 2017, URA will continue to work closely with the KTDC on the Project progress on regular basis.

**Table 1: Public Engagement Exercise**

| Date  | Name and Title or Attended Meeting   |
|---|--|
| <i>Kwun Tong District Council (KTDC) Consultation</i> |  |
| 7 Nov 2017  | ▪ KTDC 12th meeting (Full meeting)   |
| 26 Sep 2017   | ▪ KTDC's Kwun Tong Development and Renewal Task Force (KTDRTF) 10th meeting  |
| 13 Nov 2017   | ▪ Kwun Tong Central Area Committee meeting   |
| 17 Nov 2017   | ▪ Kwun Tong South Area Committee meeting   |
| 21 Nov 2017   | ▪ Lam Tin Area Committee meeting   |
| 23 Nov 2017   | ▪ Sze Shun Area Committee meeting<br>▪ Kwun Tong West Area Committee meeting   |
| 5 Dec 2017  | ▪ KTDC's Kwun Tong Development and Renewal Task Force (KTDRTF) 11th meeting  |
| <i>Other Consultations</i>                            |  |
| 11 Sep 2017   | ▪ LegCo member Hon Jonathan HO Kai Ming<br>▪ Kwun Tong District Council (KTDC) member Mr KAN Ming Tung   |
| 15 Sep 2017   | ▪ KTDC members Mr Nelson CHAN Wah Yu and Mr Patrick LAI Shu Ho   |
| 18 Sep 2017   | ▪ LegCo member Hon Wilson OR Chong Shing<br>▪ KTDC members Mr AU YEUNG Kwan Nok, Mr CHAN Chun Kit, Mr CHEUNG Ki Tang, Mr CHEUNG Pui Kong, Mr CHEUNG Yiu Pan, Mr TAM Siu Cheuk and Mr NGAI Man Yu   |
| 19 Sep 2017   | ▪ URA's Kwun Tong District Advisory Committee (KTDAC) 3rd meeting  |
| 25 Sep 2017   | ▪ KTDC member Mr WONG Chun Ping  |
| 13 Oct 2017   | ▪ LegCo member Hon Jeremy TAM Man Ho<br>▪ KTDC member Mr Anthony BUX Sheik   |
| 30 Oct 2017   | ▪ KTDC Chairman Dr Bunny CHAN Chung Bun<br>▪ KTDC Vice-Chairman Mr Kin HUNG Kam In<br>▪ KTDC members Mr AU YEUNG Kwan Nok, Mr Nelson CHAN Wah Yu, Mr Jimmy CHAN Yiu Hung, Mr CHAN Chun Kit, Mr CHAN Kok Wah, Mr CHEUNG Ki Tang, Mr CHEUNG Shun Wah, Mr CHEUNG Yiu Pan, Ms FU Pik Chun, Mr KAN Ming Tung, Mr Patrick LAI Shu Ho, Mr LUI Tung Hai, Mr Marco MA Yat Chiu, Mr NGAI Man Yu, Mr So Koon Chung, MS Ann SO Lai Chun, Mr TANG Wing Chun, Mr WONG Chun Ping, Mr YIP Hing Kwok and Mr Perry YIU Pak Leung<br>▪ LegCo member Hon HO Kai Ming |
| 31 Oct 2017   | ▪ LegCo member Hon Wilson OR Chong Shing<br>▪ KTDC member Mr CHEUNG Yiu Pan and Mr CHAN Chun Kit   |
| 3 Nov 2017  | ▪ LegCo member Hon Jonathan HO Kai Ming  |
| 6 Nov 2017  | ▪ KTDC members Mrs Winnie POON YAM Wai Chun, Mr MOK Kin Shing, Mr WONG Chi Kin, Mr CHENG Keng leong, Mr YIP Hing Kwok, Mr HSU Hoi Shan, Mr Kevin SO Koon Chung and Mr Anthony BUX Sheik  |

***Proposed Scheme to incorporate Key Architectural and Landscape Design Refinements as a Response to Public Aspiration***

In response to the public comments received during the publication period, detailed design and refinements have been made to the Master Layout Plans (**Annex 2**). The key planning and design merits of the current Proposed Scheme are highlighted as follows:

i) **Capturing the 'Essence' of the Civic Landmark Building:** In response to the public's aspiration for a landmark building, an architectural design study has been advanced. The building form adopted a more curvilinear design taking an elliptical parabola form (**Figure 1**) capturing the design essence according to the approved MLP in 2008 (A/K14/576). This landmark building will accommodate a multi-purpose activity centre, government offices, social welfare facilities, and commercial and/or education uses, and an additional 500m<sup>2</sup> for social welfare facilities to serve the local community. Details of the accommodation will be further elaborated at **Table 2**;

ii) **Greenery and Open Space for Public Enjoyment:** The Proposed Scheme will provide not less than 9,350sqm of at-grade public open space (compare to the 2008 Approved Scheme A/14/576 of 8,700sqm), including Yue Man Square rest garden, Civic Square, entrance piazzas, these at-grade landscaped spaces, together with the landscaped terraced decks and podium gardens physically connected at various levels (**Figure 2**). These open spaces including Yue Man Square rest garden, Civic Square, terraced decks, podium gardens and the entrance plazas along Kwun Tong Road, Hong Ning Road and Hip Wo Street, will add up to over 10,000sqm. The site coverage of greenery has been increased to over 30% (i.e. 30.8%). Opportunities for tree planting have been maximised where possible, enhancing the shading function of the POS. to Appropriate seating out areas and informal/formal event spaces for various amenity events/activities were also incorporated into the open space design. As a balance to planting of new trees and public active space, the scheme will provide not less than 504 trees, with the 2 Old & Valuable Trees (CVT) preserved in-situ;

iii) **New Mini-Covered Entrance Piazza and 'Grand Staircase'** – In addition to the proposed Civic Square (located adjacent to Hong Ning Road) which will be used for public events, a new semi-covered mini piazza with a 'Grand Staircase' have been provided under the landmark building for public use (**Figure 3**). A holistic design has been adopted to form a vibrant node connecting the POS network and DA5. An entrance plaza will provide a convenient pedestrian access from Kwun Tong Road, spanning over the vehicular ingress from Hong Ning Road, and into Yue Man Square rest garden. The covered area (not less than 10m in width) will offer shading for enjoying different outdoor activities, e.g. street performances in front of the Grand Staircase, and terraced gardens adjoining will provide pocket amenity space for

resting. A cascading water feature as backdrop fronting onto Hong Ning Road will be provided to create a welcoming entry experience. The setback from Hong Ning Road will further enhance the ventilation near the Civic landmark building;

iv) **Stepped Building Profile:** The design of the G/IC and commercial building within DA5 will adopt a stepped height profile (**Figure 2**). The proposed terraced landscaped decks will connect Yue Man Square rest garden to DAs 2,3,4, 5 and the MTR station, with cascading water features and green walls. The podium roof gardens will also provide greening opportunities and will be accessible to the public at reasonable hours;

v) **Enhanced Pedestrian Linkages to Surrounding Areas:** Two pedestrian linkages are provided to adjacent areas, such as the footbridges to APM and Tsun Yip Lane to the south and footbridge to DA1 to the northeast. The two existing footbridges from the MTR Kwun Tong station will be reconstructed as a pedestrian deck, connected to the proposed landscape terrace decks to improve connectivity and walkability from the MTR station to Yue Man Square rest garden, Public Transport Interchange (PTI), and the surrounding areas. Vistas and 'path-finding' themed landscape design from the three strategic entrances from Kwun Tong Road, Hong Ning Road and another one from Hip Wo Street will be provided to enhance visual and physical connectivity to Yue Man Square rest garden;

vi) **Improve Road Network to Enhance Traffic Conditions:**

To enhance traffic circulation, it is proposed to provide a new ingress at Hong Ning Road northbound traffic at the entrance to DA5 to avoid the need to loop around the project and minimising traffic on the surrounding roads. A new bus lane and a 120m long lay-by are also included along Kwun Tong Road to alleviate the traffic congestion due to loading/unloading of bus passengers. In response to KTDC's request for providing more public carpark, the URA will explore the feasibility of providing a higher range of car parking within DAs4&5 subject to further detailed traffic study;

vii) **Enhance Visual Permeability and Ventilation along Kwun Tong Road:** The separation of the office tower and the commercial building at DAs 4&5 will help to minimise visual impacts on Kwun Tong Road and enhance ventilation (**Figure 4**). The proposed landmark tower will increase by 25m from 260mPD to 285mPD (9.6% increase), resulting in a slimmer tower hence increasing the separation between surrounding buildings and improving overall ventilation. The provision of 2 urban windows, three entrance piazzas and an organic building form will help to break up the visual bulk along Kwun Tong Road;

viii) **Further Setback from Hong Ning Road:** With the provision of a new Grand Staircase and entrance piazza with terraced gardens and water features, the setback between the landmark G/IC cum



commercial building at ground level and the site boundary is now increased to about 36 meters (2008 approved MLP was about 25m) (Figure 1); and

ix) **Environmental and 'Smart City' Design** – Subject to further preparation of detailed design, the KTTC development will adopt a sustainable approach by promoting 'smart city' designs as far as practicable and feasible. For example, the civic landmark G/IC cum commercial building may adopt a theme of energy-efficient building materials and explore the feasibility to provide 'smart' lamp posts, real-time information on display panels showing bus arrival time or community information, etc.

#### **Proposed G/IC Facilities and Multi-Purpose Activity Centre**

A 1,500sqm multi-purpose activity centre was originally proposed in the 2008 Approved Scheme. Of this 1,500sqm, the URA/future JV partner would be responsible for managing 1,000sqm whilst Government department would be responsible for 500sqm. In the current proposal, the URA will now provide and manage the whole multi-purpose activity centre comprising of 1,500sqm for community use (Table 2).

In consultation with Planning Department in June 2017, a new request for 500sqm of G/IC GFA for social welfare facilities was made by the Social Welfare Department (SWD). Subject to policy and funding support, the URA will provide the requested SWD facilities within the G/IC and commercial building for the benefit of the community. A summary of the G/IC facilities within DAs 1 to 5 is provided in Table 2.

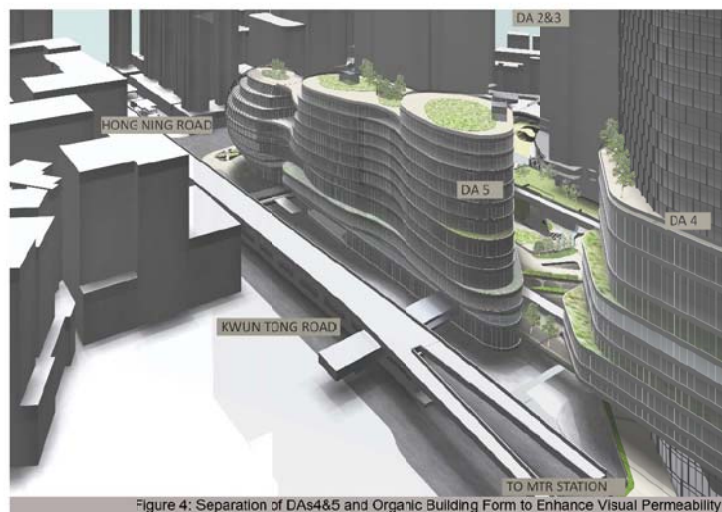


Figure 4: Separation of DAs4&5 and Organic Building Form to Enhance Visual Permeability

**Table 2: G/IC Facilities in K7 KTTC**

| Development Area (DA)              | G/IC GFA               |                      | Commercial GFA (for Multi-Purpose Venue) |                       | Use   |
|------------------------------------|------------------------|----------------------|--|-----------------------|---|
|                                    | 2015 Approved Scheme   | 2017 Proposed Scheme | 2015 Approved Scheme                     | 2017 Proposed Scheme  |   |
| DA 1 (not part of this submission) | 6,200                  | Same                 | -  | -                     | • Jockey Club Clinic                              |
| DA 2 & 3                           | 14,679<br>1,270<br>250 | Same<br>Same<br>Same | -  | -                     | • PTI (bus + minibus)<br>• Hawker Bazaar<br>• RCP |
| DA 4                               | 2,021                  | Same                 | -  | -                     | • PTI (taxi stand)                                |
| DA 5                               | 6,080                  | Same                 | -  | -                     | • Government offices incl. Post Office, KTDC      |
|                                    | 500 (Govt. to manage)  | 0                    | 1,000 (URA to manage)                    | 1,500 (URA to manage) | • Multi-purpose activity centre                   |
|                                    | 0                      | 500                  | -  | -                     | • SWD facilities                                  |
| <b>Total</b>                       | <b>31,000</b>          | <b>31,000</b>        | <b>1,000</b>                             | <b>1,500</b>          |   |

|  | 2015 Approved Scheme | 2017 Proposed Scheme |
|--|----------------------|----------------------|
| G/IC GFA and Multi-purpose venue (manage by URA) | 32,000               | 32,500 (+1.6%)       |

#### **Commercial Development fronting onto Pedestrianised Area/Streets**

In order to preserve local character and street activities, provision of pedestrianised streets has been widely adopted in this MLP amendment. The combination of street-front retail facilities, hawker bazaar and generous open space will create a variety and diversity of urban spaces and shopping experiences. Through these purposely designed pedestrianised routes as "streets" interweave with the POS network, the public can easily 'walk' or window shop along retail shops and hawker bazaar and as a whole experience to provide the diverse and variety in shopping needs. A 15,000sqm of retail spaces which frontage directly onto pedestrianised areas or streets will be provided within the Project. This includes about 3,750sqm retail GFA within DAs2&3, and 11,250sqm within DAs4&5. In total, about 2,700sqm will

front onto the four streets abutting the Project whilst about 12,300sqm will front onto the indoor pedestrian areas and POS network at-grade, MTR deck or the other 2 landscaped deck levels, following the topography of the site.

### Comparison of Development Parameters

The proposed plot ratio and total GFA for the Proposed Scheme will remain the same as the Approved Scheme. **Table 3** provides a summary comparison of the Approved and Proposed Schemes. The proposed amendments are related to the following key planning development parameters: a) proposed height of landmark office tower from 260 to 285mPD; b) the completion date for DAs4&5 has been amended from 2024 to 2026; c) an extra 500sqm of G/IC GFA for social welfare facilities will be provided whilst no reduction in the 1,500sqm of GFA for a "multi-purpose activity centre" which will be managed by URA. The amendments related to the detailed architectural and landscape design are shown in the Landscape Master Plan (LMP) and photomontages (**Figures 1-3**). Further architectural and landscape design details will be addressed in the detailed design stage subsequent to the approval. A schedule of accommodation showing Sub-Areas A and B is provided in **Annex 1**.

**Table 3: Comparison of Development Parameters**

| Development Parameter           | Approved Scheme (Application No. TPB/A/K14/727)  | Proposed Scheme (Application No. TPB/A/K14/745)   |
|---------------------------------|--|---|
| CDA Zone Area (m <sup>2</sup> ) | 46,294   | No change   |
| No. of Blocks:                  | 6  | No change   |
| -Residential Towers             | 4  |   |
| -Non-domestic Tower             | 2  |   |
| Total Plot Ratio                | 8.06   | No change   |
| Domestic PR                     | 3.00   |   |
| Non-Domestic PR                 | 5.06   |   |
| Total GFA (m <sup>2</sup> )     | 373,420  | No change   |
| -Residential                    | 138,980  | No change   |
| -Commercial/Retail              | 111,780 (incl. 1,000m <sup>2</sup> for multi-purpose activity centre, and 1,300 m <sup>2</sup> for social enterprise uses) | No change (incl. <b>1,500m<sup>2</sup> for multi-purpose activity centre</b> and 1,300 m <sup>2</sup> for social enterprise uses) |
| -Office                         | 65,860   | No change   |
| -Hotel                          | 32,000   | No change   |
| -G/IC (Incl. PTI)               | 24,800 (500m <sup>2</sup> reserved for multi-purpose activity centre)  | No change ( <b>500m<sup>2</sup> reserved for social welfare facilities</b> )  |
| Maximum Building Height (mPD)   |  |   |
| -Residential Towers             | 165.4-178  | No change   |
| -Commercial Tower               | 260  | <b>285 (+9.8%)</b>  |



| Development Parameter                                       | Approved Scheme (Application No. TPB/A/K14/727)  | Proposed Scheme (Application No. TPB/A/K14/745)                                       |
|---|--|---|
| No. of Storeys  |  |   |
| -Residential Tower  | 39-43<br>(plus 4 storeys of PTI/retail/hawker bazaar/clubhouse, 2 storeys basement carpark, 1 storey refuge floor, 1 storey transfer plate and 1 storey residential lobby) | No change   |
| -Non-domestic: Commercial Tower (office/hotel/retail) (DA4) | 55<br>(plus 4 storeys of basement carpark/retail, 3 storeys refuge, E&M and 1 storey mezzanine floor)  | <b>60 (+9%)</b><br>(plus 6 storeys of basement carpark/retail, 4 storeys refuge, E&M) |
| Composite G/IC & Commercial Building                        | 13 (plus 4 storeys basement carpark/retail)  | No change   |
| Site Coverage (SC)  |  |   |
| -Not exceeding 15m  | <70%   | No change   |
| -Domestic SC  | <11%   |   |
| Non-dom SC 15-43m   | <52%   |   |
| Non-dom SC 44-61m   | <19%   |   |
| Non-dom SC >61m   | <9%  |   |
| No. of Flats/Rooms  |  |   |
| -Residential Flats  | ≤1,999   | No change   |
| -Hotel Rooms  | ≤400   | No change   |
| Average Flat Size (m <sup>2</sup> )                         | About 70   | No change   |
| Design Population   | 4,598  | No change   |
| Public Open Space- at grade (m <sup>2</sup> )               | Not less than 9,348  | Not less than 9,350   |
| Private Open Space (m <sup>2</sup> )                        | Not less than 4,598  | No change   |
| Car Parking Spaces  | 980-1,310  | <b>991-1321 (+0.84 to 1.12%)</b>  |

| Development Parameter    | Approved Scheme (Application No. TPB/A/K14/727)         | Proposed Scheme (Application No. TPB/A/K14/745) |
|--------------------------|---|---|
| Loading/Unloading Bays   | 123-176   | <b>124-177(+0.57-0.81%)</b>                     |
| Implementation Programme |   |   |
| -DA2                     | 2021 (PTI and Hawker bazaar to be completed in 2020-21) | No change                                       |
| -DA3                     |   |   |
| -DA4                     | 2024 (tentative)  | <b>2026 (tentative)</b>                         |
| -DA5                     | 2024(tentative)   | <b>2026(tentative)</b>                          |

### Technical Assessments

In response to the comments received during the publication period, a number of technical assessments have been conducted for the Proposed Scheme. These include a Landscape Master Plan (LMP), air ventilation assessment (AVA), an environmental review (ER), and Visual Impact Assessment (VIA). These are provided in **Annexes 3 to 6**.

The Proposed Scheme will provide The landscape framework outlining the various functions of the public and private open space. 'Greening' will be used as a major landscape design theme to visually unify the proposed development and to create a unique sense of identity. The integration of sensitive soft and hard landscaping measures within residential area, streetscape, recreational, commercial, business and community facilities will enhance the living environment, accentuate the positive visual attributes of the proposed development and provide a degree of privacy where appropriate. Details are provided in **Annex 3**.

The VIA has shown that the difference in visual impact for the proposed landmark tower as viewed from the 7 district viewpoints for both the 260 and 285mPD building height proposals are negligible (V1-7). The proposed slimmer tower form will increase the separation with adjacent buildings and help to minimise visual impact to adjacent areas. Details are provided in **Annex 4**.

The AVA has shown that the revised building form and layout would result in improvements in some areas as compared with the Baseline Scheme. Generally, the ventilation performance is similar to the surroundings for both the Baseline and Proposed Schemes. Details are provided in **Annex 5**

In regards to railway noise impacts, it was found that the revised building form and layout can provide equivalent sufficient shielding effect for the residential development within DAs 2&3. For traffic noise

impacts, it was found that the revised layout within DAs 4&5 would not cause any adverse impacts upon the residential development in DA 2 and 3. The compliance rate at DA 2&3 would be about 89%, same as the 2015 Approved Scheme. Details are provided in **Annex 6**.

### **Conclusion**

In response to public comments, the URA has advanced the detailed design of the architectural and landscape aspects of the Project, as well as the related technical assessments, with an aim to incorporate the public aspirations in the current scheme. These design features included a landmark building of G/IC cum commercial building, stepped height profile for DA5 commercial building and cascading garden design with water features within the public open spaces.

Construction works within DAs 2 and 3 is currently ongoing, and anticipated to be completed in 2021. The Proposed Scheme is in line with the planning intentions for comprehensive redevelopment and to ensure the earlier implementation of Yue Man Square rest garden and connection to the MTR. In summary, the Proposed Scheme will have the following planning and design merits:

- Separation of Development Packages DAs 4 & 5 to facilitate earlier implementation of the MTR elevated deck and Yue Man Square rest garden at DA4 The Proposed Scheme has provided multi-level landscape decks to enhance connectivity;
- Maintain the 'essence' of the design features as contained in the previously approved MLP, e.g. the landmark building of G/IC cum commercial building, stepped height profile and terraced gardens with water features;
- Better permeability and ventilation by breaking up the long and bulky commercial development on Kwun Tong Road, and to create urban windows at strategic locations of the commercial building and a more organic building form;
- Improved pedestrian connectivity by provision of new at-grade openings, two footbridges and multi-level landscape decks at different levels connected to the MTR, Yue Man Square rest garden, PTI and the surrounding areas;
- Enhance greening by the provision of new and mini-covered entrance plazas, terrace and podium gardens, landscaped decks, rooftop gardens, edge planting, etc.
- Slimmer landmark office/hotel tower form and fulfilment of SBD guidelines resulting in environmental improvements e.g. enhanced air ventilation, sunlight exposure, view corridors, setbacks, etc.

- Subject to further detailed design, the KTTC development will adopt a sustainable approach by incorporating 'smart city' designs, e.g. 'smart' lamp posts, energy-efficient building materials and real-time information panel.

In light of the above mentioned merits of the Proposed Scheme, members of the TPB are respectfully requested to give favourable consideration to this planning application.

### **Annexes:**

Annex 1: Schedule of Accommodation for Sub-Areas A and B

Annex 2: Master Layout Plan (MLP)

Annex 3: Landscape Master Plan (LMP)

Annex 4: Visual Impact Assessment

Annex 5: Air ventilation assessment (AVA)

Annex 6: Environmental review (ER)

### **December 2017**



## 行政摘要

市區重建局觀塘市中心重建項目第 16 條規劃申請：進一步資料  
回應於二零一七年八月二十二日至九月十二日期間收到的公眾意見

### 背景

市建局原計劃將第 4 和第 5 發展區同期發展，但由於第 5 發展區內有為數不少的構築物屬非法佔用，可能出現的變數。市建局於今年 4 月向城市規劃委員會（城規會）遞交的修訂規劃申請，申請內容主要是關乎第 4 和第 5 發展區分期發展、樓宇高度、行人連接、以及交通道路配置的規劃議題。在修訂規劃申請的公布期內，市建局收到不同持份者的意見，包括觀塘區議會，十分關注項目建築及園景的細部設計。市建局亦於 9 月 26 日及 11 月 7 日出席了觀塘區議會會議。市建局決定提前展開項目的建築及園境的細部設計並進行有關的技術評估，盡量融入市民對細部設計元素的期望，維持原設計的神髓。為此，市建局向城規會提交要求，延期審議該早前遞交的規劃修訂申請，以便進行細部設計的相關工作，並就修訂設計諮詢區議會及回應公眾的期望。

### 提前進行建築及園境的細部設計

有關的深化設計著重加強項目的行人連接性和連繫、設施和其使用度的多樣化，以及交通道路網絡的改善等。這些深化設計總括如下：

- i) 地標建築特色 - 政府/機構/社區設施的細部設計，包括蛋型的政府樓層、多用途活動中心和商業部份，以及設有水景及「梯級」式的裕民坊公園設計；
- ii) 更多的綠化及休憩空間供市民享用 - 新方案提供達 9,350 平方米的地面休憩空間，較 2008 年原方案的 8,700 平方米為多。如把建築物平台部分的綠化空間一併計算，總面積將會超過一萬平方米；
- iii) 增設有蓋小廣場 - 除連接裕民坊公園的弧形公眾廣場外，在政府/商業/多用途活動中心蛋型地標大廈之下增設有蓋廣場，全天候供公眾使用；
- iv) 台階式平台拾級而上 - 第 5 區的樓宇設計，保留平台拾級而上的設計神髓，亦於第 4 區的平台花園用“梯級”式連接裕民坊公園；
- v) 周邊連繫、四通八達 - 透過提供行人天橋到鄰近地區改善地區整體的暢達性及連接性，連接 APM 及駿業里天橋，亦加寬連接地鐵站，第 4 期發展區及裕民坊休憩花園的綠化平台，疏導日益增長的人流；

### vi) 改善道路網絡、舒緩擠塞 -

- a) 康寧道新增北行車輛至第 5 區入口，避免車輛圍繞項目進入市中心，減輕周邊道路交通擠塞；
- b) 建議於觀塘道市中心一段對開新增一條讓巴士停車上落的行車線，舒緩現時該段道路的情況；

### vii) 提升樓宇的通風效果 - 透過分隔第 4 及 5 區的建築，減低對觀塘道的視覺影響及改善通風；而在整體的地積比沒變的情況下，將第 4 區酒店及商業大樓的樓宇外型縮窄轉高 25 米，到水平基準上 285 米，令建築物之間的間距增加，進一步改善整體樓宇及市中心的通風；

### viii) 增加地標建築與周邊環境的間距 - 因應康寧道新增北行至第 5 區入口，向康寧道的地面建築與地盤界線間距增至 36 米；

### ix) 環保及智慧城市設計 - 隨著時代進步，觀塘市中心發展會盡量加入環保及智慧城市的元素，如：智能燈柱、地標大樓採用節能建築物料、研究提供巴士到站時間顯示板等。

### 結語

市建局經過早前與不同區議員交流、聽取意見，並在 11 月 7 日向區議會展示了深化的修訂計設和整體方向。觀塘區議會大致接受觀塘市中心計劃的深化設計。就有關設計的進一步細化內容，市建局承諾會繼續與區議會及持份者保持溝通和交待進度。

市區重建局  
2017 年 12 月





Figure 1: Artist Impression of Civic Square and Landmark Building





Figure 2: Civic Square and Cascading Podium Garden





Figure 3: Mini-covered Entrance Plaza and Grand Staircase near Hong Ning Road



**Annex 1:****Overall Plot Ratio Calculation**

|                     |         |
|---------------------|---------|
| CDA Zone Area (sqm) | 46,294  |
| Total GFA (sqm)     | 373,420 |
| Overall PR          | 8.06    |

**Schedule of Accommodation for Kwun Tong Town Centre – Main Site**

| Residential Sub-Area A                                  |                                   |  |                    |
|---|-----------------------------------|--|--------------------|
|   |                                   | m <sup>2</sup> (About)   | Plot Ratio (About) |
| <b>Site Area</b>  |                                   | Gross Sub Area A Site Area: 27,770m <sup>2</sup><br>Net Sub Area A Site Area: 19,700m <sup>2</sup> |                    |
| <b>Total Gross Floor Area and/or Plot Ratio</b>         | <b>Domestic</b>                   | 138,980  | 7.05               |
|   | <b>including</b>                  |  |                    |
|   | - Flat                            | 138,980  | 7.05               |
|   | <b>Non-domestic</b>               | 35,817   | 1.82               |
|   | <b>including</b>                  |  |                    |
|   | - Retail/ Educational Institution | 19,297   | 0.98               |
|   | - Public Transport Interchange    | 15,000   | 0.76               |
|   | - Government Use                  | 1,520  | 0.08               |
| <b>No. of Block</b>                                     |                                   | 4  |                    |
| <b>Building Height / No. of Storeys</b>                 |                                   | 165.4 - 178 mPD<br>39 - 43 storeys   |                    |
|   | <b>excluding</b>                  | 4 storeys PTI/ Retail / Hawker bazaar/ Clubhouse   |                    |
|   |                                   | 5 storeys Basement carpark/Fire refuge floor/ Transfer plate/ Residential lobby                    |                    |
| <b>Site Coverage</b>                                    |                                   | Non-domestic ≤ 70%<br>Domestic ≤ 11%   |                    |
| <b>No. of Units</b>                                     |                                   | ≤1,999 flats   |                    |
| <b>Average Flat Size</b>                                |                                   | About 70m <sup>2</sup>   |                    |
| <b>Population (assume average household size = 2.3)</b> |                                   | 4,598  |                    |
| <b>Open Space</b>                                       | <b>Private</b>                    | Not less than 4,598m <sup>2</sup>  |                    |
|   | <b>Public</b>                     | Not less than 7,566m <sup>2</sup>  |                    |
| <b>Residents' Clubhouse</b>                             |                                   | ≤5% of domestic GFA  |                    |
| <b>No. of Parking Space and</b>                         | <b>Private Car Parking Spaces</b> | 353 - 415  |                    |

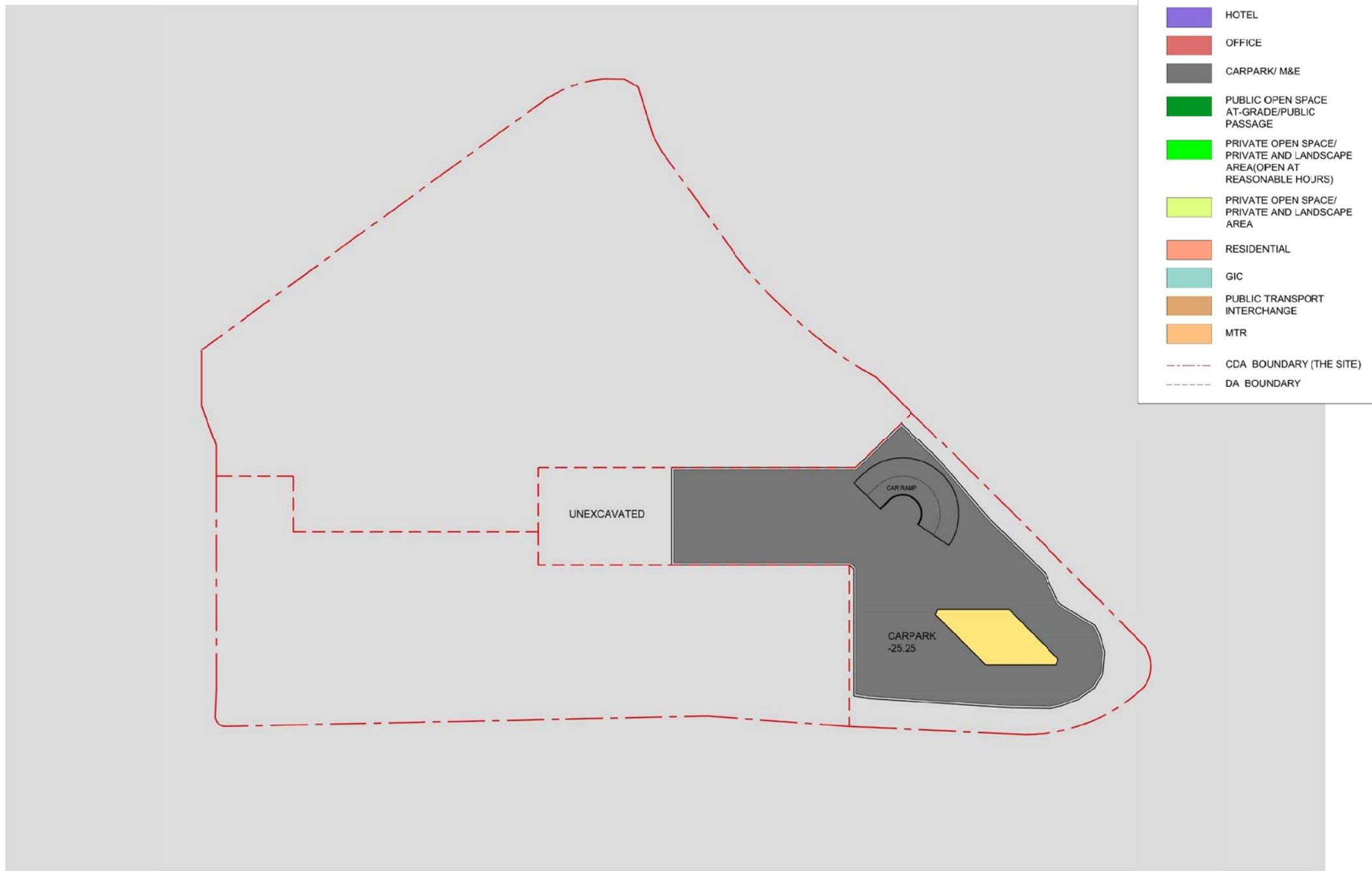
|   |                                   |  |  |                    |       |  |
|---|-----------------------------------|--|--|--------------------|-------|--|
| Loading / unloading Spaces                          |                                   | Loading / Unloading Spaces   |  | 19                 |       |  |
| Commercial Sub-Area B                               |                                   |  |  |                    |       |  |
|   |                                   | m <sup>2</sup> (about)   |  | Plot Ratio (About) |       |  |
| Site Area   |                                   | Gross Sub Area B Site Area: 18,524m <sup>2</sup><br>Net Sub Area B Site Area: 16,742m <sup>2</sup> |  |                    |       |  |
| Total Gross Floor Area and/or Plot Ratio            | Domestic                          |  | -  |                    | -     |  |
|   | Non-domestic                      |  | 198,623  |                    | 11.86 |  |
|   | including                         |  |  |                    |       |  |
|   | - Hotel                           |  | 32,000   |                    | 1.91  |  |
|   | - Office                          |  | 65,860   |                    | 3.93  |  |
|   | - Retail/ Educational Institution |  | 92,483   |                    | 5.52  |  |
|   | - Public Transport Interchange    |  | 1,700  |                    | 0.10  |  |
|   | - Government Use                  |  | 6,580  |                    | 0.39  |  |
| No. of Block  |                                   | Non-domestic   |  | 2                  |       |  |
| Building Height / No. of Storeys                    | Non-domestic                      |  | 285 mPD<br>13 (DA5) and 60 (DA4) storeys   |                    |       |  |
|   | excluding                         |  | 4 (DA5) and 6 (DA4) storeys basement retail & carpark, and a mezzanine floor (DA5) |                    |       |  |
|   |                                   |  | 4 fire refuge & E&M floors (DA4)   |                    |       |  |
| Site Coverage                                       |                                   |  | ≤ 91%  |                    |       |  |
| No. of Units  |                                   |  | ≤400 hotel rooms   |                    |       |  |
| Open Space  | Private                           |  | -  |                    |       |  |
|   | Public                            |  | Not less than 1,784m <sup>2</sup>  |                    |       |  |
| No. of Parking Space and Loading / unloading Spaces |                                   | Private Car Parking Spaces   |  | 638-906*           |       |  |
|   |                                   | Loading / Unloading Spaces   |  | 105– 158*          |       |  |

\*Subject to agreement with Transport Department

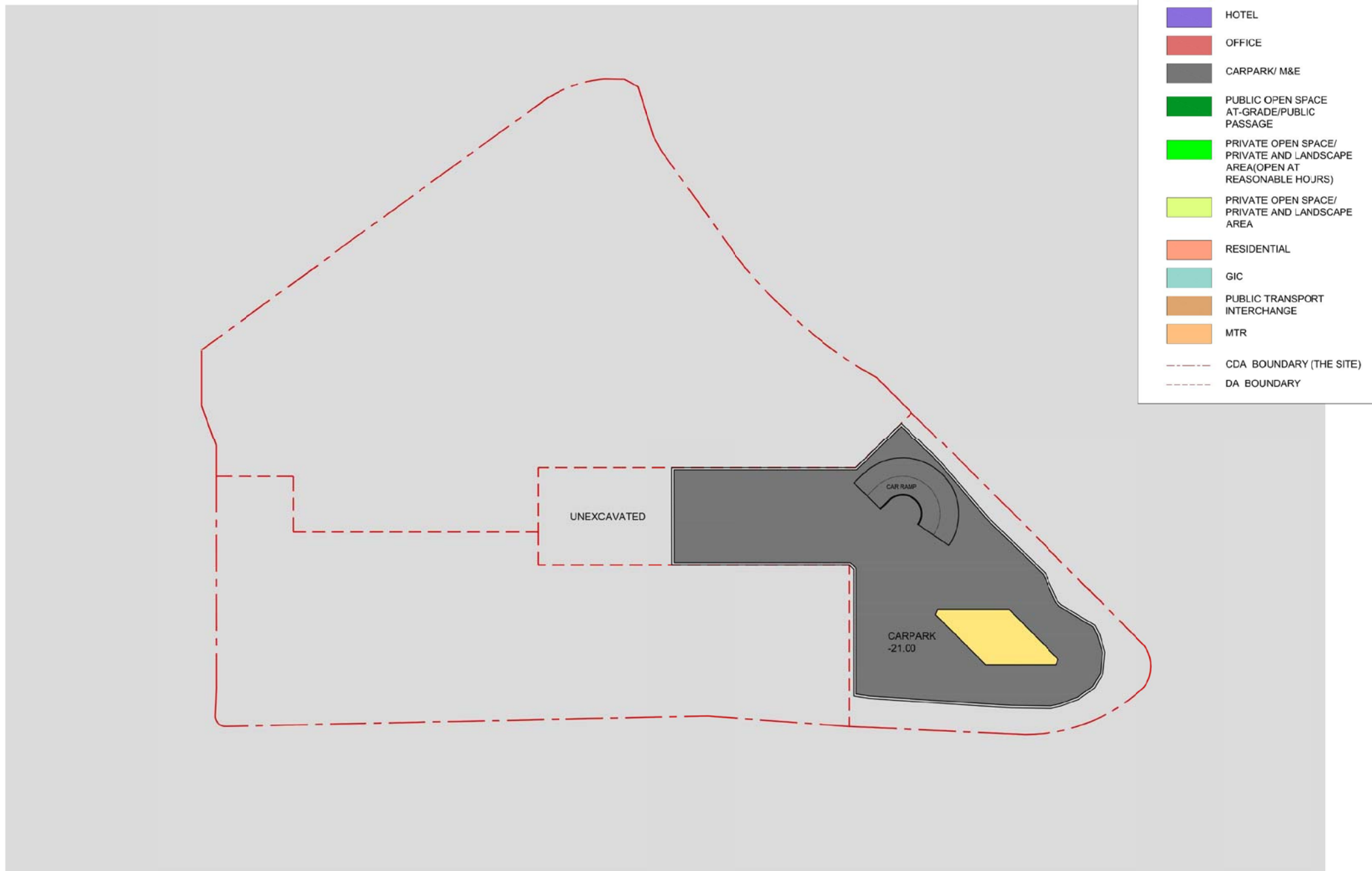


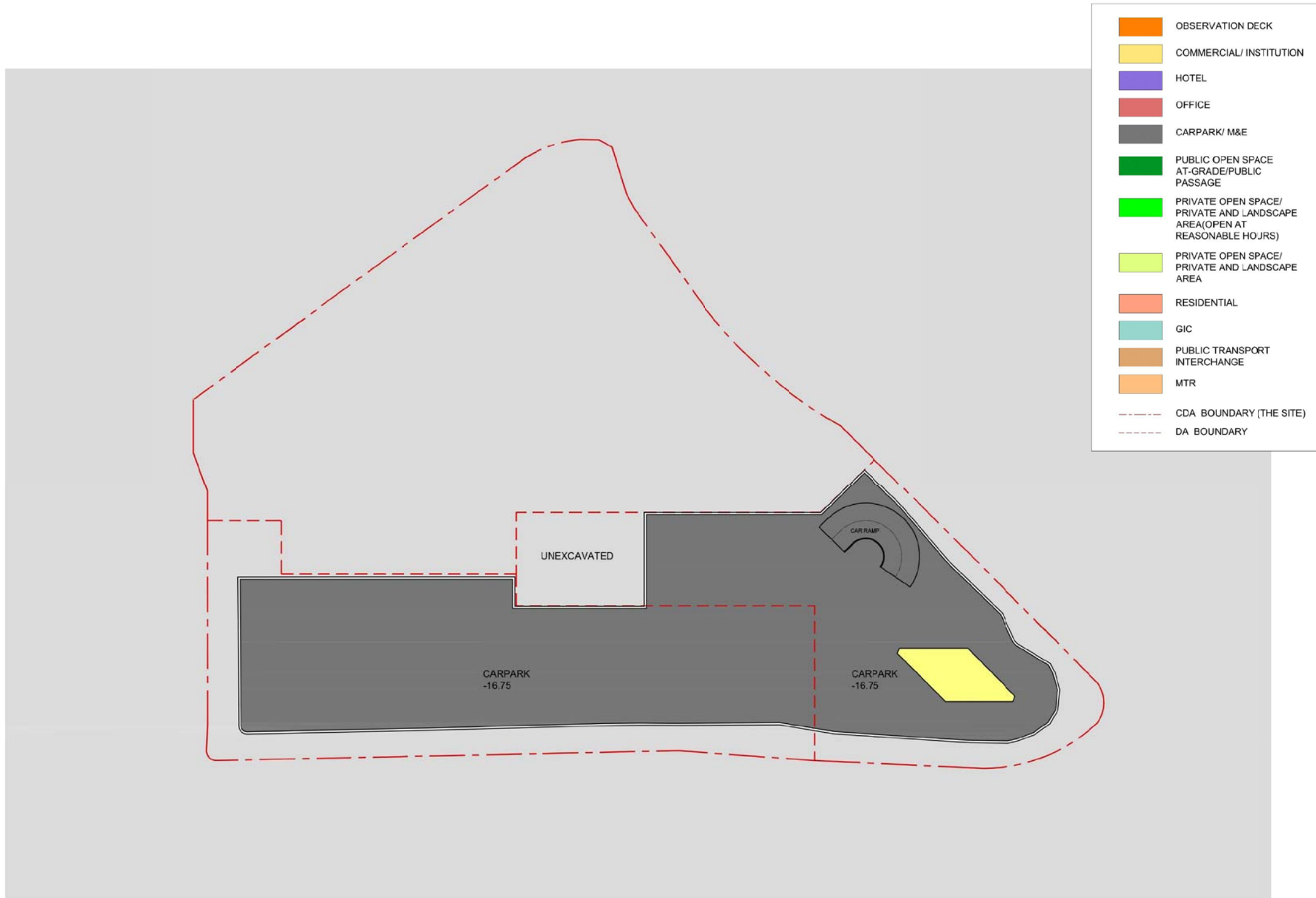
## **Annex 2: Master Layout Plan (MLP)**



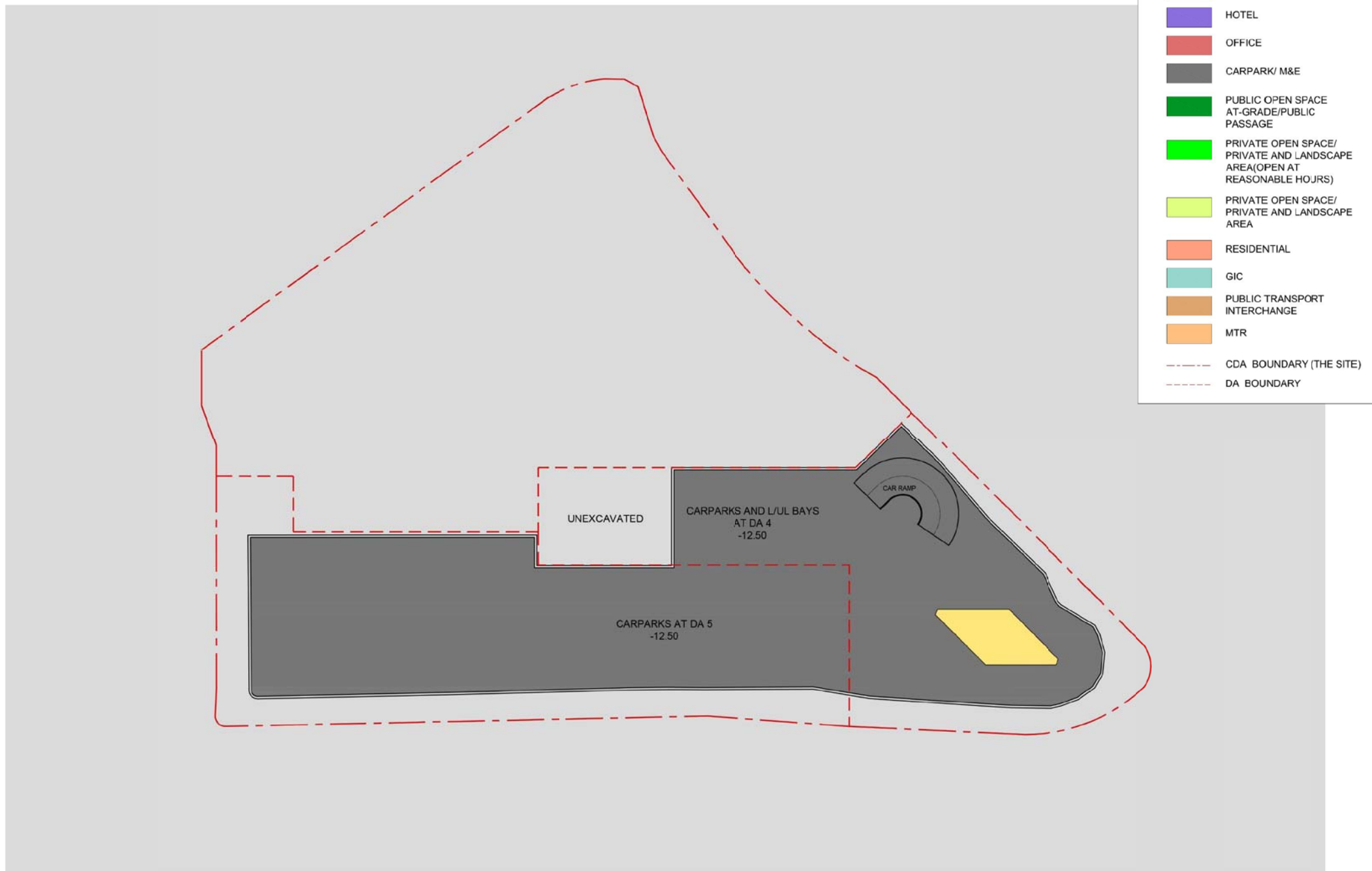


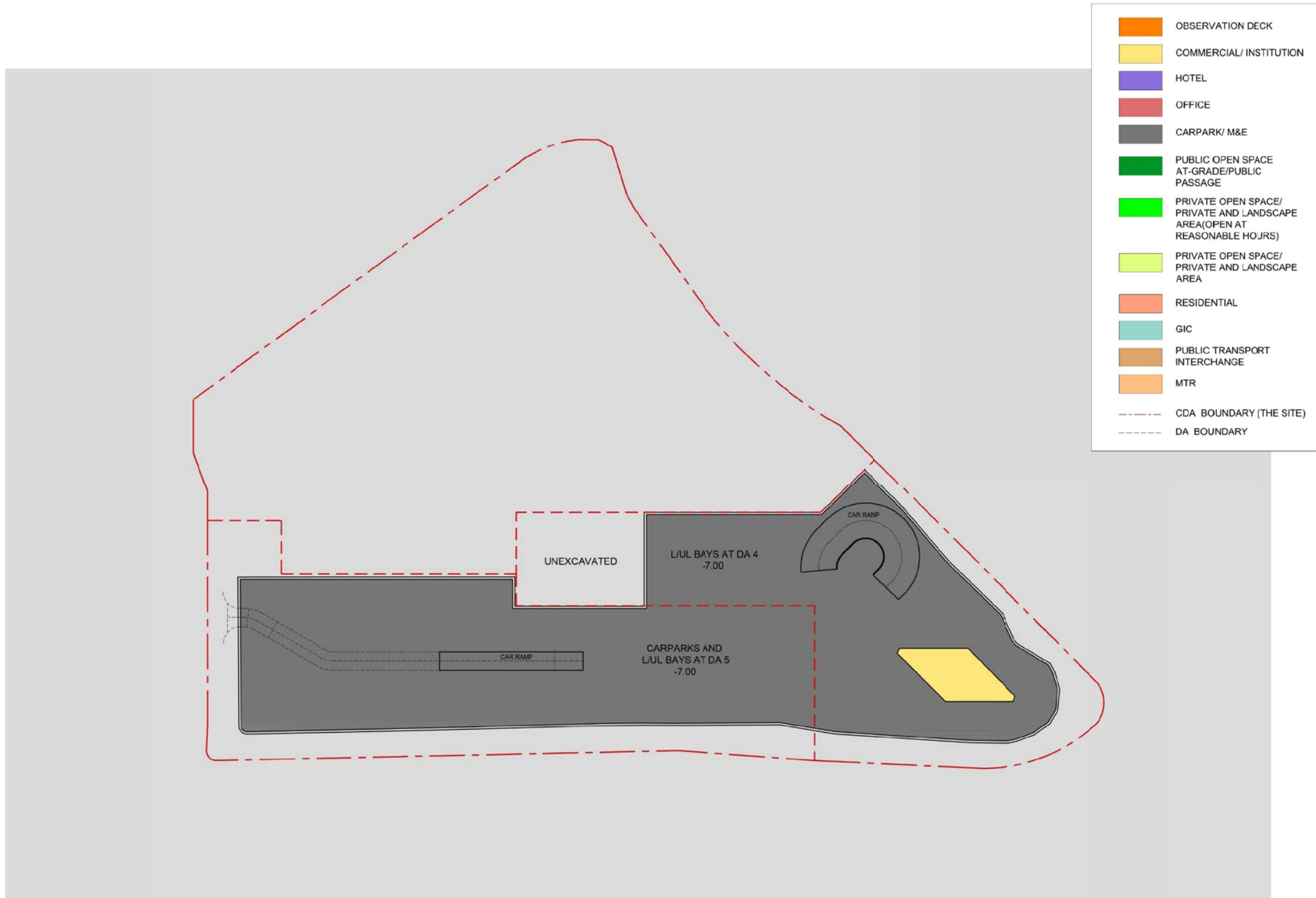




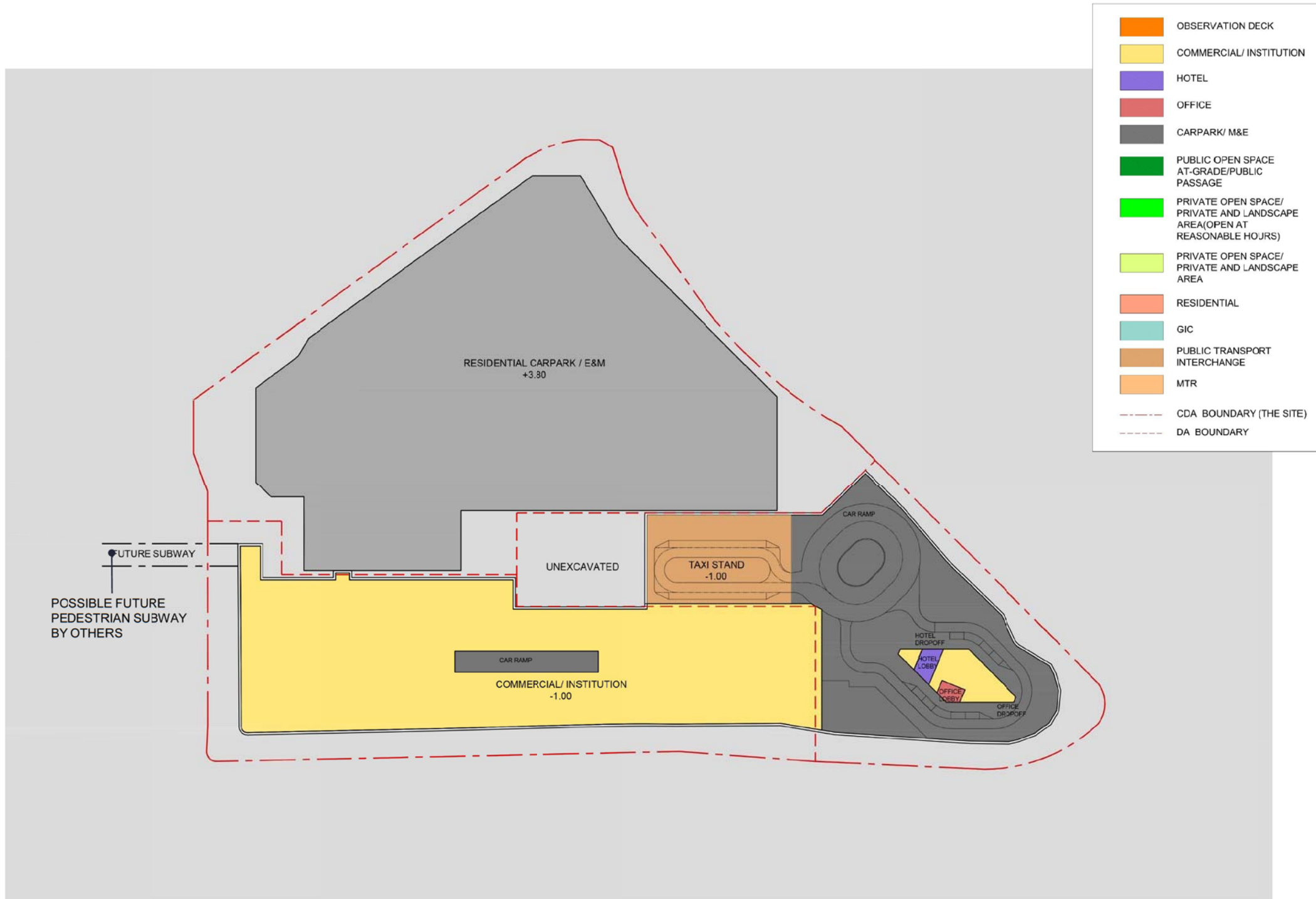












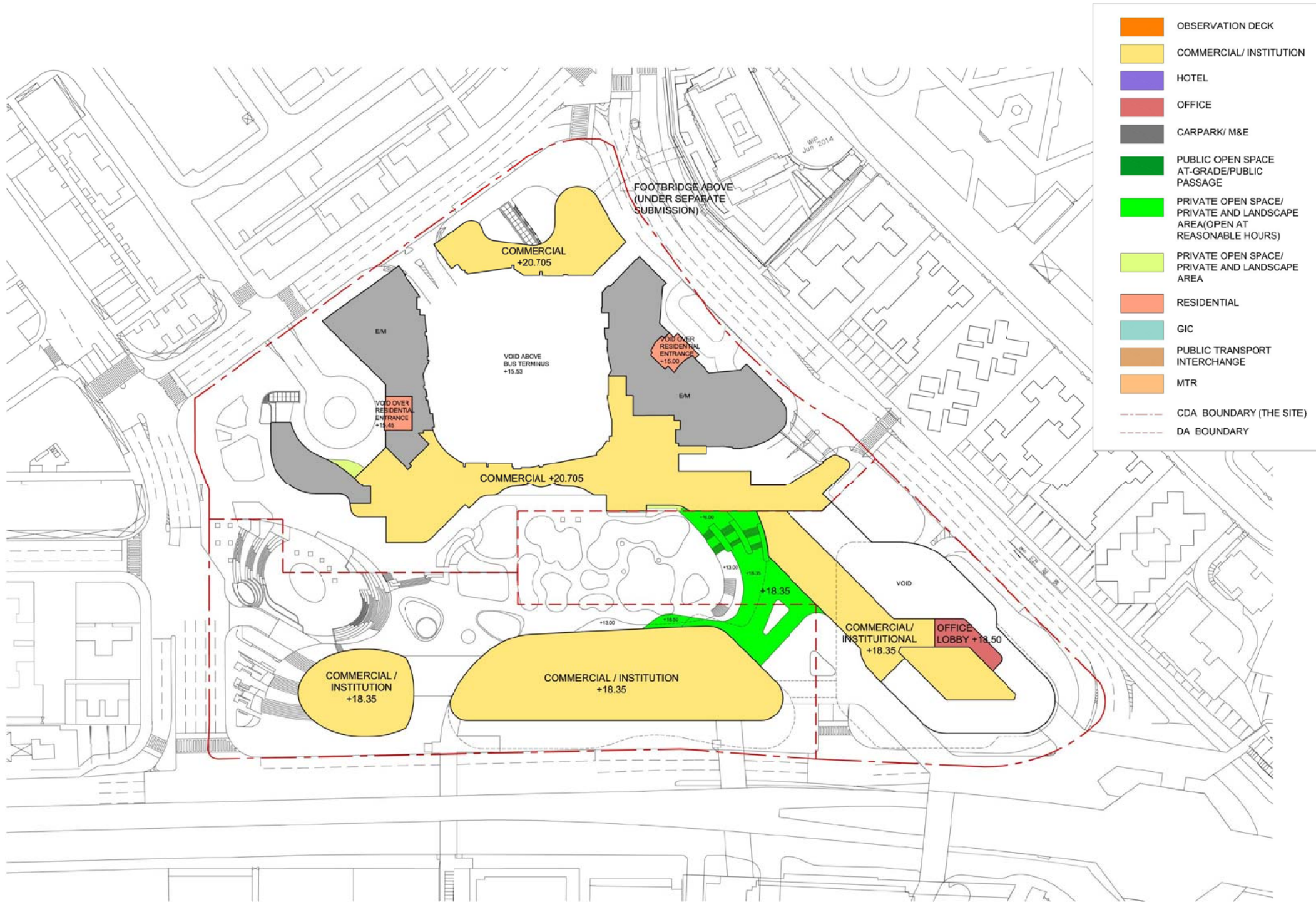












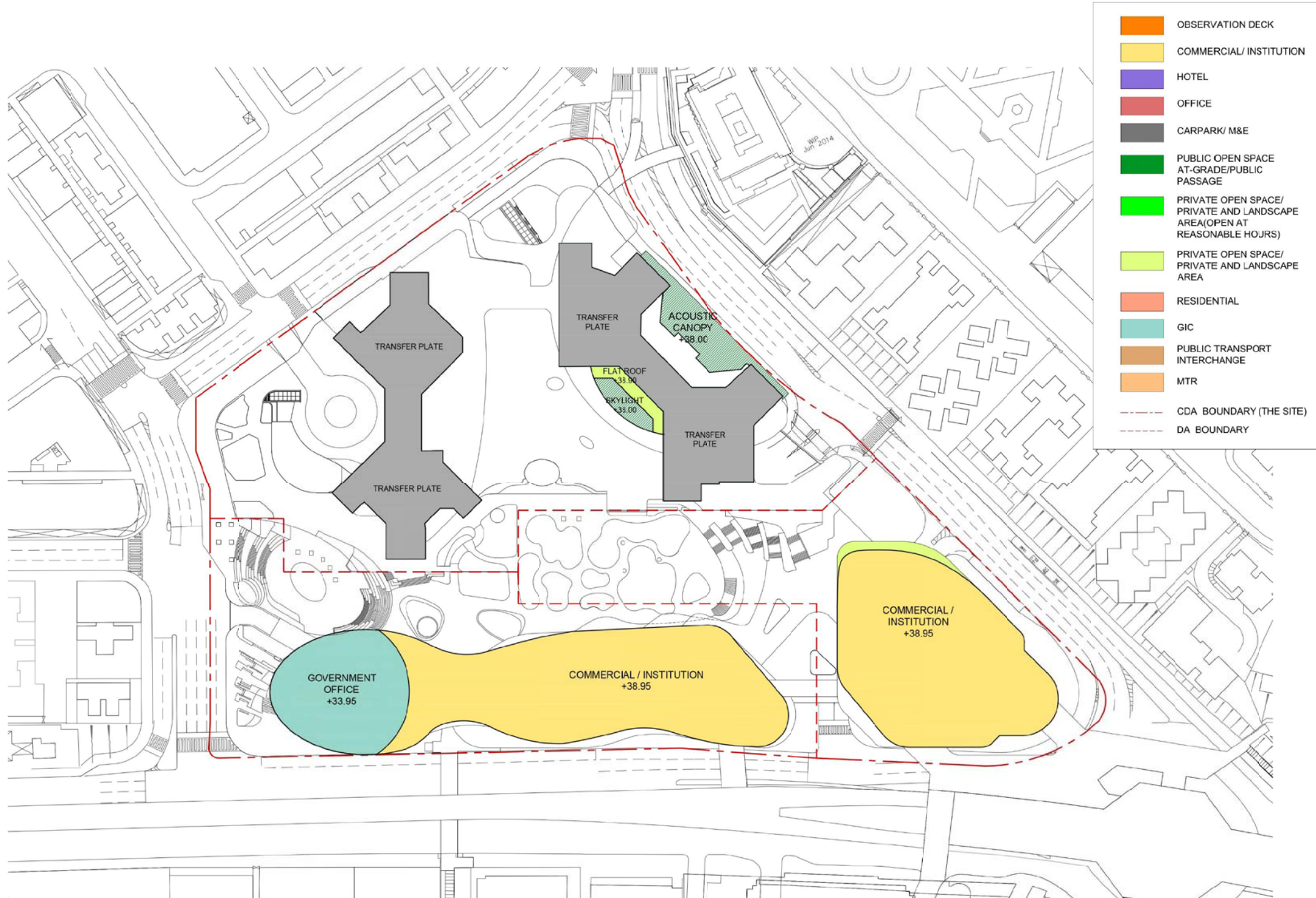


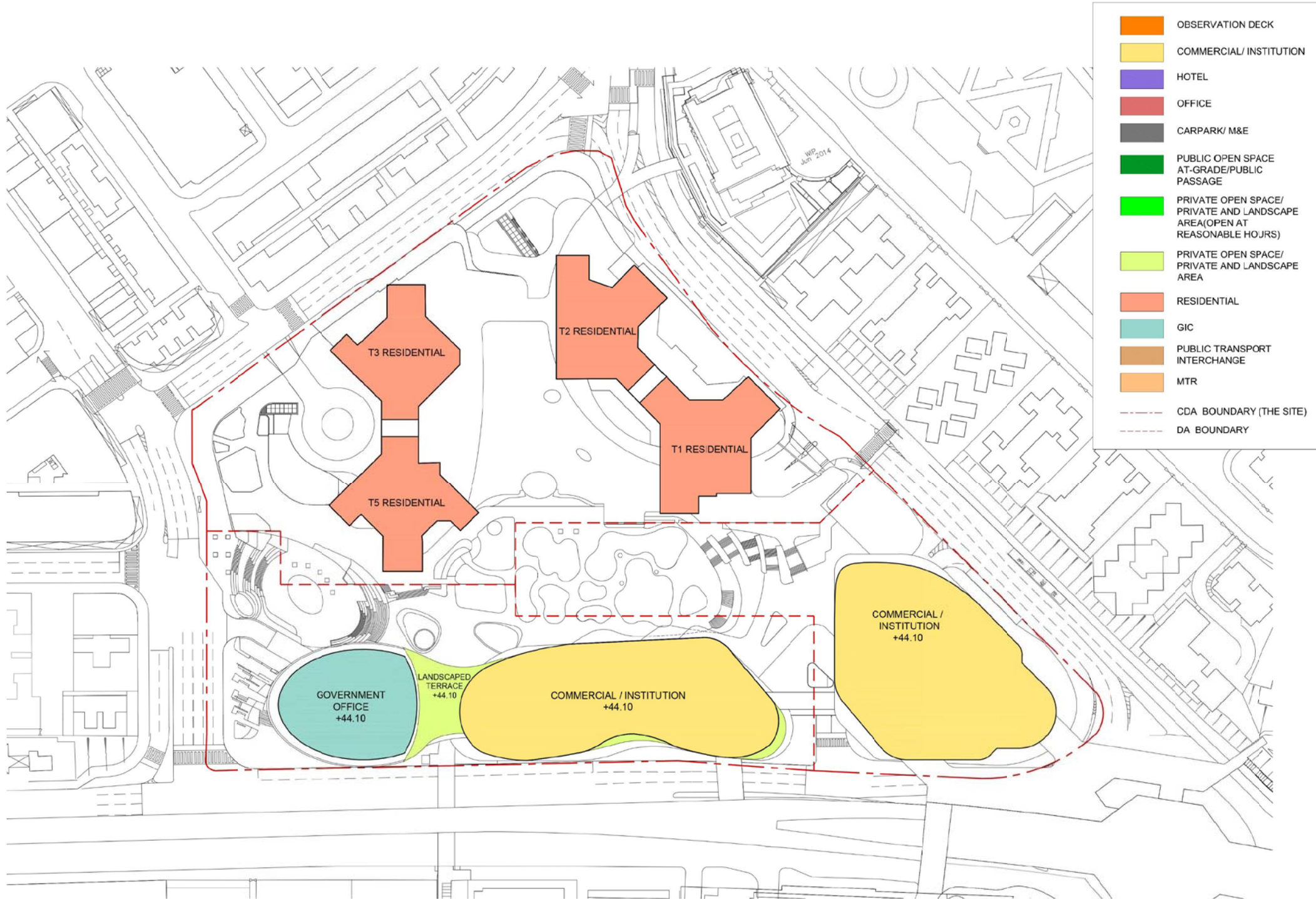




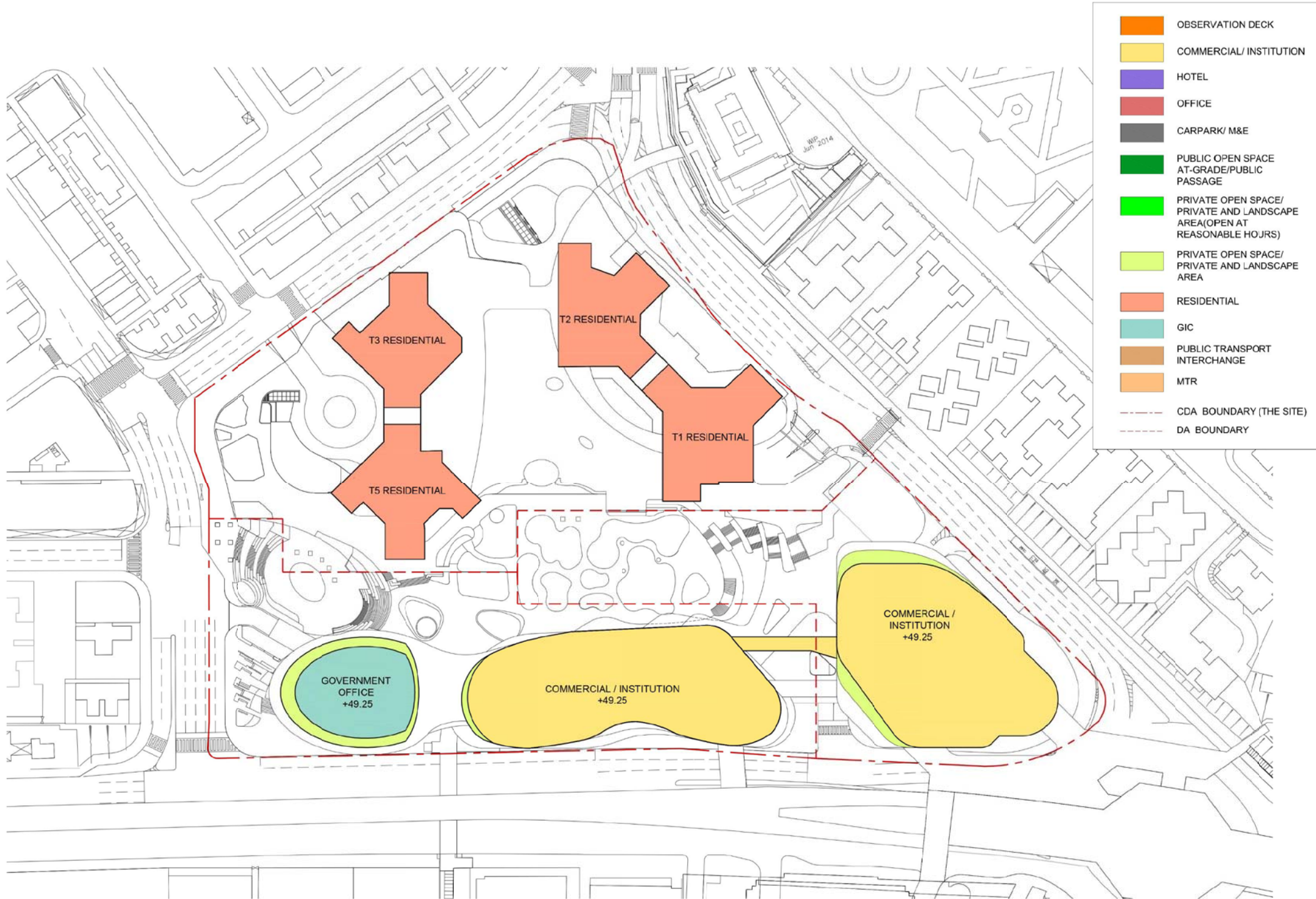


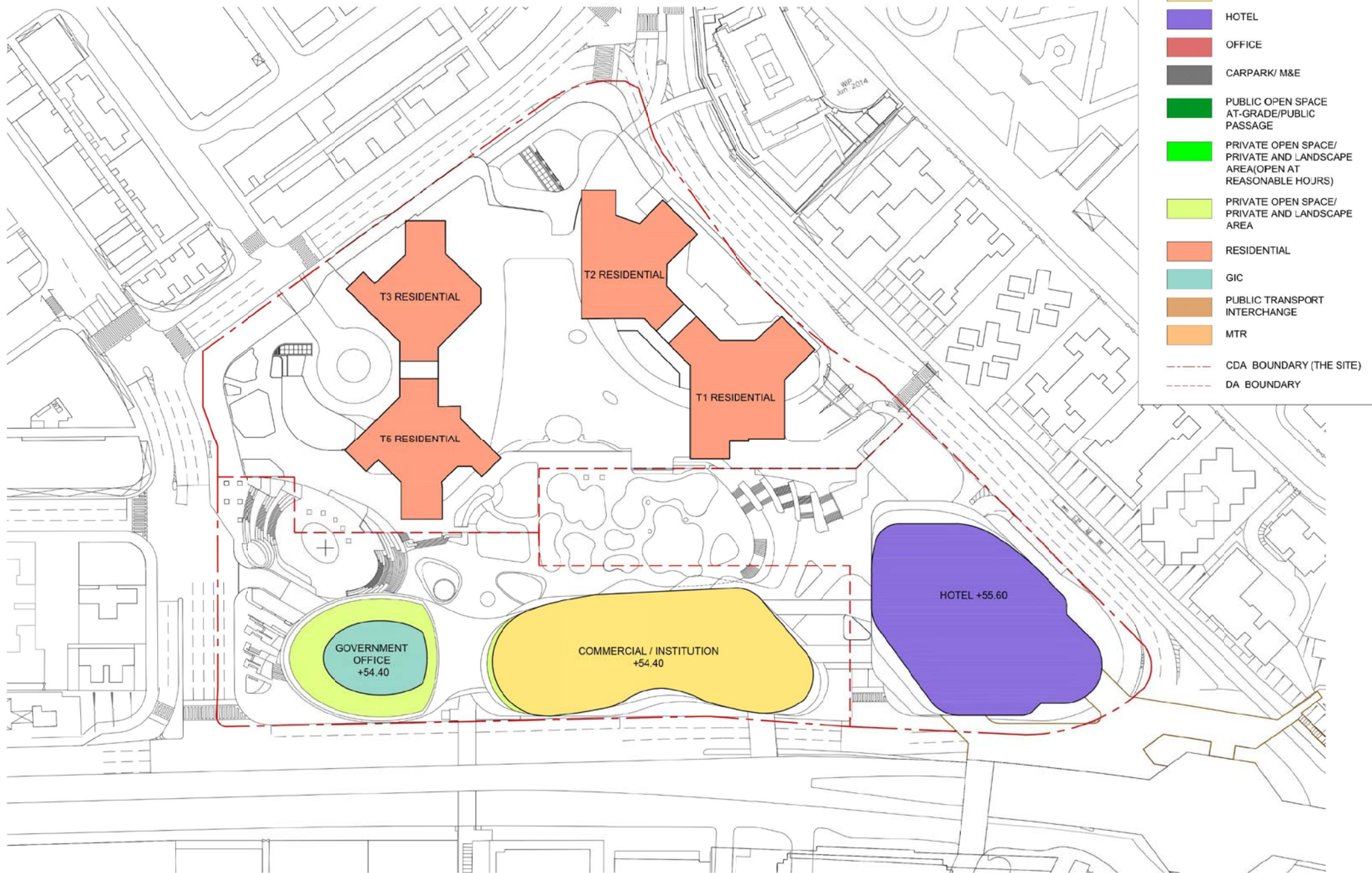






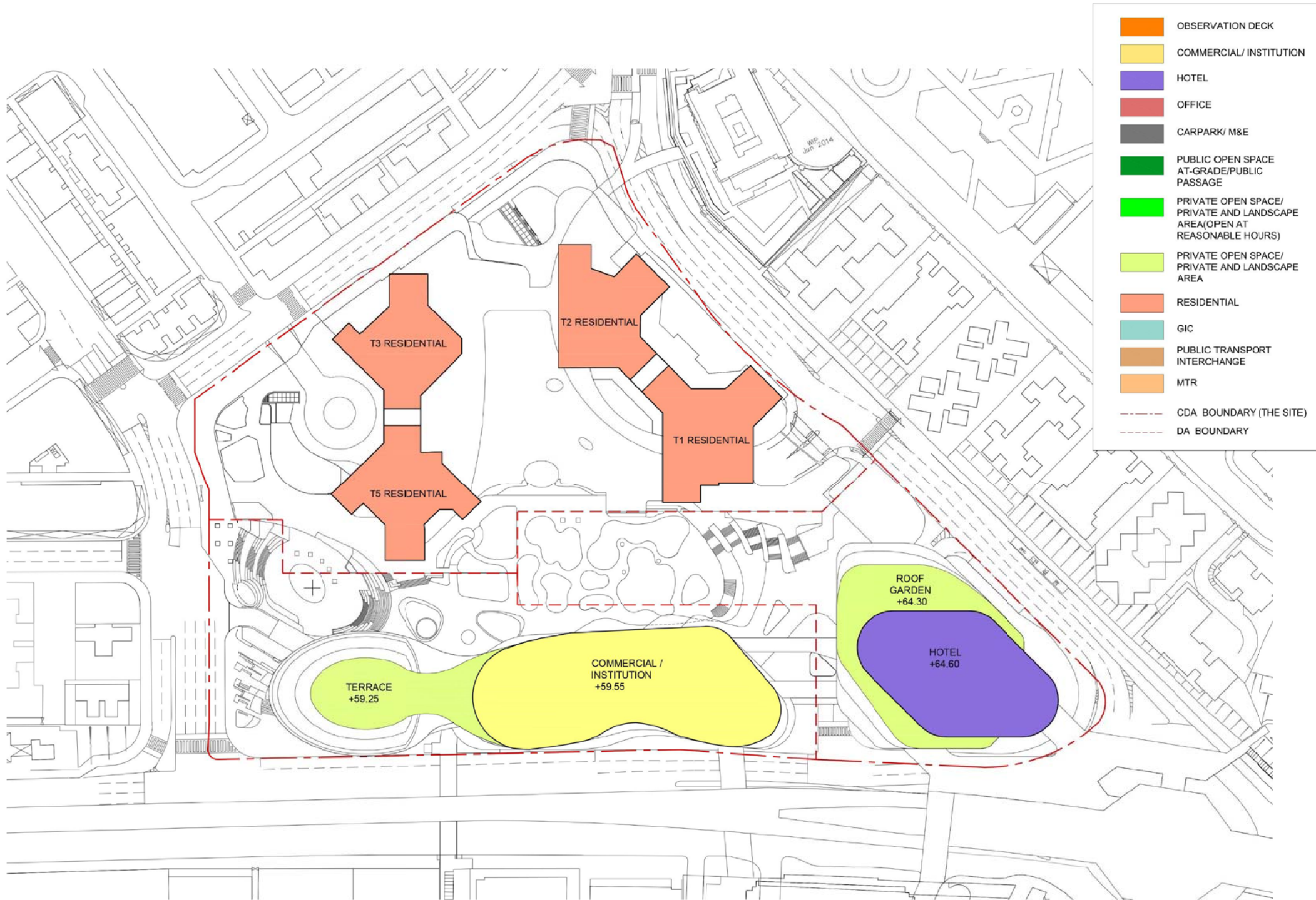


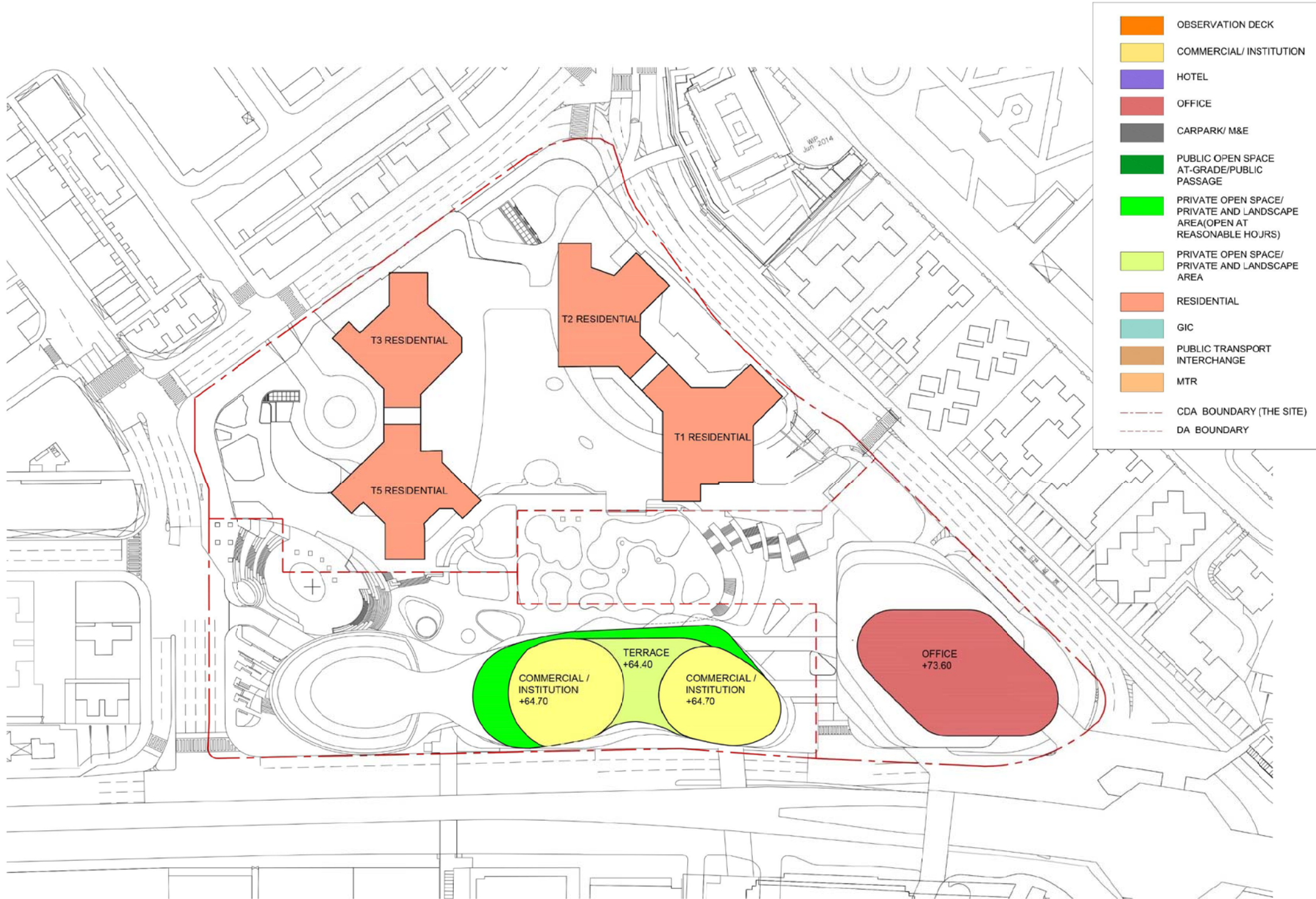




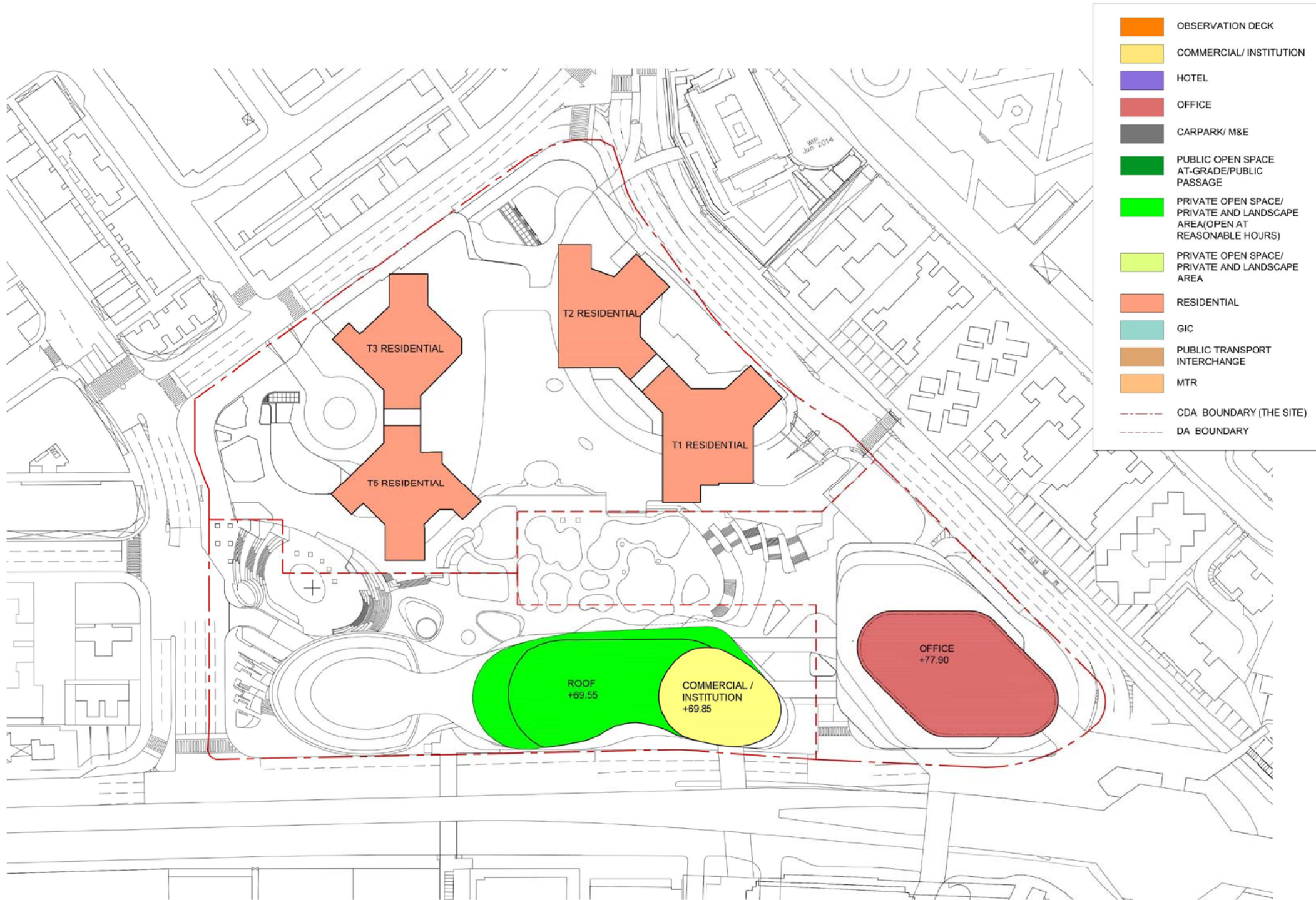
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- COMMERCIAL/ INSTITUTION
- HOTEL
- OFFICE
- CARPARK/ M&E
- PUBLIC OPEN SPACE AT-GRADE/PUBLIC PASSAGE
- PRIVATE OPEN SPACE/ PRIVATE AND LANDSCAPE AREA(OPEN AT REASONABLE HOJRS)
- PRIVATE OPEN SPACE/ PRIVATE AND LANDSCAPE AREA
- RESIDENTIAL
- GIC
- PUBLIC TRANSPORT INTERCHANGE
- MTR
- CDA BOUNDARY (THE SITE)
- DA BOUNDARY

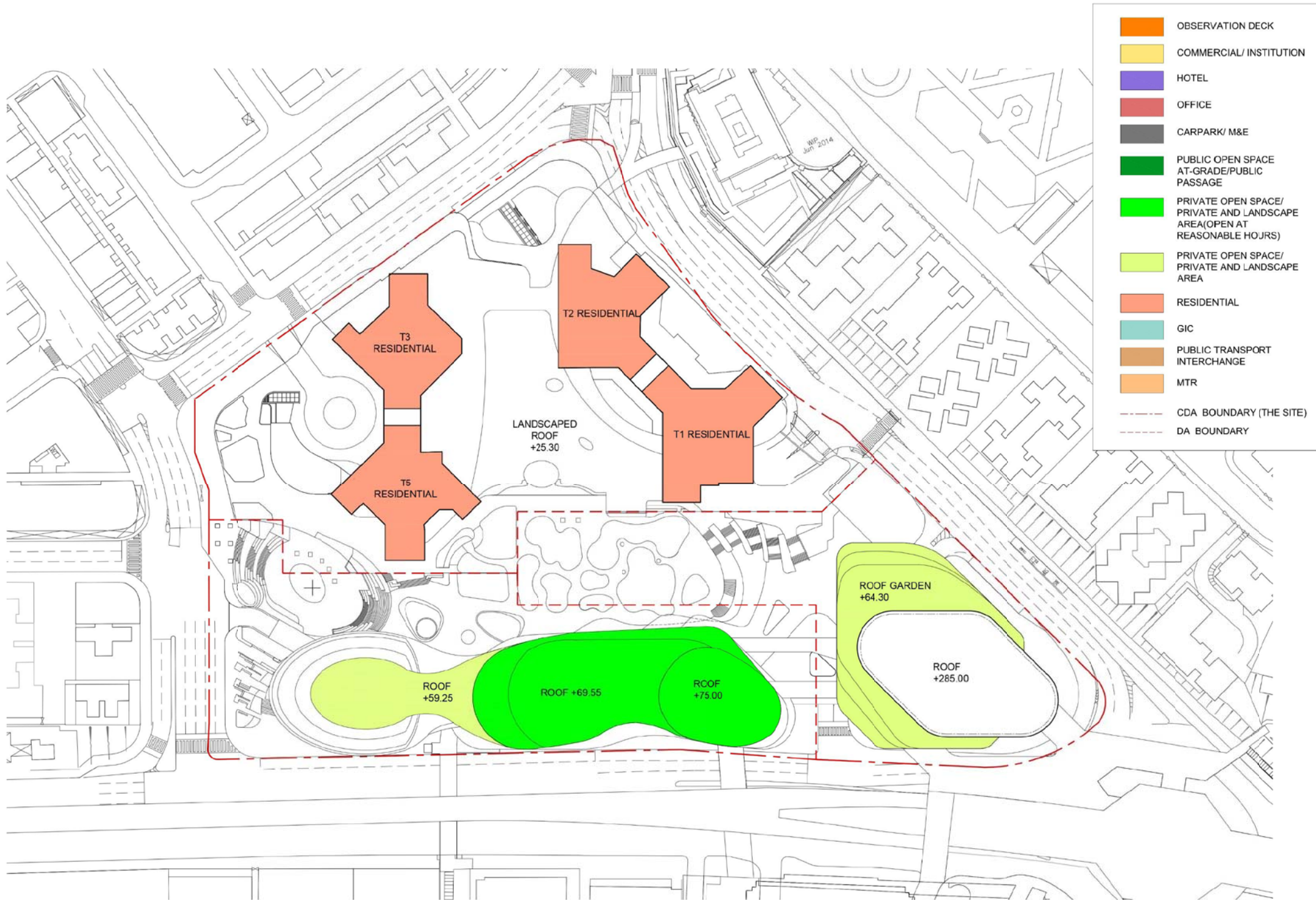




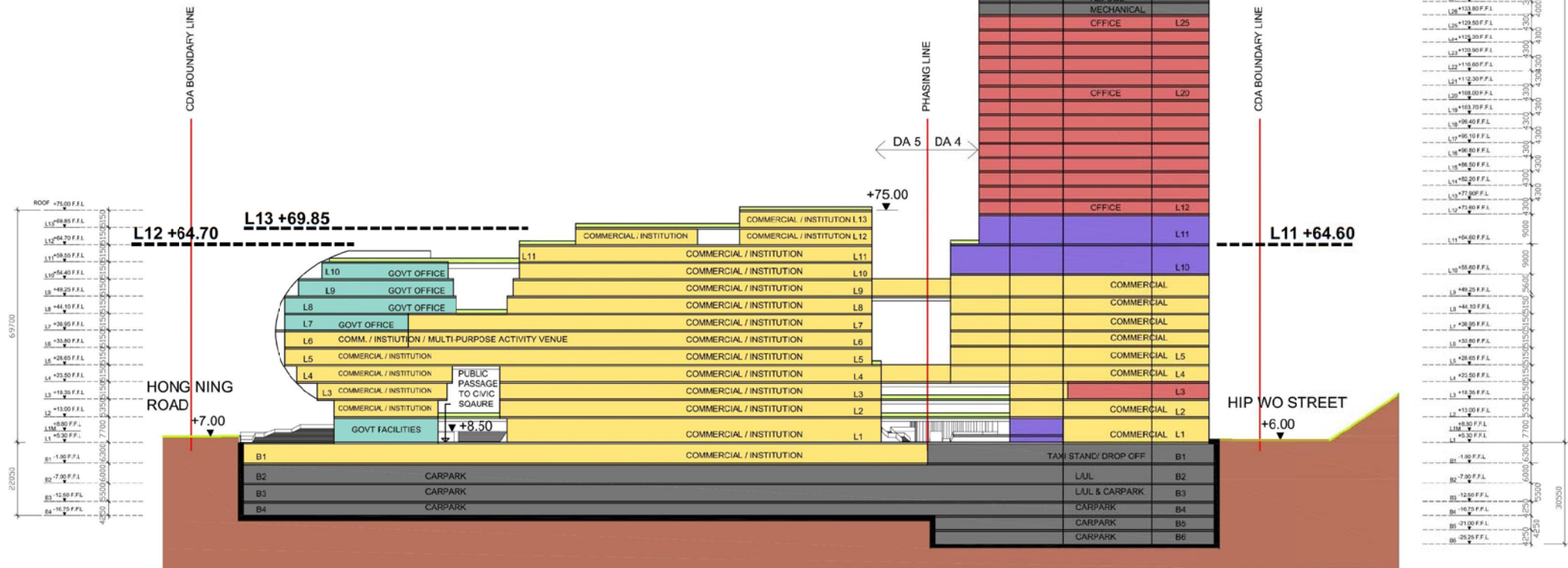


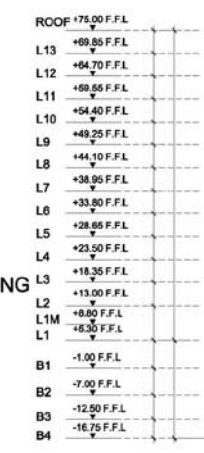
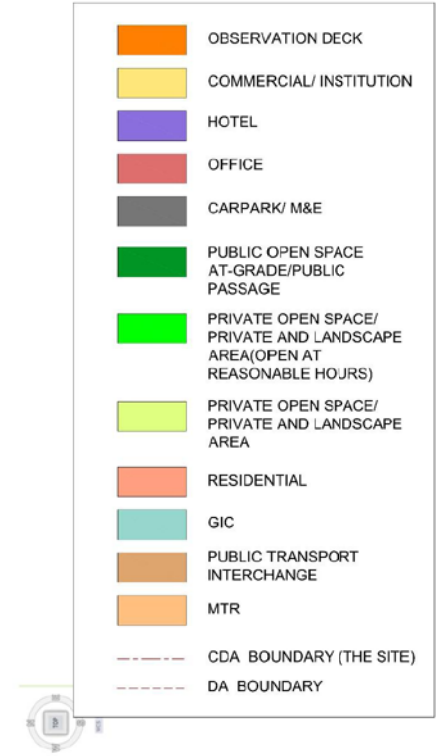
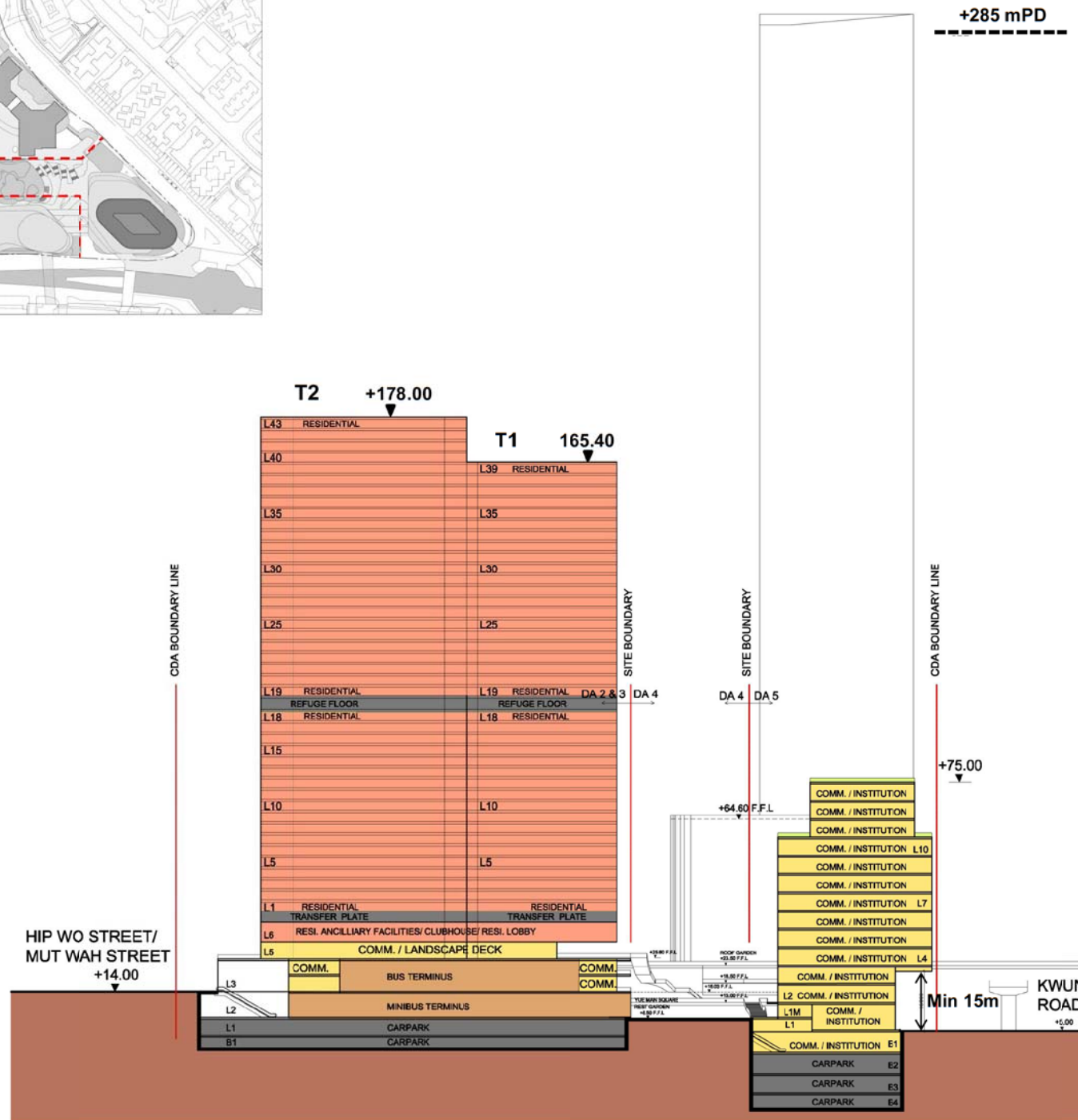
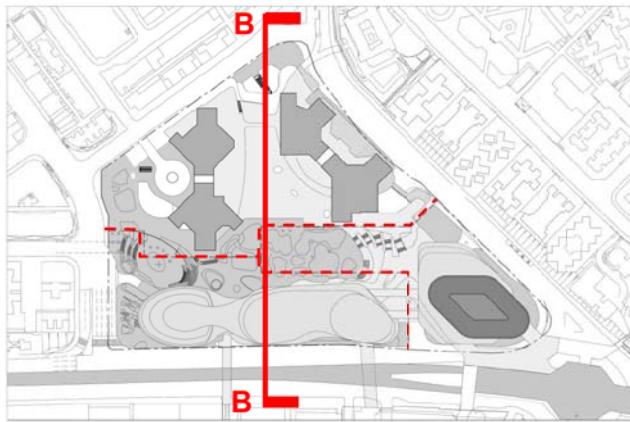




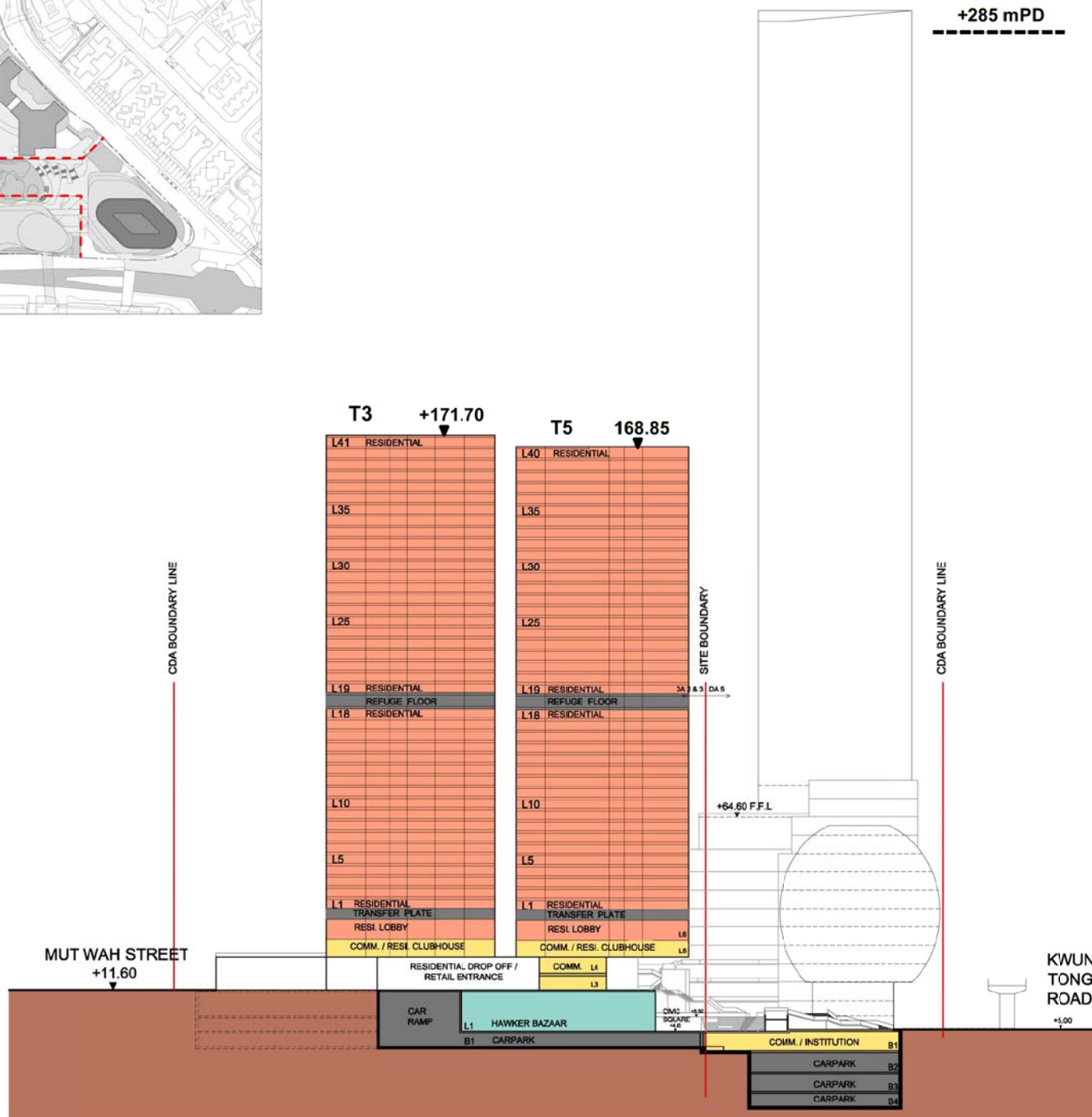
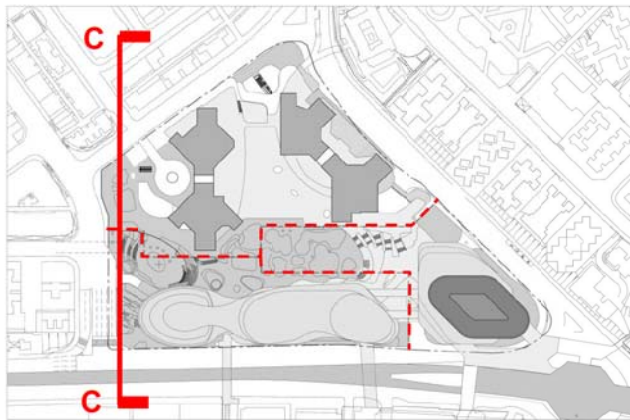






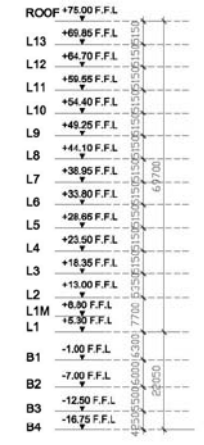






+285 mPD

- OBSERVATION DECK
- COMMERCIAL/ INSTITUTION
- HOTEL
- OFFICE
- CARPARK/ M&E
- PUBLIC OPEN SPACE AT-GRADE/PUBLIC PASSAGE
- PRIVATE OPEN SPACE/ PRIVATE AND LANDSCAPE AREA (OPEN AT REASONABLE HOURS)
- PRIVATE OPEN SPACE/ PRIVATE AND LANDSCAPE AREA
- RESIDENTIAL
- GIC
- PUBLIC TRANSPORT INTERCHANGE
- MTR
- CDA BOUNDARY (THE SITE)
- DA BOUNDARY



## **Annex 3: Landscape Master Plan (LMP)**



**S16 Planning Application  
Kwun Tong Town Centre Redevelopment Project (KTTC)  
Main Site**

**Revised Landscape Master Plan with Tree Preservation Proposal**

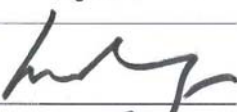


**December 2017**

Prepared By:  
**ADI Limited**



# ADI

|                      |   |
|----------------------|---|
| <b>Project Title</b> | S16 Planning Application<br>Kwun Tong Town Centre Redevelopment Project (KTTC)<br>Main Site |
| <b>Report Title</b>  | Revised Landscape Master Plan with Tree Preservation Proposal                               |
| <b>Date of Issue</b> | 08 <sup>th</sup> December 2017  |

|                    | <b>Name</b>  | <b>Signature</b>  | <b>Date</b>                    |
|--------------------|--------------|---|--------------------------------|
| <b>Compiled by</b> | Chung Ho Man |  | 08 <sup>th</sup> December 2017 |
| <b>Checked by</b>  | Elsa Kwong   |   | 08 <sup>th</sup> December 2017 |
| <b>Approved by</b> | Alison Lee   |  | 08 <sup>th</sup> December 2017 |



## TABLE OF CONTENTS

|   | Page |
|---|------|
| 1 INTRODUCTION                                  | 1    |
| 2 SUMMARY TREE PRESERVATION & REPLANTING SCHEME | 1    |
| 3 REVISED LANDSCAPE MASTER PLAN                 | 5    |
| 4 LANDSCAPE MATERIALS & MAINTENANCE             | 9    |

|             |  |
|-------------|--|
| FIGURE 8.3  | OPEN SPACE DEMARCATION PLAN – UPPER LEVELS (L2 TO ROOF OF DAS 4&5) |
| FIGURE 9.1  | ACCESSIBILITY AND CONNECTIVITY OF THE OPEN SPACES (SHEET 1 OF 5)   |
| FIGURE 9.2  | ACCESSIBILITY AND CONNECTIVITY OF THE OPEN SPACES (SHEET 2 OF 5)   |
| FIGURE 9.3  | ACCESSIBILITY AND CONNECTIVITY OF THE OPEN SPACES (SHEET 3 OF 5)   |
| FIGURE 9.4  | ACCESSIBILITY AND CONNECTIVITY OF THE OPEN SPACES (SHEET 4 OF 5)   |
| FIGURE 9.5  | ACCESSIBILITY AND CONNECTIVITY OF THE OPEN SPACES (SHEET 5 OF 5)   |
| FIGURE 10.0 | GREEN AREA CALCULATION   |
| FIGURE 11.0 | OPEN SPACE ALLOCATION IN SUB-AREAS                                 |

## FIGURES & DRAWINGS

|             |  |
|-------------|--|
| FIGURE 1.1  | TREE SURVEY PLAN   |
| FIGURE 1.2  | TREE IMPACT PLAN   |
| FIGURE 2.1  | TREE ASSESSMENT SCHEDULE - DAS 2&3                                 |
| FIGURE 2.2  | TREE ASSESSMENT SCHEDULE - DAS 4&5 (SHEET 1 OF 2)                  |
| FIGURE 2.3  | TREE ASSESSMENT SCHEDULE - DAS 4&5 (SHEET 2 OF 2)                  |
| FIGURE 2.4  | TREE SCHEDULE - TRANSPLANTED TREES IN OFF-SITE NURSERY             |
| FIGURE 4.0  | COMPENSATORY PLANTING PLAN   |
| FIGURE 5.1  | LANDSCAPE MASTER PLAN – COMBINED                                   |
| FIGURE 5.2  | LANDSCAPE MASTER PLAN – GROUND LEVELS (L1 TO L1M)                  |
| FIGURE 5.3  | LANDSCAPE MASTER PLAN – LEVEL L1 CIVIC SQUARE                      |
| FIGURE 5.4  | LANDSCAPE MASTER PLAN – TERRACED GARDENS (L2 TO L4)                |
| FIGURE 5.5  | LANDSCAPE MASTER PLAN – SKY GARDENS AND ROOF PLAN (L5 TO ROOF)     |
| FIGURE 6.1  | LANDSCAPE SECTION A  |
| FIGURE 6.2  | LANDSCAPE SECTION B  |
| FIGURE 6.3  | LANDSCAPE SECTION C  |
| FIGURE 6.4  | LANDSCAPE SECTION D  |
| FIGURE 6.5  | INDICATIVE LANDSCAPE BLOW-UP PLAN AND SECTION SHEET 1 OF 6         |
| FIGURE 6.6  | INDICATIVE LANDSCAPE BLOW-UP PLAN AND SECTION SHEET 2 OF 6         |
| FIGURE 6.7  | INDICATIVE LANDSCAPE BLOW-UP PLAN AND SECTION SHEET 3 OF 6         |
| FIGURE 6.8  | INDICATIVE LANDSCAPE BLOW-UP PLAN AND SECTION SHEET 4 OF 6         |
| FIGURE 6.9  | INDICATIVE LANDSCAPE BLOW-UP PLAN AND SECTION SHEET 5 OF 6         |
| FIGURE 6.10 | INDICATIVE LANDSCAPE BLOW-UP PLAN AND SECTION SHEET 6 OF 6         |
| FIGURE 7.0  | GENERAL LEVELS PLAN  |
| FIGURE 8.1  | OPEN SPACE DEMARCATION PLAN – OVERALL                              |
| FIGURE 8.2  | OPEN SPACE DEMARCATION PLAN - AT GROUND LEVELS (L1&L1M OF DAS 4&5) |

## TABLES

|           |  |
|-----------|--|
| TABLE 2.1 | SUMMARY OF TREE SPECIES AND NUMBER OF TREES  |
| TABLE 2.2 | COMPARISON OF NUMBER OF EXISTING LIVING TREES BETWEEN AND APPROVED TRA IN 2012 CURRENT CONDITION |
| TABLE 2.3 | COMPARISON BETWEEN THE UPDATE TREE PRESERVATION PROPOSAL AND THE APPROVED TRA AND TPS            |
| TABLE 2.4 | SUMMARY OF TREATMENT OF TRANSPLANTED TREES WITHIN THE MAIN SITE                                  |
| TABLE 2.5 | PROPOSED TREE SPECIES FOR COMPENSATORY PLANTING IN THE APPROVED TRA                              |
| TABLE 2.6 | PROPOSED TREE SPECIES FOR COMPENSATORY PLANTING FOR T55  |
| TABLE 2.7 | PROPOSED TREE SPECIES FOR COMPENSATORY PLANTING FOR T11, T51 AND T52                             |
| TABLE 2.8 | SUMMARY OF COMPENSATORY TREES WITHIN THE MAIN SITE   |
| TABLE 2.9 | SUMMARY OF TREES WITHIN THE MAIN SITE  |
| TABLE 3.1 | PROPOSED CANDIDATE PLANTING LIST   |
| TABLE 4.1 | SUMMARY OF KEY HARD LANDSCAPE ELEMENTS   |
| TABLE 4.2 | SUMMARY OF RESPONSIBLE LANDSCAPE MANAGEMENT AND MAINTENANCE PARTIES                              |

## 1 INTRODUCTION

### 1.1 Background

The Urban Renewal Authority (URA) submitted a planning application to the Town Planning Board (TPB) in April 2017 for a revised Master Layout Plan for the Kwun Tong Town Centre (KTTC) Project (Application No. TPB/A/K14/745). In view of land clearance and acquisition issues arising from illegal occupiers within Development Area 5 (DA5), and in order to facilitate the earlier implementation of Yue Man Square rest garden (YMSRG) within DA4 for public enjoyment and to provide pedestrian connections between the MTR Kwun Tong station, DAs 1, 2, 3 & 4, YMSRG within DA4 and adjacent neighbourhoods including Sau Mau Ping, it was proposed to separate DAs 4 and 5 into two different phases.

During the TPB's publication period from 22 August to 12 September 2017, apart from comments from various Government departments on the planning aspects, views on the detailed architectural and landscape design of the project were received from the Kwun Tong District Council (KTDC) and the community, covering among others, detailed design of the Government offices cum commercial development facing Hong Ning Road and Kwun Tong Road, as well as detailed landscape design of the YMSRG. In response to the public's views, URA decided to advance the detailed architectural and landscape design of the Project, as well as some of the related technical assessments, with an aim to integrate design elements of these public aspirations as far as practicable, as our commitment to maintain the 'essence' of the design intention as contained in the previously approved Master Layout Plan. These particularly included a civic landmark at Government office cum commercial building at DA5, stepped height profile for DA5 building and cascading garden design with proper water and landscape features within the public open spaces at DAs 4&5, as well as enhanced connections to the MTR Kwun Tong Station.

Tree preservation proposal is the same as shown in April 2017 submission, here contained in this submission for reference. Landscape and tree provisions are made with reference to Approved Scheme by Town Planning Board (TPB) in 2015, Approved Tree Preservation and Tree Removal Application (TRA) in 2012, the Landscape Master Plan (LMP) submission for Development Areas (DAs) 2&3 and the Approved Tree Preservation Scheme (TPS) in compliance with the planning landscape condition in 2017. The following is a summary of the amendments in the Revised Scheme related to landscape and tree provisions:

**Development Area/Phasing Boundary** – Change of phasing boundary of DA 4 to include the Yue Man Square Rest Garden (YMSRG) into DA4.

**DA 2** – Inclusion of a single-storey 'Anchor Shop' at +25.30 Level of Private Landscape Areas within DA2. Open space and greening provision largely remain unchanged as proposed in the LMP submission in 2017.

**DA 3** – Removal of a staircase access with seating area connecting DA3 to Hawker Bazaar to open up the Civic Square. The staircase arrangement is an interim scheme to maintain the existing underground drainage system, the drainage system will be diverted during the implementation of DA5.

**DA 4 & 5** – Further development of the buildings, Yue Man Square Rest Garden and associated open spaces and landscape provision according to the revised MLP. Edge planting incorporated on the articulated edge of the buildings to soften the building mass and maximised greening opportunities for KTTC.

**Tree Condition and Tree Treatment Updated on April 2017 submission** – Reviewed condition change of retained trees and transplanted trees on temporary hold within the Site, and recommend tree compensatory and planting proposals. This revised LMP provides the same tree preservation, transplanting proposal and compensatory planting proposal as in the April 2017 submission. Subject to drainage diversion proposal in area adjacent to Hawker Bazaar in DA3, some new tree planting location in DA 2 & 3 has been adjusted to maintain the same numbers of compensatory and new trees planting as in the previous LMP submission.

**DA 4** – Terraced Gardens and Water Gardens incorporated to the east of YMSRG.

**DA 5** – Open up the Civic Square to create a better connection to Hawker Bazaar and Kwun Tong Road and to provide a multi-functional space for gathering and occasional event. Stepped seating areas and Grand Staircase incorporated to enhance the entrance from Kwun Tong Road and connection to DA5 landmark building.

## 2 SUMMARY TREE PRESERVATION & REPLANTING PROPOSAL

### 2.1 Findings of Tree Survey

The Tree Survey is based on the Tree Survey Plan in the Approved TPS (2016). Condition of existing trees within the Main Site (DAs 2-5) has been reviewed by ADI in March 2017. According to current conditions, a total of 62 nos. of existing trees are located within the Main Site. All of the surveyed trees are of common species found in Hong Kong. Of these surveyed trees, 13 trees are found in areas under the Lease of NKIL 6514 (DAs 2 & 3), 49 trees are found within DAs 4 & 5. **Figure 1.1** Tree Survey Plan shows the location of existing trees recorded within the Site. Condition of existing trees is listed in the **Figure 2.1 to 2.3**. **Figure 2.4** shows the transplanted trees currently holding in offsite nursery. Photographic Record of Tree Survey refers to the April 2017 submission.

The trees comprise 19 different species. Two species are native to Hong Kong (16% of total quantity of trees) and the remaining are common plantation species for parks and gardens. Dominant tree species include *Aleurites moluccana*, *Bombax ceiba*, *Ficus microcarpa* and *Roystonea regia*. The species of surveyed trees and number of each tree species are summarised in **Table 2.1** below.

**Table 2.1 – Summary of Tree Species and Number of Trees**

| Botanical Name                                    | Chinese Name | Quantity  |
|---|--------------|-----------|
| <i>Aleurites moluccana</i>                        | 石栗           | 5         |
| <i>Araucaria columnaris</i>                       | 異葉南洋杉        | 3         |
| <i>Archontophoenix alexandrae</i>                 | 假檳榔          | 4         |
| <i>Bombax ceiba</i>                               | 木棉           | 6         |
| <i>Callistemon viminalis</i>                      | 串錢柳          | 3         |
| <i>Cratogeomys unilobularis</i>                   | 樹頭菜          | 1         |
| <i>Ficus elastica</i>                             | 印度榕          | 2         |
| <i>Ficus microcarpa</i> *                         | 榕樹           | 7         |
| <i>Hibiscus tiliaceus</i>                         | 黃槿           | 1         |
| <i>Hyophorbe iagenicaulis</i>                     | 酒瓶椰子         | 3         |
| <i>Lagerstroemia speciosa</i>                     | 大花紫薇         | 4         |
| <i>Livistona chinensis</i>                        | 蒲葵           | 4         |
| <i>Macaranga tanarius</i> var. <i>tomentosa</i> * | 血桐           | 3         |
| <i>Roystonea regia</i>                            | 大王椰子         | 2         |
| <i>Ravenala madagascariensis</i>                  | 旅人蕉          | 5         |
| <i>Schefflera actinophylla</i>                    | 輻葉鵝掌柴        | 2         |
| <i>Spathodea campanulata</i>                      | 火焰樹          | 1         |
| <i>Syegrus romanzoffiana</i>                      | 皇后葵          | 2         |
| <i>Syzygium jambos</i>                            | 蒲桃           | 4         |
| <b>Total:</b>                                     |              | <b>62</b> |



It was found that majority of trees have a good to fair tree form and are in good to fair conditions, and exhibit medium amenity value. Besides, transplanted trees in the temporary holding nursery within the Site were hard pruned with deformed trunk and broken branches, imbalance form and structural defects. Seven mature specimens were found with medium amenity value as they are mature in size and are good health condition. Their retention or transplanting proposals remain unchanged as in the previously approved TPS.

There are no rare or protected species, or other Champion Trees found within the Site or in the immediate vicinity.

2 nos. of trees (**T36 and T37**) as registered OVTs under ETWB TC(W) No. 29/2004. These are 2 nos. of *Ficus elastica* (LCSD/KT/2 and LCSD/KT3) found in Yue Man Square rest garden.

Tree **T33**, *Ficus microcarpa*, is a significant tree with high amenity value to be retained in Yuen Man Square rest garden with OVTs mentioned above.

Other than the existing trees recorded on site, there are 10 nos. of transplanted trees (T15, T16, T17, T19, T20, T123, T124A, T125, T126 and T127) which were already transplanted to an off-site temporary holding nursery after the TRA was approved in 2012 to facilitate the Interim Re-provision of Government Facilities. **Figure 2.4** Tree Schedule – Transplanted Trees in off-site nursery refers. The photographic records of those 10 nos. of transplant trees refer to the regular quarterly tree monitoring report submitted to Lands Department.

A total of 4 nos. trees will be transplanted from Yuet Wah Street Site (DA1) to DA 2 of the Main Site including T94(YW), T98(YW), T103(YW) and T106(YW) after completion of works. **Figure 2.4** Tree Schedule – Transplanted Trees in off-site nursery refers.

A tree condition review has been conducted in March 2017, and listed in the April 2017 submission, with changes summarised as follows:

- Dead Tree **T88** has been removed from the site according to the TPS approved in 2016.
- Tree **T26** has been removed due to tree incident according to the TPS approved in 2016.
- Tree **T52** in Yue Man Square rest garden has been removed by the maintenance department. One retained tree has been removed from the current Tree Preservation Proposal.
- Trees **T51 and T11** are proposed to be felled under the current scheme due to its change of health and structural stability condition, they are proposed to be felled under the current scheme instead of retention or transplanting respectively in the approved TRA and approved TPS. These trees within DA4 are currently located in Yue Man Square rest garden and on the pavement adjacent to Hip Wo Street.

**Table 2.2 – Comparison of number of existing living trees between and approved TRA in 2012 current condition**

| Item                        | Approved TRA in 2012          | Approved TPS in 2016       | Application No. A/K14/745 2017 | Remarks  |
|-----------------------------|-------------------------------|----------------------------|--------------------------------|--|
| Retain Tree                 | 30                            | 34                         | 33                             | <u>2017: 1 no. of retained tree (T51) is proposed to be felled due to its change of health and structural stability condition.</u>   |
| Transplant Tree             | 49                            | 29                         | 27                             | 10 nos. of transplant trees were already transplanted to an offsite temporary holding nursery<br><br>1 no. of transplant tree (T26) was severely damaged by traffic accident, it is removed by relevant government department and reported to DLO<br><br><u>2017: 1 no. of transplant tree (T11) is proposed to be felled due to its change of health and structural stability condition.</u><br><br><u>2017: 1 no. of transplant tree (T52) located within Yue Man Square Rest Garden has been removed by maintenance department.</u>   |
| Fell Tree #                 | 5                             | 0                          | 0                              | All 5 nos. of fell trees already felled by URA to facilitate the provision of temporary government facilities  |
| Fell Tree ^                 | 0                             | 10                         | 0                              | 9 nos. of fell trees which were severely damaged by Typhoon and removed by relevant government department. They are not considered as existing trees in the current site.<br><br>1 no. of fell tree which was severely damaged by traffic accident and removed by relevant government department. It is not considered as existing trees in the current site.  |
| Fell Tree 2017              |                               |                            | 2                              | <u>2017: 2 nos. of existing tree (T11 and T51) are proposed to be felled due to their change of health and structural stability condition from the original retain and transplant proposal.</u>  |
| Total Nos. of Trees on Site | 84<br>(Included 2 dead trees) | 63<br>(Plus T88 dead tree) | 62                             | <b>84</b> (86 nos. of trees in the approved TRA in 2012 = 84 nos. of Living Trees recorded + 2 nos. of dead trees)<br><b>-2</b> (Retained Trees removed by Government after typhoon)<br><b>+6</b> (New Retained Trees found in current site)<br><b>-20</b> (10 Transplant Trees transplanted to temporary nursery<br>(6 Transplant Trees removed by Government after typhoon "Vincente")<br>(1 Transplant Trees removed by Government after typhoon "Kalmaegi")<br>(1 Transplant Tree was found missing)<br>(1 Transplant Tree was found dead and removed by URA)<br>(1 Transplant Tree removed by Government after traffic accident)<br><b>-5</b> (Fell Trees already felled by URA)<br><b>-1</b> (1 Transplant Tree located within Yue Man Square Rest Garden removed by maintenance department)<br><b>=62 (Current total Nos. of Trees on Site)</b> |

Note: # 5 Trees were recommended to be felled in approved TRA in 2012.

^ 9 Trees were severely damaged by typhoon and removed by relevant government department

^ 1 Tree was severely damaged by traffic accident and removed by relevant government department

## 2.2 Tree Recommendations

Recommendations for works on the affected trees within the Site are shown in the **Figure 2.1 to 2.3 Tree Assessment Schedule**.

**Table 2.3- Comparison between the update Tree Preservation Proposal and the Approved TRA and TPS**

| Recommendation  | Approved TRA in 2012<br>(Application No. TPB/A/K14/576) | Approved Tree Preservation Scheme in 2016<br>(Application No. TPB/A/K14/727) | Current Scheme     |
|---|---|--|--------------------|
| Trees to be Retained within Site  | 30  | 34   | 33                 |
| Trees to be Transplanted on site (recorded within Site)                   | 18  | 19   | 15                 |
| Trees to be further transplanted to an off-site temporary holding nursery | 31  | 10   | 12                 |
| Trees to be Felled  | 5   | 0  | 2<br>(T51 and T11) |
| <b>Total</b>  | <b>84</b>   | <b>63</b>  | <b>62</b>          |
| Dead Trees Felled or Removed  | 2   | 1  | 0                  |
| Tree Removed by Maintenance Department                                    | 0   | 10   | 1 (T52)            |

Note: The total number of existing trees in update survey is different from the recorded in the tree survey of the approved TRA or TPS as some of the old/dead trees have been damaged by typhoon or traffic accident and/or removed by maintenance departments. There are new trees planting for replacement within the area observed in 2016. A tree in Yuen Man Square rest garden has been removed due to the same reason in 2017. Another 14 nos. of transplanted trees are currently holding in off-site nursery and to be replanted to DA 4 & 5 after works completed.

## 2.3 Overall Tree Planting Proposal

This section will focus on the Overall Tree Planting Proposal of the Site, which covers all the trees within the Site after completion of works including retained trees, transplanted trees, compensatory trees and new trees as shown on **Figure 4.0 Compensatory Planting Plan**. **Table 2.4** summarised the treatment of transplanted trees.

DAs 2 to 5 of the Main Site would able to accommodate **504** nos. trees. They are categorized as below:-

### Trees to be retained

A total of **33** nos. existing trees will be retained in-situ. All of these trees are located within DAs 4 in Yue Man Square rest garden.

### Trees to be transplanted on site

A total of **15** nos. existing trees will be transplanted within the Site.

These trees are in conflict with the proposed scheme and include the following:-

- **2** trees within DAs 2 & 3 to be transplanted directly to the final receptor locations
- **10** trees within DAs 2 & 3 to be transplanted to a temporary locations within the Site before transplanting to the final receptor locations
- **3** trees within DAs 4 to be transplanted to the final receptor location adjacent to Yue Man Square rest garden considered that these trees are mature and relatively less tolerant transplanting to temporary holding nursery. The receptor site mentioned above is located adjacent to unexcavated area holding the retained trees. Proposed planting area/planter will be formed at early stage during the implementation of DA4 receiving of these transplanted trees as early as technically feasible.

### Trees to be transplanted to offsite temporary holding nursery and back to site

**10** nos. of transplanted trees (T15, T16, T17, T19, T20, T123, T124A, T125, T126 and T127) were already transplanted to an off-site temporary holding nursery after the TRA approved in 2012. These trees will be largely replanted to DA5 in planting areas in proposed Civic Square whilst trees T19 and T20 will be replanted in a new planter extension area at Hip Wo Street adjacent to preserved tree T9.

Another **4** nos. of trees originally located in Yuet Wah Street Site (DA1) including T94(YW), T98(YW), T103(YW) and T106(YW) were already transplanted to an off-site temporary holding nursery after the TRA approved in 2012. Trees will be replanted in DA2.

**11** trees within DAs 4 & 5 and **1** tree temporary hold within DAs 2 & 3, which are currently found on Site, to be transplanted to offsite temporary holding nursery before replanting to final receptor location in DA5.

**Table 2.4 – Summary of treatment of Transplanted Trees within the Main Site**

| Treatment   | No. of Trees in this submission | Tree ID  | Original Location    | Final Receptor Location |
|---|---------------------------------|--|----------------------|-------------------------|
| Existing trees to be transplanted on the site   | 15                              | 12 trees (T24, T25, T27, T77, T82, T84, T87, T89, T90, T91, T92 and T93)   | DAs 2 & 3            | DAs 2 & 3               |
|   |                                 | 3 trees (T10, T13, T14)  | DA 4                 | DA 4                    |
| Existing trees on site to be further transplanted to an offsite temporary holding nursery and then back to site | 12                              | 1 tree (T70)   | DAs 2 & 3            | DA 5                    |
|   |                                 | 7 trees (T1 to T5, T23 and T18)  | DA 4                 | DAs 4 & 5               |
|   |                                 | 4 trees (T71 to T74)   | DA 5                 | DA 3                    |
| Existing trees transplanted from the offsite temporary holding nursery back to the site                         | 10                              | 10 trees (T15, T16, T17, T19, T20, T123, T124A, T125, T126 and T127)   | DAs 4 & 5            | DAs 4 & 5               |
| Existing trees to be transplanted from Yuet Wah Street Site to the  | 4                               | 4 trees (T94(YW), T98(YW), T103(YW) and T106(YW))  | Yuet Wah Street Site | DAs 2 & 3               |
| <b>Total Number of transplanted trees within the Main Site</b>  | <b>41</b>                       | <b>20</b> transplanted trees to be located within DAs 2 & 3<br><b>21</b> transplanted trees to be located within DAs 4 & 5 |                      |                         |

### Compensatory Trees

A total of **43** nos. compensatory trees of standard to heavy standard size will be planted within DAs 2 to 5 and include the followings as shown on **Figure 4.0 Compensatory Planting Plan**:-

- **26** nos. compensatory trees to compensate for a net loss of **5** existing trees (already felled) according to the approved TRA (2012). Compensatory trees will be located in DAs, 4 & 5. The composition of compensatory tree species are shown in **Table 2.5** below:



**Table 2.5 - Proposed Tree Species for compensatory planting in the approved TRA**

| Species name               | Size           | Quantity |
|----------------------------|----------------|----------|
| <i>Celtis sinensis</i>     | Heavy Standard | 13       |
| <i>Cinnamomum camphora</i> | Heavy Standard | 7        |
| <i>Ficus microcarpa</i>    | Heavy Standard | 6        |

- 1 no. compensatory tree to compensate for a net loss of 1 tree from Yuet Wah Street Site (T109), which was proposed to be transplanted to the Main Site according to the approved TRA in S16 Application No. A/K14/576, but had collapsed after Typhoon "Kai Tak" Signal No. 8 on 17th August 2013. It was agreed with PlanD that T109(YW) would be compensated within the Main Site based on tree quantity at a ratio of 1:1.
- Net loss of 9 trees (T45, T53, T54, T56 and T69 at Development Areas 4 & 5; T78, T79, T80 and T83 at Development Areas 2 & 3) by the damage of typhoon. 9 compensatory trees to be compensated based on tree quantity at a ratio of 1:1 for a net loss of 2 retained trees and 7 transplanted trees, which were severely damaged by Typhoon and reported with "removal by relevant government department" (T45, T53, T54, T56, T69, T78, T79, T80 and T83) within the main site. 4 compensatory trees will be located within DAs 2 & 3, and 5 compensatory trees will be located within DAs 4 & 5.
- Net loss of 1 tree (T55) at Development Areas 2 & 3 which have been felled as per Emergency Tree Felling Application. 3 compensatory trees (*Sterculia lanceolata*) of min. 90mm DBH each are proposed to be planted at min.4.5m spacing c.c. within NKIL6514 (DAs 2 & 3) to compensate for the loss of T55 which is acceptable by DLO. 3 compensatory trees will be located in DAs 2 & 3.

**Table 2.6 - Proposed Tree Species for compensatory planting for T55**

| Species name                | Size           | Quantity |
|-----------------------------|----------------|----------|
| <i>Sterculia lanceolata</i> | Heavy Standard | 3        |

- Net loss of 1 tree (T26) at Development Areas 2 & 3 by traffic accident. 1 no. compensatory tree to be compensated based on tree quantity at a ratio of 1:1 for a net loss of T26 within the main site.
- Under the current scheme, net loss of 2 trees (T11 and T51) which their health and structural condition are poor and 1 tree (T52) removed by maintenance department at DA4. 3 compensatory trees of standard size stock are proposed in DA5 to compensate the loss of 3 trees at a ratio of 1:1.

**Table 2.7 - Proposed Tree Species for compensatory planting for T11, T51 and T52**

| Species name              | Size           | Quantity |
|---------------------------|----------------|----------|
| <i>Terminalia mantaly</i> | Heavy Standard | 3        |

Summary of Compensatory Trees within the Main Site is shown in **Table 2.8**.

**Table 2.8 – Summary of Compensatory Trees within the Main Site**

| Treatment  | No. of Compensatory Trees in this submission | Tree ID  | Original Location    | Final Location |
|--|--|--|----------------------|----------------|
| Net loss of 5 existing trees which have been felled as per approved TRA                | 26   | T6-8, T12 and T124   | DAs 4 & 5            | DAs 4 & 5      |
| Net loss of 1 tree by the damage of typhoon  | 1  | T109 (YW)  | Yuet Wah Street Site | DAs 2 & 3      |
| Net loss of 9 trees by the damage of typhoon   | 5  | T45, T53, T54, T56 and T69   | DAs 4 & 5            | DAs 4 & 5      |
|  | 4  | T78, T79, T80 and T83  | DAs 2 & 3            | DAs 2 & 3      |
| Net loss of 1 tree which have been felled as per Emergency Tree Felling Application    | 3  | T55  | DAs 2 & 3            | DAs 2 & 3      |
| Net loss of 1 tree by traffic  | 1  | T26  | DAs 2 & 3            | DAs 2 & 3      |
| Net loss of 2 trees as proposed fell tree due to poor health and structural conditions | 2  | T11 and T51  | DAs 4 & 5            | DAs 4 & 5      |
| New loss of 1 tree removed by department   | 1  | T52  | DAs 4 & 5            | DAs 4 & 5      |
| <b>Total Number of Compensatory trees within</b>                                       | <b>43</b>                                    | <b>9 compensatory trees to be located within DAs 2 &amp; 3<br/>34 compensatory trees to be located within DAs. 4 &amp; 5</b> |                      |                |

Table 2.9- Summary of Trees within the Main Site

| Treatment  | No. of Trees from the Approved Planning Application no. TPB/A/K14/72 7 (2012) | No. of Trees from the Approved TPS in 2016 | No. of Trees in this submission |                                 |            |
|--|---|--|---------------------------------|---------------------------------|------------|
|  |   |  | Final Receptor Location DAs 2&3 | Final Receptor Location DAs 4&5 | Sub- Total |
| Existing trees to be retained  | 34  | 34   | 0                               | 33                              | 33         |
| Existing trees to be transplanted on the site  | 27  | 18   | 12                              | 3                               | 15         |
| Existing trees to be further transplanted to offsite temporary holding nursery and then back to the site | 3   | 11   | 4                               | 8                               | 12         |
| Existing trees transplanted from offsite temporary holding nursery back to the site                      | 10  | 10   | 0                               | 10                              | 10         |
| Existing trees to be transplanted from Yuet Wah Street Site to the site                                  | 4   | 4  | 4                               | 0                               | 4          |
| Compensatory trees   | 27  | 40   | 9                               | 34                              | 43         |
| New trees to be planted  | 429   | 417  | 219                             | 168                             | 387        |
| <b>Total Number of trees within the Site after completion of work</b>                                    | <b>534</b>  | <b>534</b>                                 | <b>248</b>                      | <b>277</b>                      | <b>504</b> |

Note: Main Site was divided into four Development Areas (DAs 2-5) intend to be implemented in phases, temporary location for transplanted trees within DAs 4 & 5 will subject to future tree condition and to be reviewed under separated submission at detailed design stage.

## 2.4 Tree Protection Strategy for Yue Man Square

- The area of open ground / planting below the existing trees will be maintained and be no less than the current condition of Yue Man Square rest garden
- Temporary Protective Fencing – As far as practicable, the Contractor will erect temporary protective fencing as specified around the area covered by the spread of the trees to be retained. Such fences should remain intact for the duration of the construction period. No works, temporary structures or stockpiling of any kind will take place within the fenced area and/or under the canopy of any existing tree to be retained. The protective fencing is to be erected prior to any site clearance or other works or site operations which may affect the retained trees.
- Temporary Protective Trunk Armouring – In cases where protective fencing is deemed to be impractical and when so instructed by the Resident Field Officers (RFO) for tree protection, the tree trunk must be protected from abrasions by wrapping it with hessian sacking and strapping pallet timbers secured with wire. Such wire will be adjusted from time to time in order not to impede the growth of the retained tree.
- Temporary Protective Mulching – In cases where protective fencing is deemed to be impractical and when so instructed by the RFO, root zones beneath the crown spread should be protected from compaction through the use of a geotextile membrane covered temporarily with gravel. Vehicle movement or operation of equipment within the tree protection zone must be approved by the RFO. In these cases, all such activities will be confined to the areas covered by the protective mulching, which will be further protected by double, overlapping, thick plywood panels.

## 3 REVISED LANDSCAPE MASTER PLAN

### 3.1 Landscape Design Concept & Strategy

The Landscape Design Proposal is illustrated in the Revised Landscape Master Plans in **Figure 5.1 to 11.0**. The landscape design principles intend to not only enhance the subject site but also respond to the contextual setting of the area and the requirements from local residents.

'Greening' will be used as a major landscape design theme to visually unify the proposed development and to create a unique sense of identity. A cohesive overall landscape character will also be created whilst at the same time providing specific features and 'spaces' within the proposed development. The integration of sensitive soft and hard landscaping measures within residential area, streetscape, recreational, commercial, business and community facilities will enhance the living environment, accentuate the positive visual attributes of the proposed development and provide a degree of privacy where appropriate.

Given that the proposed development consists of a number of different buildings, the landscape design intend to integrate and harmonise different functions and uses of the development. As mentioned above, the variety of different developments within the Site is an opportunity to incorporate a distinct character within each space whilst maintaining an overall sense of coherence. The proposed development can be divided into **9** distinct following landscape and open space zones:

- 1) Civic Square
- 2) Yue Man Square rest garden
- 3) Sky Garden/ Roof Garden
- 4) Kwun Tong Plaza
- 5) Entrance Plazas and Grand Staircase
- 6) Terraced Garden and Water Garden
- 7) Podium Garden
- 8) Boulevard
- 9) Enhanced Streetscape

Different landscape themes applied to the character zones as mentioned above provide a distinct identity to each space, create a rich variety of the landscape characters between garden and park, G/IC facilities, commercial and residential developments, create a robust streetscape and shop frontage and maximise visual interest for the KTTC. For example:

- The Civic Square will have an "amphitheatre" like setting composed of terraced staircase, platforms and terraced planter. This setting framed a large oval space allowing activities such as performances, gatherings and exhibitions etc. Tree planting in the Square assists visitors and pedestrians navigating through the spaces and allows a better physical and visual connection to the Hawker Bazaar (at +4.5), Yue Man Square rest garden (at +8.5), to DA3 at +10.0 and the surrounding streetscapes;
- The Yue Man Square rest garden will remain as a passive park with the emphasis on preserved landscape and trees: shade trees, display planting and screening shrubs to define 'green rooms' through the combination of preserved trees and new tree planting. Some 'pocket spaces' framed by planting area allow space for table and bench for passive recreation like reading and chess playing etc.;
- The water theme is demonstrated on the Terraced Garden to the east of YMSRG. Water walls and features extend from the edge of YMSRG into the Terrace Garden from +13.00 to 25.75 mPD;
- The Kwun Tong Plaza is designed as entrance threshold to the Terraced Garden and YMSRG. Planters, benches and water features are designed with a modern and formal design language reflecting the future commercial surroundings. Area under building cover is designed with flexible spaces allowing exhibitions and events; and
- With similar modern treatment for Kwun Tong Plaza, three entrance plazas are designed at Kwun Tong Road connecting to Civic Square and YMSRG. Grand Staircase with terraced planters and sitting out areas, water features form the theme of these plaza.



### 3.2 Open Space and Greening

#### Open Space

A primary objective of the overall development is to maximise open space and greening generally within the development. The open space provision and allocation in different DAs are illustrated on **Figure 8.1 to 8.3**.

Area of different open space zonings (for Public and Private use) under the current remain largely the same and complied with the provision in the previous approved scheme.

Open spaces under the current scheme allocated within the planning Sub-area A and B are demonstrated in **Figure 11**. The provision remains largely the same as previously approved.

Accessibility and Connectivity of the Open Spaces in-between different development areas and levels are demonstrated in **Figure 9.1 to 9.5**.

#### Greening

Under this revision, refer to **Figure 10.0** Green Area Calculation, the site coverage of greenery follows the requirement under the Building Department's SBD Guidelines PNAP APP-152 (Item 18), i.e. not less than 30% of the Main Site. The total site area for the Main Site is **46,294m<sup>2</sup>**. The current scheme would be able to accommodate total greenery areas of not less than **30.8%** of the total site area. This greening provision is higher than 28.66% proposed in the 2008 approved scheme and 30.04% proposed in the 2015 approved scheme.

Under the current scheme, more greenery areas are provided along the building edges at upper levels, in sky gardens and on the roofs of building within DA 4&5, although covered greening areas at upper levels (above 15m from mean street level) are not counted according to SBG. These green features will soften the development and responding to the green amenity at the lower levels of the development.

### 3.3 Landscape Design Principles

Consideration of the opportunities and constraints presented by the site conditions and the contextual setting of the site ensures that environmental improvements are integral components of the proposed development. The landscape design principles include:

- The production of a large amount of landscape open space to form an urban oasis in the dense environment of Kwun Tong through preserving mature trees in the core of the Main Site and provision of greenery at lower and upper levels of developments.
- To ensure the proposed development maximised greening effects within the congested built environment and sensitively upgrading the surrounding areas via a green interface treatment. Plantings at lower and upper levels of developments and provision of multi-levelled water gardens have been incorporated into this revised scheme.
- To maximise and exploit views to the landscaped open space from within the development and from adjacent developments.
- To create a variety of exciting landscape spaces that become attractions in themselves whilst serving and integrating with the overall development.
- To create a high degree of visual interest and continuity through effective landscape design.
- To develop a well-coordinated palette of materials and items which sensitively relate to the architecture.
- To ensure that adequate signage is provided to indicate public open spaces and demarcate these areas for public use.
- To ensure that signage and way finding information devices are designed as integrated components identifying and extending the architectural and landscape design themes throughout the development, and
- To accommodate a variety of uses within the site and ensure the landscape responds and reflects to these different uses.

### 3.4 Major Landscape Elements

- Civic Square** – An "amphitheatre" like open area facing Hong Ning Road. This square is a main entrance threshold to Hawker Bazaar and post office at level +4.50mPD and YMSG at +8.50mPD as well as to other open spaces of the development. The design enhanced the openness of the Civic Square to allow flexibility for various functions. It could be used for a variety of recreation and entertainment events. Preserved (transplanted) and new planted trees in terraced planters and in tree pits are proposed to create shading effect for the open area. Platforms and steps serve as an auditorium when there are events and happenings. The greening effect extends onto the pavement of Hong Ning Road navigating visitors to the Civic Square and YMSG to the further east. The interface between the Civic Square and YMSG is designed as a Sculpture Garden composed of landscape berms for leisure and art display etc. forming a transition from a formal and open square to the more naturally setting in YMSG.
- Yue Man Square rest garden – LCSD site** - most of the existing features within the Garden will be retained including the registered OVTs (*Ficus elastica*), quality trees and transplanted trees. The area of the Garden (4,060m<sup>2</sup>) is the same as the previously approved schemes. The design incorporated bench and table in pocket areas under shade by trees to enhance the robustness and attractiveness of the Garden. The spatial arrangement in the Garden has been slightly modified to improve pedestrian circulation, to allow passive recreation facilities and to integrate with the surrounding new environment. The Garden designed with a more naturalistic design approach. A few water features are designed at the eastern edge of the Garden to provide a transition from the Garden to the Terrace Garden and Water Garden at upper levels, at where connecting the commercial uses in DA4 and open spaces at DA2.
- Sky Garden/ Roof Garden – Sky Garden/ Roof Garden** create several open spaces/greening amenities at different levels of the buildings in DA4&5 which will be landscaped to provide another group of green open spaces at the lower and upper levels of the buildings. These areas, not only serve the development itself, they also provide visual interest to the surrounding areas. Tree planting, shrub and lawn framing spaces for sitting areas and lawn for leisure.
- Kwun Tong Plaza** – The Kwun Tong Plaza will become an entrance threshold to different areas of the KTTC from Hip Wo Street and Kwun Tong Road to YMSG. Street trees in grid with sitting edge at the entrance from Kwun Tong Road will enhance the amenity at the point of entry. Secondly, an escalator added in the current scheme to access Level +13.00mPD of DA4, where going to the commercial uses in DA4 and the lower tier of the Terrace Garden. An oval shape platform with planters creates an entrance node at the base of the escalator. Planting with shade tolerant species designed along the circulation space under covered area provides separation and screening to DA2. Greening on the top of Terraced Garden at +23.2mPD creates multi-levelled greening and visual amenity in the views looking from Yue Man Square rest garden and surrounding streets. The covered space has been intentionally left open to maximise the flexibility of the space for events and exhibitions. Feature paving responding to Yue Man Square rest garden in the Plaza assists visitors and pedestrian navigating through the space from public areas to adjacent shops and café. Sculptural benches and water feature are key features in the Garden.
- Entrance Plaza** - Three Entrance Plaza are designed at the entrance threshold from Kwun Tong Road to YMSG. The Plaza at the junction of Hong Ning Road and Kwun Tong Road is focus on a Grand Staircase with planting alongside. The Staircase provides access to the Government Building and stepped sitting areas on the other side. These stepped pocket spaces forming a landscape focus at the main entry point of the development and provide rest area for the visitors and the community. A terraced planter and water cascade designed at the northern end of the Plaza forming a back drop for this landscape vista to screen the ramp access to the basement.

Moving to the east next to the planned bus stop, another entrance plaza designed with steps for entering YMSG and adjacent commercial building and an underpass connecting to the Civic Square. The underpass is naturally lighted up through the skylights in the Sculpture Garden above creating a more comfortable walkway to access Civic Square from Kwun Tong Road. Shade tolerant plant species will be utilised in the Plaza to enhance the continuity of greening in these public spaces. Again multi-levelled greening is provided on the building edges and sky gardens above the Plaza contributing the amenity along Kwun Tong Road.

Another Plaza connecting Kwun Tong Road to Yue Man Square rest garden is designed with steps and escalator located adjacent to the access road to the landmark building. This entry point is designed with an iconic water feature responding to entry landscape to the landmark building that forming a unity for the entire space and to disguise the functional appearance of the road. Shade tolerant plant species will be used in the area.

- f. **Terraced Garden and Water Garden** – Terraced link bridges are designed connecting DA 4 and DA 2. The linkage is designed in tiers of the garden areas with setbacks towards the east. This is a key feature added in the current scheme. The garden provides circulation to shops on one side, access to commercial floors and the landscape deck in DA2 and lookouts towards YMSRG at higher levels of the development. Water is the main theme for this Garden. It is evident through the provision of water walls and features at different levels of the Garden forming a back drop to YMSRG. The Garden could be accessed from a continuous staircase from +8.50 YMSRG to +13.0 to +25.75mPD. Integrated design with water walls and staircase will also disguise its functional appearance for circulation. Edge planting is designed along edges to soften the development edge. The Garden will plant with trees and shrubs. The edge of planter incorporated benches for visitors' rest and stay under shade of trees. The Garden at +13.0mPD extends to the south connecting to MTR Kwun Tong Station Concourse at elevated level. Decorative paving is designed on the footbridge blending space in front of the Station and the Garden area navigating visitors towards KTTC.
- g. **Podium Gardens in residential portion**- the Boulevard path is flanked by the gardens of the adjacent residential developments will create a relaxed but visually stimulating entry to the development. These gardens provide additional, valuable greening to the development and will provide the residents with a significant passive recreation area.
- h. **The Boulevard** - the Boulevard serves the primary circulation movement from north to south through the site and linking the intersection of Hip Wo Street and Mut Wah Street with the major landscape spaces within the centre of the development. A single storey "Anchor Shop" is introduced at +25.25mPD below the Boulevard adjacent to DA3 under this application. Planting in the Boulevard remains unchanged as the previous approved scheme. The roof of the "Anchor Shop" is designed with planting and provides connection to the podium garden of DA3.
- i. **Podium of Community Facilities and Residential Towers** – Extensive green areas will be provided to these areas including tree planting, shrubs and groundcover planting and lawn. Active recreation area including outdoor swimming pool, children play area, jogging path and lawn, as well as passive recreation area including timber decks, seating and water features are provided at podium areas at level +30 for the residents.
- j. **Green Roofs, Green Walls** - the benefits of green roofs and walls briefly include: a reduction of thermal loading on the building fabric; heat island reduction (in urban situations), storm water attenuation, noise reduction, ecological enhancement, air purification and psychological well-being of urbanites. Perhaps the most important reason for the long-term development of green roofs and walls is that they could help to visibly restore the connections between the built environment and the natural, between mankind and nature. This project incorporates a wide variety of green roofs and walls including intensive and extensive green roofs, climbing plants on walls and structures, plants on separate specially designed structures and the use of supported growing medium attached to vertical structures.
- k. **Enhanced Streetscape** – Decorative paving and roadside planting and tree pits are designed at the entrance threshold to the KTTC at where not interfered the pedestrian circulation. Instant greening effect and shade walking environment created through preservation of trees and new tree planting.

### 3.5 Proposed Planting Strategy

Planting will comprise principally of a mixture of trees and shrubs forming a lush landscape oasis for the district. Planting will be selected to suit different usage and functional requirements of individual areas. Feature shade tree will be provided along major access routes and gathering locations and at selected

locations as landscape features. Those trees proposed to be transplanted will be planted back within the site according to their individual characteristics, with the two OVTs retained in their current positions inside Yue Man Square rest garden. Vertical Greening will also be developed within the site as a landscape feature.

A total of **504** nos. trees will be accommodated within the Main Site after completion of work, including all retained trees, transplanted trees, compensatory trees and new trees.

Some evergreen trees, large and small, are proposed to provide all-year-round greenery to the areas. Together with a variety of shrubs, ground-covers and climbers, seasonal changes seen by different flower and foliage colours and the mixture of large and small trees, it is believed that the development will provide a relaxing and interesting space for surrounding residents and the public, commensurate with the principle design objectives of the project.

In general, the design intent of planting sizes and density are as follows:

Heavy standard to standard size trees will be selected for new tree planting after considering the suitability of planting in different locations, for example, smaller size tree is more suitable for planting on sky garden/roof garden. Soil specification and soil samples will be submitted for approval by the Landscape Architect. The planting size of low shrubs will vary from 300mm to 600mm (Height) whilst tall shrubs will be above 800mm (Height). For groundcovers, 200mm to 300mm (Height) size will be provided. The planting density for shrubs will be spaced between 250mm to 50mm and for the ground covers, 150mm to 250mm. A minimum of 12 months establishment period will be incorporated for all planting elements.

A list of proposed candidate planting is shown in **Table 3.1** below:



Table 3.1 – Proposed Candidate Planting List

| SCIENTIFIC NAME                                | CHINESE COMMON NAME | PROPOSED SIZE                  | SPACING (mm) |
|--|---------------------|--------------------------------|--------------|
| <b>A. TREE</b>                                 |                     |                                |              |
| <i>Bauhinia purpurea</i>                       | 紅花羊蹄甲               | Heavy Standard                 | 5000         |
| <i>Cassia surattensis</i>                      | 黃槐決明                | Heavy Standard / Standard      | 3000         |
| <i>Celtis sinensis</i>                         | 朴樹                  | Heavy Standard                 | 5000-8000    |
| <i>Cinnamomum burmannii</i>                    | 陰香                  | Heavy Standard                 | 5000         |
| <i>Cinnamomum camphora</i>                     | 樟樹                  | Heavy Standard                 | 5000-8000    |
| <i>Delonix regia</i>                           | 鳳凰木                 | Heavy Standard                 | 8000         |
| <i>Elaeocarpus decipiens</i>                   | 杜英                  | Heavy Standard                 | 5000         |
| <i>Elaeocarpus hainanensis</i>                 | 水石榕                 | Heavy Standard/ Standard       | 5000         |
| <i>Ficus binnendijkii</i> 'Alii'               | 亞里垂榕                | Heavy Standard/ Standard       | 5000         |
| <i>Ficus elastica</i>                          | 印度橡樹                | Heavy Standard                 | 8000         |
| <i>Ficus microcarpa</i>                        | 細葉榕                 | Heavy Standard                 | 8000         |
| <i>Lagerstroemia speciosa</i>                  | 大花紫薇                | Heavy Standard / Standard      | 4000         |
| <i>Plumeria rubra</i>                          | 雞蛋花                 | Heavy Standard / Standard      | 4000         |
| <i>Sapium sebiferum</i>                        | 烏柏                  | Heavy Standard                 | 5000-8000    |
| <i>Schefflera actinophylla</i>                 | 傘樹                  | Heavy Standard/ Standard       | 4000         |
| <i>Spathodea campanulata</i>                   | 火焰樹                 | Heavy Standard                 | 5000         |
| <i>Syzygium jambos</i>                         | 蒲桃                  | Heavy Standard                 | 8000         |
| <i>Tabebuia chrysantha</i>                     | 黃金風鈴木               | Heavy Standard/ Standard       | 4000         |
| <i>Terminalia mantaly</i>                      | 小葉欖仁                | Heavy Standard/ Standard       | 4000         |
| <i>Bischofia javanica</i>                      | 秋楓                  | Heavy Standard/ Standard       | 5000         |
| <i>Koelreuteria formosana</i>                  | 台灣樂樹                | Heavy Standard/ Standard       | 5000         |
| <b>A1. ROADSIDE TREE</b>                       |                     |                                |              |
| <i>Cassia surattensis</i>                      | 黃槐決明                | Heavy Standard / Standard      | 3000         |
| <i>Cinnamomum burmannii</i>                    | 陰香                  | Heavy Standard/ Standard       | 5000         |
| <i>Elaeocarpus chinensis</i>                   | 野杜英                 | Heavy Standard                 | 5000         |
| <i>Terminalia mantaly</i>                      | 小葉欖仁                | Heavy Standard                 | 5000         |
| <b>A2. CONIFER</b>                             |                     |                                |              |
| <i>Juniperus chinensis</i> var. <i>kaizuca</i> | 龍柏                  | 2000mm(H)x1000mm(S)            | 2000         |
| <i>Thuja orientalis</i>                        | 側柏                  | 2000mm(H)x1000mm(S)            | 2000         |
| <b>B. SPECIMEN PLANT</b>                       |                     |                                |              |
| <i>Furcraea foetida</i> cv. 'Striata'          | 黃紋萬年麻               | 1500mm(H)x1000mm(S)            | Specimen     |
| <i>Cycas revoluta</i>                          | 蘇鐵                  | 3000mm(H)x1000mm(S)            | Specimen     |
| <i>Dracaena marginata</i> 'tricolor'           | 三色鐵樹                | 1000mm Ht.<br>3 nos. of shoots | Specimen     |

| SCIENTIFIC NAME                                  | CHINESE COMMON NAME | PROPOSED SIZE                          | SPACING (mm) |
|--|---------------------|--|--------------|
| <i>Dracaena reflexa</i> cv. <i>variegata</i>     | 分枝鐵樹                | 1000 to 1500mm Ht.<br>3 nos. of shoots | Specimen     |
| <i>Yucca elephantipes</i>                        | 象腳王蘭                | 1500 to 2000mm Ht.<br>4 nos. of shoots | Specimen     |
| <i>Radermachera sinica</i>                       | 菜豆樹                 | 2000mm(H)x1000mm(S)                    | Specimen     |
| <i>Ravenala madagascariensis</i>                 | 旅人蕉                 | 3000 to 4000mm Ht.                     | Specimen     |
| <b>C. BAMBOO</b>                                 |                     |  |              |
| <i>Phyllostachys aurea</i>                       | 人面竹                 | 1500 to 2000mm Ht.<br>4 nos. of shoots | 750          |
| <i>Phyllostachys nigra</i>                       | 紫竹                  | 1500 to 2000mm Ht.<br>4 nos. of shoots | 500          |
| <b>D. PALM TREE</b>                              |                     |  |              |
| <i>Archontophoenix alexandrae</i>                | 假檳榔                 | 6000mmHt.                              | Specimen     |
| <i>Chrysalidocarpus lutescens</i>                | 散尾葵                 | 2000mmHt.                              | 900          |
| <i>Livistona chinensis</i>                       | 蒲葵                  | 2000 to 3000mmHt.                      | Specimen     |
| <i>Phoenix roebelenii</i>                        | 日本葵                 | 2000 to 3000mmHt.                      | 1000         |
| <i>Rhapis excelsa</i>                            | 棕竹                  | 1000 to 1500mmHt.                      | 1000         |
| <i>Roystonea regia</i>                           | 王棕                  | 6000mmHt.                              | Specimen     |
| <i>Syagrus romanzoffiana</i>                     | 皇后葵                 | 3000mmHt.                              | 1500         |
| <b>E. CLIMBER</b>                                |                     |  |              |
| <i>Bougainvillea spectabilis</i>                 | 賀春紅                 | 1200mm length; 3 shoots                | 2000         |
| <i>Ficus pumila</i>                              | 薜荔                  | 250mm length; 5 shoots                 | 1500         |
| <i>Pyrostegia venusta</i>                        | 炮仗花                 | 900mm length; 4 shoots                 | 1500         |
| <i>Quisqualis indica</i>                         | 使君花                 | 750mm length; 3 shoots                 | 1500         |
| <b>F. SHRUB</b>                                  |                     |  |              |
| <i>Alpinia speciosa</i> 'Variegata'              | 花葉艷山薑               | 400mm(H)x300mm(S)                      | 450          |
| <i>Calathea zebrina</i>                          | 斑葉竹芋                | 250mm(H)x250mm(S)                      | 300          |
| <i>Canna indica</i> (Yellow)                     | 美人蕉                 | 300mm(H)x300mm(S)                      | 450          |
| <i>Codiaeum variegatum</i>                       | 灑金榕                 | 450mm(H)x300mm(S)                      | 450          |
| <i>Gardenia jasminoides</i>                      | 白蟬                  | 600mm(H)x600mm(S)                      | 750          |
| <i>Iris tectorius</i>                            | 藍蝴蝶                 | 300mm(H)x250mm(S)                      | 300          |
| <i>Ixora stricta</i>                             | 細葉龍船                | 200mm(H)x200mm(S)                      | 300          |
| <i>Philodendron pittieri</i>                     | 小葉蔓綠絨               | 500mm(H)x500mm(S)                      | 600          |
| <i>Philodendron sellcum</i>                      | 春羽                  | 800mm(H)x600mm(S)                      | 750          |
| <i>Pittosporum tobira</i>                        | 海桐花                 | 750mm(H)x600mm(S)                      | 800          |
| <i>Rhododendron mucronatum</i><br>(White flower) | 白杜鵑                 | 600mm(H)x500mm(S)                      | 600          |
| <i>Rhododendron simsii</i>                       | 紅杜鵑                 | 300mm(H)x300mm(S)                      | 350          |

| SCIENTIFIC NAME                            | CHINESE COMMON NAME | PROPOSED SIZE             | SPACING (mm) |
|--|---------------------|---------------------------|--------------|
| <i>Strelitzia reginae</i>                  | 天堂鳥蕉                | 400mm(H)x250mm(S)         | 450          |
| <i>Aglaia odorata</i>                      | 米仔蘭                 | 500mm(H)x400mm(S)         | 500          |
| <i>Carmona microphylla</i>                 | 福建茶                 | 600mm(H)x400mm(S)         | 300          |
| <i>Duranta erecta</i> 'Golden Leave'       | 金連翹                 | 300mm(H)x300mm(S)         | 200          |
| <i>Ficus microcarpa</i> cv. Golden Leaves  | 黃金榕                 | 400mm(H)x300mm(S)         | 400          |
| <i>Ixora chinensis</i>                     | 龍船花                 | 450mm(H)x300mm(S)         | 250          |
| <b>G. GROUND COVER</b>                     |                     |                           |              |
| <i>Catharanthus roseus</i>                 | 長春海棠                | 300mm(H)x250mm(S)         | 300          |
| <i>Cuphea hyssopifolia</i>                 | 雪茄花                 | 200mm(H)x150mm(S)         | 200          |
| <i>Epipremnum aureum</i>                   | 綠蘿                  | 250mm(H)x300mm(S)         | 400          |
| <i>Liriope spicata</i>                     | 麥門冬                 | 100mm(H)x150mm(S)         | 200          |
| <i>Phyllanthus myrtifolius</i>             | 錫蘭葉下珠               | 200mm(H)x300mm(S)         | 400          |
| <i>Sansevieria trifasciata</i> 'Laurentii' | 金邊虎尾蘭               | 450mm(H)x150mm(S)         | 400          |
| <i>Zephyranthes candida</i>                | 玉簫                  | 250mm(H)x250mm(S)         | 200          |
| <b>H. SHADE TOLERANT TREE/ PALM</b>        |                     |                           |              |
| <i>Podocarpus nagi</i>                     | 竹柏                  | Standard                  | 2000         |
| <i>Sterculia lanceolata</i>                | 假蘋婆                 | Standard                  | 3000         |
| <i>Ilex rotunda</i>                        | 鐵冬青                 | Standard                  | 3000         |
| <i>Schefflera heptaphylla</i>              | 鵝掌柴                 | Heavy Standard / Standard | 5000         |
| <i>Schefflera actinophylla</i>             | 傘樹                  | Heavy Standard / Standard | 5000         |
| <i>Chrysalidocarpus lutescens</i>          | 散尾葵                 | 2000mmHt.                 | 900          |
| <i>Podocarpus macrophyllus</i>             | 羅漢松                 | Standard                  | 2000         |
| <i>Garcinia subelliptica</i>               | 福木                  | Standard                  | 2000         |
| <i>Michelia chapensis</i>                  | 樂昌含笑                | Heavy Standard / Standard | 5000         |
| <b>I. SHADE TOLERANT SHRUB</b>             |                     |                           |              |
| <i>Dieffenbachia maculata</i> 'Camille'    | 白玉粉黛                | 500mm(H)x300mm(S)         | 500          |
| <i>Fagraea ceilanica</i>                   | 灰莉                  | 500mm(H)x400mm(S)         | 500          |
| <i>Schefflera octophylla</i>               | 鴨腳木                 | 500mm(H)x400mm(S)         | 500          |
| <i>Aspidistra elatior</i>                  | 一葉蘭                 | 400mm(H)x400mm(S)         | 300          |
| <i>Murraya paniculata</i>                  | 九里香                 | 600mm(H)x500mm(S)         | 600          |
| <i>Ficus microcarpa</i> cv. Golden Leaves  | 黃金榕                 | 400mm(H)x300mm(S)         | 400          |
| <i>Nandina domestica</i>                   | 南天竹                 | 500mm(H)x450mm(S)         | 450          |

| SCIENTIFIC NAME                             | CHINESE COMMON NAME | PROPOSED SIZE     | SPACING (mm) |
|---|---------------------|-------------------|--------------|
| <i>Aglaonema</i> 'Silver Queen'             | 銀皇后                 | 300mm(H)x300mm(S) | 450          |
| <i>Cordyline terminalis</i>                 | 朱蕉                  | 800mm(H)x500mm(S) | 600          |
| <b>J. SHADE TOLERANT GROUND COVER</b>       |                     |                   |              |
| <i>Liriope spicata</i>                      | 麥門冬                 | 150mm(H)x150mm(S) | 200          |
| <i>Setcreasea purpurea</i>                  | 紫鴨趾草                | 300mm(H)x300mm(S) | 450          |
| <i>Zephyranthes candida</i>                 | 玉簫                  | 250mm(H)x250mm(S) | 200          |
| <i>Ophiopogon japonicus</i> 'Nana'          | 玉龍草                 | 100mm(H)x150mm(S) | 200          |
| <i>Sansevieria trifasciata</i> cv. 'Hahnii' | 短葉虎尾蘭               | 150mm(H)x200mm(S) | 250          |
| <i>Iris tectorum</i>                        | 鳶尾藍蝴蝶               | 300mm(H)x250mm(S) | 300          |

\* Species selection will be subject to detailed design development and market availability

### 3.6 Soil Depth and Drainage for Planting

In general, the soil depth provision shall be of minimum 300mm for lawn and groundcover, 600mm for shrub planting, and a minimum of 1200mm for tree planting, excluding all drainage layers, waterproofing and protective screeding. All planting areas shall be provided with adequate drainage.

### 3.7 Irrigation

The proposed irrigation system will be via automatic/ manual water point operation, covering the entire planting area within the site. The proposed source of water supply is subject to final approval from the Water Supplies Department.

### 3.8 Signage

Adequate signage will be provided to demarcate the proposed public open spaces. The signs indicating the hours of opening and contacts of responsible management office will be clearly shown.

## 4 LANDSCAPE MATERIALS AND MAINTENANCE

### 4.1 Hardworks Material

The design intent of key hard landscape elements is summarized in **Table 4.1**.



**Table 4.1 - Summary of Key Hard Landscape Elements**

| Item  | Location   | Design Intent and Functional Requirement   | Proposed Material   |
|---|--|--|---|
| Streetscape Paving  | Footpaths  | To provide an attractive, durable and safe surface for pedestrian circulation in both wet and dry conditions. Paving must be commensurate with the architectural style of the development and material will be subject to approval of HyD.   | Granite stone paver or concrete unit paver (subject to approval of HyD)                               |
| Roadway   | EVA  | To provide an attractive, safe and durable surface for use by heavy vehicles; to clearly demarcate those areas where major pedestrian and vehicular movements coincide and /or where pedestrians have priority; to visually define the edges of carriageways. Paving must be commensurate with the architectural style of the development.   | Natural or artificial granite stone paver or precast concrete unit paver                              |
| Water Wall and Feature                                      | Podium Garden, Residential Entrance Roundabout, Hotel Lobby Entrance | Water feature will be used to enhance the visual character of the landscape area and create focal point.   | Decorative stone or ceramic tile to create an easily maintained decorative feature.                   |
| Internal Assess Paths, Plazas, Terrace and Associated Areas | Various  | To provide an attractive, durable and safe surface for pedestrian circulation in both wet and dry conditions. Paving must be commensurate with the architectural style of the development.   | Granite stone paver or concrete unit paver.   |
| Swimming Pool Surrounds                                     | Swimming Pool  | Swimming pool surrounds will be paved using a non-slip paver with decorative banding. Patterning shall compliment the swimming pool tile patterns and the architectural style of the buildings.  | Natural Stone/ Homogeneous tile/ Timber Deck.   |
| Swimming Pool   | Swimming Pool  | A decorative swimming pool tile to be used to create a safe swimming pool surface and edge.  | Ceramic/ Mosaic tile  |
| Timber Deck   | Boulevard, Podium Gardens, Roof Garden/ Sky Garden                   | To provide an attractive, comfortable and durable material to commensurate with the landscape designer's intent.   | Treated natural timber from renewable resources or artificial timber product                          |
| Footpath and Exterior Landscape Areas                       | Yue Man Square rest garden, Sky Garden/Roof Garden                   | To provide an attractive, durable and safe surface for pedestrian circulation and users of the garden areas in both wet and dry conditions. Paving must be commensurate with the architectural style of the development and character of the gardens. Paving material of Yue Man Square rest garden will be subject to the approval of LCSD. | Granite stone paver or artificial granite tile for Yue Man Square rest garden, Sky Garden/Roof Garden |

All outdoor facilities e.g. Swimming Pool and Children Play Area will be in full compliance with relevant safety standards and guidelines.

## 4.2 Landscape Maintenance

The following **Table 4.2** is a summary of the responsible landscape maintenance parties.

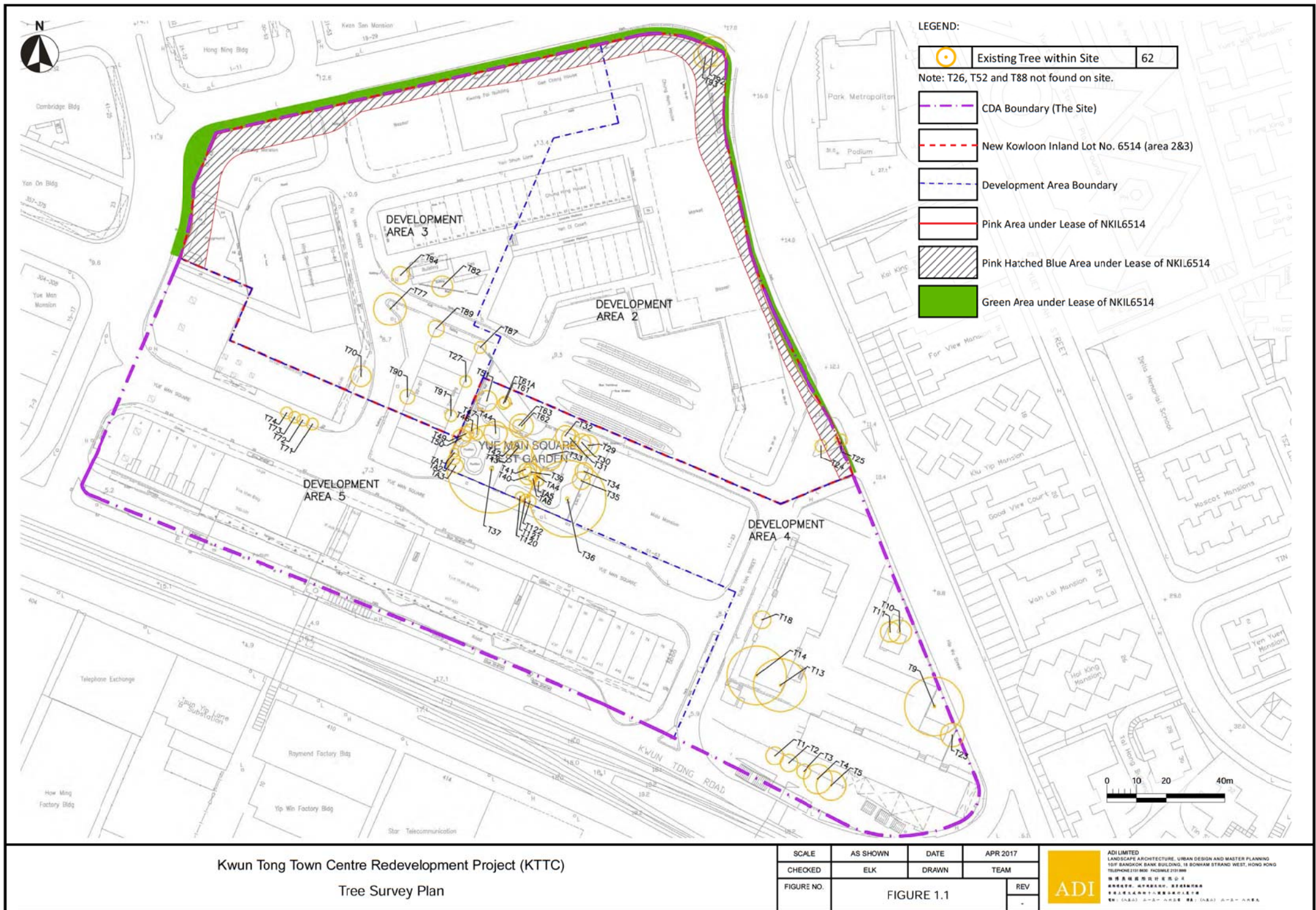
**Table 4.2 - Summary of Responsible Landscape Management and Maintenance Parties**

| Item   | Management Agency | Maintenance Agency                            |
|--|-------------------|---|
| Public Open Space<br>Yue Man Square rest garden<br>owned by LCSD in DAs 3 & 4<br>(Note: Total Site Area in the Main Site owned by LCSD=4,060m <sup>2</sup> ) | LCSD              | LCSD  |
| Public Open Space owned by URA   | URA/ Developer    | URA/ Developer                                |
| Public Streetscape Area  | HyD               | HyD – Hard Landscape<br>LCSD – Soft Landscape |
| Private Landscape Area   | Developer         | Developer                                     |

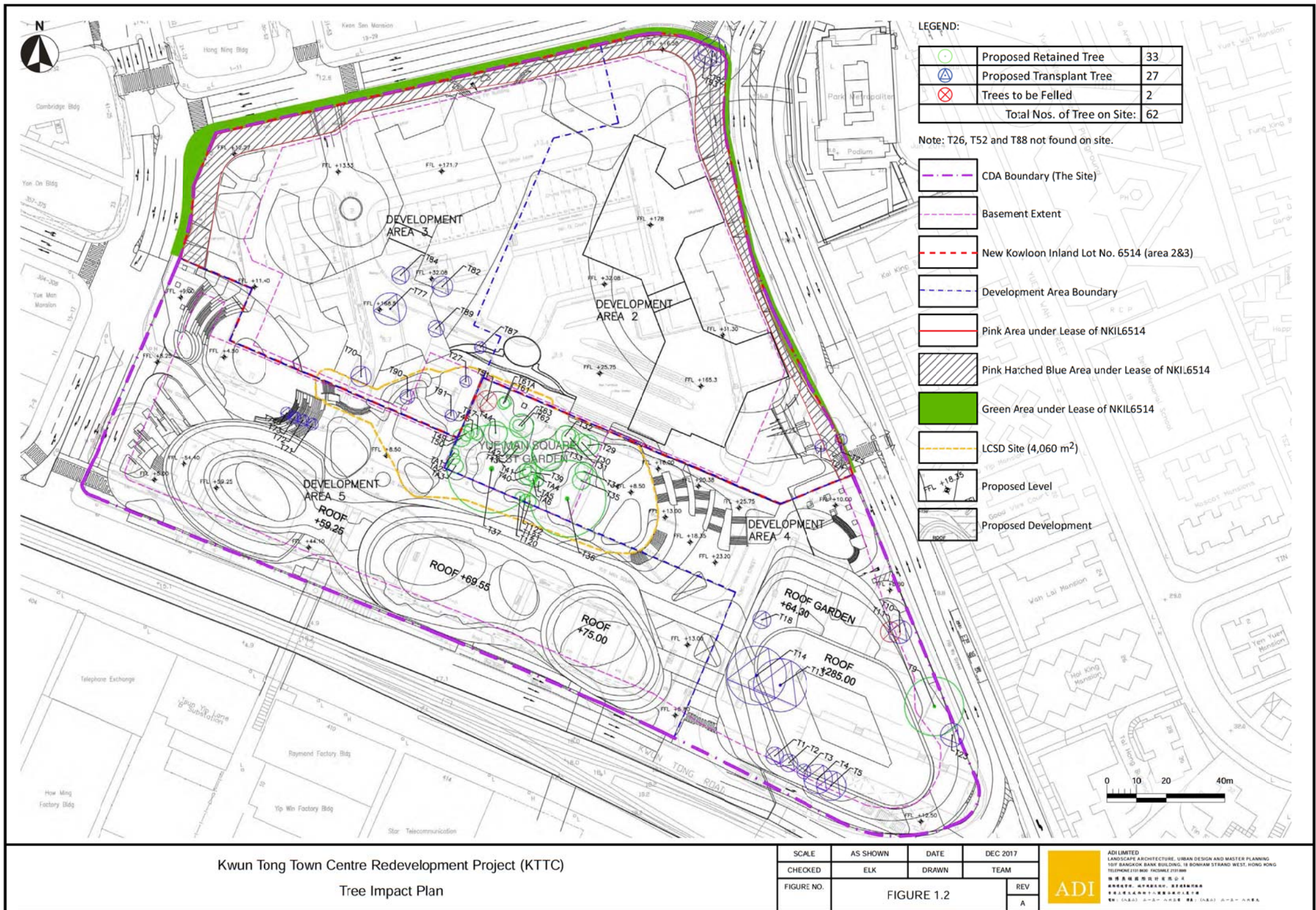
- 4.2.1 To ensure proper establishment of planting, maintenance works for soft landscape works for areas which are under the maintenance of URA/Developer will be undertaken by a soft landscape contractor for a minimum period of 12 months after the Practical Completion. Following the completion of establishment period, maintenance works will be taken up by the Property Management Office.

## FIGURES & DRAWINGS









Kwun Tong Town Centre Redevelopment Project (K TTC)

Tree Impact Plan

|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 1.2 |       | REV      |
|            |            |       | A        |

ADI LIMITED  
LANDSCAPE ARCHITECTURE, URBAN DESIGN AND MASTER PLANNING  
10/F BANGKOK BANK BUILDING, 18 BONGSAM STRAND WEST, HONG KONG  
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ADI  
香港城市規劃及園藝有限公司  
香港城市規劃及園藝有限公司  
香港城市規劃及園藝有限公司



## Existing Tree Assessment Schedule

Project Title: Minor Amendment to Approved S16 Planning Application Kwun Tong Town Centre Redevelopment Project (KTTC) Main Site

Date of Tree Survey: 20th March 2017 Surveyed by: Regine Leung Hoi Gok (CA of ISA (HK-0481 (A)))

| Tree No. | Botanical Name                                  | Chinese Name | Tree Size |            |                  | Tree Form<br>(Good/Fair/Poor) | Health Condition<br>(Good/Fair/Poor) | Structural Condition<br>(Good/Fair/Poor) | Amenity Value<br>(High/Medium/Low) | Survival Rate after Transplantation<br>(High/Medium/Low) | Soil Level at Root Collar (mPD) | Recommendation  |  |  | Current Location of Trees               | Final Location of Trees | Remarks   |
|----------|---|--------------|-----------|------------|------------------|-------------------------------|--------------------------------------|--|------------------------------------|--|---------------------------------|---|--|--|---|-------------------------|---|
|          |   |              | DBH (mm)  | Height (m) | Crown Spread (m) |                               |                                      |  |                                    |  |                                 | Approved TRA in 2012<br>(Application No. TPB/A/K14/576) | Updated TRA in 2016<br>(Application No. TPB/A/K14/727) | Updated TRA in Current Submission 2017 |   |                         |   |
| T24      | <i>Roystonea regia</i>                          | 大王椰子         | 272       | 8.5        | 4                | Good                          | Good                                 | Good                                     | High                               | Medium   | 10.60                           | Transplant to nursery                                   | Transplant   | Transplant                             | Within Site (DA3)                       | DA2                     | - Reasonably well form specimen.<br>- Within temporary holding nursery in DA3.  |
| T25      | <i>Syagrus romanzoffiana</i>                    | 皇后葵          | 143       | 5.5        | 4                | Good                          | Fair                                 | Fair                                     | Medium                             | Medium   | 11.25                           | Transplant to nursery                                   | Transplant   | Transplant                             | Outside Site                            | DA2                     | - Smaller palm grows at a roadside tree pit.<br>- Nearby traffic road.  |
| T26      | <i>Roystonea regia</i>                          | 大王椰子         | -         | -          | -                | -                             | -                                    | -  | -                                  | -  | -                               | Transplant to nursery                                   | -  | -                                      | -                                       | -                       | - Being damaged in a traffic accident in 2015 and removed from site.  |
| T27      | <i>Syagrus romanzoffiana</i>                    | 皇后葵          | 220       | 8          | 4                | Good                          | Fair                                 | Good                                     | Medium                             | Medium   | 12.25                           | Transplant to nursery                                   | Transplant   | Transplant                             | Within temporary holding nursery in DA3 | DA2                     | - Cracks and staining at trunk base.<br>- Within temporary holding nursery in DA3.  |
| T70      | <i>Roystonea regia</i>                          | 大王椰子         | 380       | 12         | 7                | Good                          | Good                                 | Fair                                     | High                               | Medium   | 7.50                            | Transplant to nursery                                   | Transplant   | Transplant                             | Within temporary holding nursery in DA3 | DA5                     | - Palm has been transplanted to temporary holding nursery in DA3.   |
| T77      | <i>Hibiscus tiliaceus</i>                       | 黄槿           | 460       | 15         | 11               | Poor                          | Fair                                 | Poor                                     | Low                                | Low  | 10.76                           | Transplant on site                                      | Transplant   | Transplant                             | Within temporary holding nursery (DA3)  | DA3                     | - A severely overextended first order branch with a large wound and poor attachment.<br>- It has been transplanted to temporary holding nursery in DA3.   |
| T82      | <i>Bombax ceiba</i>                             | 木棉           | 260       | 9          | 4                | Poor                          | Fair                                 | Fair                                     | Low                                | Medium   | 10.79                           | Transplant on site                                      | Transplant   | Transplant                             | Within temporary holding nursery (DA3)  | DA2                     | - Co-dominant trunks and crooked trunks.<br>- Hard pruned.<br>- Within temporary holding nursery in DA3.  |
| T84      | <i>Ficus microcarpa</i>                         | 榕树           | 260       | 7          | 11               | Poor                          | Poor                                 | Fair                                     | Medium                             | Medium   | 10.74                           | Transplant to nursery                                   | Transplant   | Transplant                             | Within temporary holding nursery (DA3)  | DA2                     | - Severely asymmetry of the canopy.<br>- Several wounds were found on trunk.<br>- Within temporary holding nursery in DA3.<br>- Numerous water sprouts generated after hard pruning.  |
| T87      | <i>Bombax ceiba</i>                             | 木棉           | 480       | 8          | 4                | Poor                          | Fair                                 | Poor                                     | Low                                | Low  | 11.92                           | Transplant to nursery                                   | Transplant   | Transplant                             | Within temporary holding nursery (DA3)  | DA2                     | - This tree has a significant abnormality of the trunk, i.e. bulge.<br>- Within temporary holding nursery in DA3.<br>- Hard pruned and a wound is found at the base of trunk.   |
| T88      | Dead Tree                                       | 枯树           | -         | -          | -                | -                             | -                                    | -  | -                                  | -  | 11.92                           | Fell  | Fell   | -                                      | -                                       | -                       | The tree is not found on site.  |
| T89      | <i>Macaranga tanarius</i> var. <i>tomentosa</i> | 血桐           | 391       | 8          | 6                | Poor                          | Poor                                 | Poor                                     | Low                                | Low  | 16.29                           | Transplant on site                                      | Transplant   | Transplant                             | Within temporary holding nursery (DA3)  | DA2                     | - Poor tree form.<br>- Cavities and pruning wounds found.<br>- Hard pruned.<br>- Tree bark is detached from the trunk and the tree is dying.<br>- Within temporary holding nursery in DA3.  |
| T90      | <i>Macaranga tanarius</i> var. <i>tomentosa</i> | 血桐           | 410       | 7.5        | 5                | Poor                          | Poor                                 | Poor                                     | Low                                | Low  | 16.48                           | Transplant on site                                      | Transplant   | Transplant                             | Within temporary holding nursery (DA3)  | DA2                     | - Crooked trunk<br>- Large wound found on trunk.<br>- Within temporary holding nursery in DA3.<br>- Limited live crown.   |
| T91      | <i>Macaranga tanarius</i> var. <i>tomentosa</i> | 血桐           | 225       | 6          | 4                | Poor                          | Fair                                 | Poor                                     | Low                                | Low  | 19.74                           | Transplant on site                                      | Transplant   | Transplant                             | Within temporary holding nursery (DA3)  | DA2                     | - Hard pruned with several wounds found on trunk.<br>- Within temporary holding nursery in DA3.   |
| T92      | <i>Bombax ceiba</i>                             | 木棉           | 680       | 12         | 10               | Fair                          | Fair                                 | Fair                                     | High                               | Low  | 19.74                           | Transplant on site                                      | Transplant   | Transplant                             | Within temporary holding nursery (DA2)  | DA2                     | - Slightly crooked trunk.<br>- Uneven distribution of benches.<br>- Grow at the edge of planter.<br>- Large mature tree located next to T93. It is recommended to be transplanted with T93 so as to increase the survival rate after transplantation.<br>- Within temporary holding nursery in DA2. |
| T93      | <i>Bombax ceiba</i>                             | 木棉           | 695       | 15         | 8                | Fair                          | Fair                                 | Fair                                     | High                               | Low  | 19.74                           | Transplant on site                                      | Transplant   | Transplant                             | Within temporary holding nursery (DA2)  | DA2                     | - Slightly crooked trunk.<br>- Uneven distribution of benches.<br>- Grow at the edge of planter.<br>- Large mature tree located next to T92. It is recommended to be transplanted with T92 so as to increase the survival rate after transplantation.<br>- Within temporary holding nursery in DA2. |

## Summary of the proposed treatment to existing trees within Development Area 2&amp;3

|                                    |                |
|------------------------------------|----------------|
| Trees to be retained               | 0 nos.         |
| Trees to be transplanted           | 13 nos.        |
| Trees to be felled                 | 0 nos.         |
| Trees removed or not found on site | 2 nos.         |
| <b>Total</b>                       | <b>15 nos.</b> |

Note: T70 will be transplanted to final location in DA5.

4 nos. of transplanted trees T94, T98, T103 and T106 from DA1 (Yuet Wah Street Site) will be transplanted to final location in DA2.

Kwun Tong Town Centre Redevelopment Project (KTTC)

Tree Assessment Schedule - DAs 2&amp;3

|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | SEP 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 2.1 |       | REV<br>B |

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# Existing Tree Assessment Schedule

Project Title: Minor Amendment to Approved S16 Planning Application Kwun Tong Town Centre Redevelopment Project (KTTC) Main Site

Date of Tree Survey: 20th March 2017 Surveyed by: Regine Leung Hoi Gok (CA of ISA (HK 0481 (A)))

| Tree No. | Botanical Name                 | Chinese Name | Tree Size |            |                  | Tree Form<br>(Good/Fair/Poor) | Health Condition<br>(Good/Fair/Poor) | Structural Condition<br>(Good/Fair/Poor) | Amenity Value<br>(High/Medium/Low) | Survival Rate after Transplantation<br>(High/Medium/Low) | Soil Level at Root Collar (MPD) | Recommendation                                      |  |  | Current Location of Trees | Final Location of Trees | Remarks   |
|----------|--------------------------------|--------------|-----------|------------|------------------|-------------------------------|--------------------------------------|--|------------------------------------|--|---------------------------------|---|--|--|---------------------------|-------------------------|---|
|          |                                |              | DBH (mm)  | Height (m) | Crown Spread (m) |                               |                                      |  |                                    |  |                                 | Approved TRA in 2012 (Application No. TPBA/K14/576) | Updated TRA in 2016 (Application No. TPBA/K14/727) | Updated TRA in Current Submission 2017 |                           |                         |   |
| T1       | <i>Aleurites moluccana</i>     | 石栗           | 389       | 8          | 6                | Good                          | Good                                 | Good                                     | Medium                             | Medium   | 5.81                            | Transplant to nursery                               | Transplant   | Transplant                             | Within Site (DA4)         | DA5                     | - Grove of decurrent tree species of obvious amenity.<br>- It is recommended to transplant to temporary holding nursery within site before transplanting to final receptor location.  |
| T2       | <i>Aleurites moluccana</i>     | 石栗           | 345       | 7          | 6                | Fair                          | Good                                 | Good                                     | Medium                             | Medium   | 5.85                            | Transplant to nursery                               | Transplant   | Transplant                             | Within Site (DA4)         | DA5                     | - Grove of decurrent tree species of obvious amenity.<br>- It is recommended to transplant to temporary holding nursery within site before transplanting to final receptor location.  |
| T3       | <i>Aleurites moluccana</i>     | 石栗           | 236       | 6          | 5                | Fair                          | Good                                 | Fair                                     | Medium                             | Medium   | 5.78                            | Transplant to nursery                               | Transplant   | Transplant                             | Within Site (DA4)         | DA5                     | - Tree most affected through the compellion created with the continuous canopy.<br>- It is recommended to transplant to temporary holding nursery within site before transplanting to final receptor location.  |
| T4       | <i>Aleurites moluccana</i>     | 石栗           | 313       | 7          | 5                | Fair                          | Good                                 | Fair                                     | Medium                             | Medium   | 5.76                            | Transplant to nursery                               | Transplant   | Transplant                             | Within Site (DA4)         | DA5                     | - Grove of decurrent tree species of obvious amenity.<br>- It is recommended to transplant to temporary holding nursery within site before transplanting to final receptor location.  |
| T5       | <i>Aleurites moluccana</i>     | 石栗           | 388       | 8          | 6                | Fair                          | Good                                 | Fair                                     | Medium                             | Medium   | 5.76                            | Transplant to nursery                               | Transplant   | Transplant                             | Within Site (DA4)         | DA5                     | - Grove of decurrent tree species of obvious amenity.<br>- It is recommended to transplant to temporary holding nursery within site before transplanting to final receptor location.  |
| T9       | <i>Ficus microcarpa</i>        | 榕樹           | 3000      | 18         | 15               | Fair                          | Fair                                 | Fair                                     | High                               | Low  | 9.02                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Prominent and very large specimen. Pruning of big branches due to construction of tempory structure in the proximity.   |
| T10      | <i>Ficus microcarpa</i>        | 榕樹           | 670       | 10         | 8                | Poor                          | Fair                                 | Fair                                     | Medium                             | Low  | 8.64                            | Transplant on site                                  | Transplant   | Transplant                             | Within Site (DA4)         | DA4                     | - Transplanted before. It is recommended to transplant to temporary holding nursery within site before transplanting to final receptor location.  |
| T11      | <i>Crateva unilocularis</i>    | 樹頭菜          | 239       | 13         | 7                | Poor                          | Poor                                 | Poor                                     | Low                                | Low  | 0.76                            | Transplant on site                                  | Transplant   | Fell                                   | Within Site (DA4)         | -                       | - Tree stability has been changed through very poor pruning and management.<br>- Wound found at the base of trunk. Dead branches were recorded.<br>- It is recommended to fell the tree due to potential risk of tree failure.  |
| T13      | <i>Ficus microcarpa</i>        | 榕樹           | 1100      | 14         | 15               | Poor                          | Poor                                 | Poor                                     | Medium                             | Low  | 7.37                            | Transplant on site                                  | Transplant   | Transplant                             | Within Site (DA4)         | DA4                     | - Poor tree management.<br>- Transplanted before. It is recommended to transplant to temporary holding nursery within site before transplanting to final receptor location.   |
| T14      | <i>Ficus microcarpa</i>        | 榕樹           | 1400      | 14         | 17               | Fair                          | Poor                                 | Poor                                     | Medium                             | Low  | 6.91                            | Transplant on site                                  | Transplant   | Transplant                             | Within Site (DA4)         | DA4                     | - Poor tree management.<br>- Transplanted before. It is recommended to transplant to temporary holding nursery within site before transplanting to final receptor location.   |
| T18      | <i>Bombax ceiba</i>            | 木棉           | 387       | 10         | 6                | Good                          | Fair                                 | Good                                     | High                               | Medium   | 8.32                            | Transplant on site                                  | Transplant   | Transplant                             | Within Site (DA4)         | DA5                     | - Transplanted before. It is recommended to transplant to temporary holding nursery within site before to final receptor location.  |
| T23      | <i>Ficus microcarpa</i>        | 榕樹           | 850       | 9          | 7                | Poor                          | Fair                                 | Fair                                     | Medium                             | Low  | 8.81                            | Transplant on site                                  | Transplant   | Transplant                             | Within Site (DA4)         | DA5                     | - Temporary structure was built in the proximity.<br>- Over pruned.<br>- Epicormic shoots growth.<br>- Wounds on branches and trunks.<br>- Transplanted before. It is recommended to transplant to temporary holding nursery within site before transplanting to final receptor location. |
| T29      | <i>Syzygium jambos</i>         | 蒲桃           | 277       | 8          | 7                | Fair                          | Fair                                 | Fair                                     | Medium                             | Low  | 8.92                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Nice specimen in the tree group that can extend it's crown.   |
| T30      | <i>Syzygium jambos</i>         | 蒲桃           | 204       | 8          | 6                | Poor                          | Fair                                 | Fair                                     | Medium                             | Low  | 8.92                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Form adversely affected as planting too close to the trees in the proximity and cannot fully extend the crown.  |
| T31      | <i>Syzygium jambos</i>         | 蒲桃           | 302       | 9          | 6                | Fair                          | Fair                                 | Fair                                     | Medium                             | Low  | 8.85                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Form adversely affected as planting too close to the trees in the proximity and cannot fully extend the crown.  |
| T32      | <i>Syzygium jambos</i>         | 蒲桃           | 290       | 8          | 7                | Poor                          | Fair                                 | Fair                                     | Medium                             | Low  | 8.85                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Asymmetrical canopy created through competition. Planting too close.  |
| T33      | <i>Ficus microcarpa</i>        | 榕樹           | 050       | 12         | 11               | Good                          | Good                                 | Good                                     | High                               | Low  | 0.42                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Quality tree.   |
| T34      | <i>Schefflera actinophylla</i> | 銀葉蘭掌樹        | 208       | 7          | 5                | Poor                          | Fair                                 | Fair                                     | Medium                             | Low  | 8.82                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Asymmetrical form.<br>- Small leaves.<br>- Severely leaning.  |
| T35      | <i>Schefflera actinophylla</i> | 銀葉蘭掌樹        | 350       | 9          | 6                | Fair                          | Fair                                 | Fair                                     | Low                                | Low  | 8.82                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Deformed and being overcrowded by other trees in the proximity.   |
| T36      | <i>Ficus elastica</i>          | 印度榕          | 1700      | 14         | 26               | Fair                          | Fair                                 | Fair                                     | High                               | Low  | 8.98                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - O.V.T. (Registration No.: LCSD KT3)<br>- Restricted rooting environment.<br>- In need of rhizosphere management.  |
| T37      | <i>Ficus elastica</i>          | 印度榕          | 2100      | 20         | 30               | Fair                          | Good                                 | Fair                                     | High                               | Low  | 8.50                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - O.V.T. (Registration No.: LCSD KT2)<br>- Restricted root zone area.<br>- Located in a planter.<br>- Producing many aerial roots.  |

Kwun Tong Town Centre Redevelopment Project (KTTC)

Tree Assessment Schedule - DAs 4&5 (Sheet 1 of 2)

|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | SEP 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 2.2 |       | REV B    |



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| Tree No. | Botanical Name                    | Chinese Name | Tree Size |            |                  | Tree Form | Health Condition | Structural Condition | Amenity Value | Survival Rate after Transplantation | Soil Level at Root Collar (mPD) | Recommendation                                      |  |  | Current Location of Trees | Final Location of Trees | Remarks  |
|----------|-----------------------------------|--------------|-----------|------------|------------------|-----------|------------------|----------------------|---------------|-------------------------------------|---------------------------------|---|--|--|---------------------------|-------------------------|--|
|          |                                   |              | DBH (mm)  | Height (m) | Crown Spread (m) |           |                  |                      |               |                                     |                                 | Approved TRA in 2012 (Application No. TPDA/K14/576) | Updated TRA in 2016 (Application No. TPDA/K14/727) | Updated TRA in Current Submission 2017 |                           |                         |  |
| T39      | <i>Roystonea regia</i>            | 大王椰子         | 432       | 13         | 6                | Good      | Good             | Good                 | High          | High                                | 7.25                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Quality specimen palm.   |
| T40      | <i>Roystonea regia</i>            | 大王椰子         | 392       | 13         | 6                | Good      | Good             | Good                 | High          | High                                | 7.25                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Quality specimen palm.   |
| T41      | <i>Roystonea regia</i>            | 大王椰子         | 378       | 9          | 4                | Good      | Good             | Good                 | High          | High                                | 7.25                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Smallest of the group of three larger palms.   |
| T42      | <i>Ravenea madagascariensis</i>   | 旅人蕉          | 410       | 8          | 4                | Fair      | Good             | Fair                 | Medium        | High                                | 8.76                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Multi-stemmed specimen with 4 major leaders.   |
| T43      | <i>Ravenea madagascariensis</i>   | 旅人蕉          | 510       | 8          | 4                | Fair      | Good             | Fair                 | Medium        | High                                | 8.94                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Multi-stemmed specimen with 3 major leaders.   |
| T44      | <i>Bombax ceiba</i>               | 木棉           | 431       | 11         | 8                | Poor      | Good             | Fair                 | Medium        | Low                                 | 8.76                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Co-dominant.<br>- Very high crown lift.<br>- Reduced mass dampening ability.   |
| T46      | <i>Lagerstroemia speciosa</i>     | 大花紫薇         | 190       | 8          | 5                | Poor      | Good             | Fair                 | Medium        | Low                                 | 8.94                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Severely asymmetrical tree.  |
| T47      | <i>Lagerstroemia speciosa</i>     | 大花紫薇         | 104       | 6          | 4                | Poor      | Good             | Fair                 | Low           | Low                                 | 8.71                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Irregular form.  |
| T49      | <i>Lagerstroemia speciosa</i>     | 大花紫薇         | 141       | 8          | 5                | Poor      | Fair             | Fair                 | Medium        | Low                                 | 8.55                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Suppressed with limited distal branching.  |
| T50      | <i>Lagerstroemia speciosa</i>     | 大花紫薇         | 220       | 7          | 6                | Good      | Fair             | Fair                 | Medium        | Medium                              | 8.55                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Well formed specimen.<br>- Not in a prominent location.<br>- Predation obvious.  |
| T51      | <i>Spathodea campanulata</i>      | 火焰树          | 363       | 7          | 6                | Poor      | Poor             | Fair                 | Low           | Low                                 | 9.10                            | Retain  | Retain   | Fell                                   | Within Site (DA4)         | -                       | - No live crown.<br>- In poor health.  |
| T52      | <i>Spathodea campanulata</i>      | 火焰树          | -         | -          | -                | -         | -                | -                    | -             | -                                   | -                               | Transplant to nursery                               | Transplant   | -                                      | -                         | -                       | - Not found on site.   |
| T61      | <i>Livistona chinensis</i>        | 蒲葵           | 184       | 7          | 4                | Fair      | Good             | Fair                 | Medium        | Medium                              | 9.10                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Leaning due to competition from the very close planting.   |
| T61A     | <i>Livistona chinensis</i>        | 蒲葵           | 157       | 7          | 4                | Good      | Good             | Fair                 | Medium        | Medium                              | 9.10                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Leaning due to competition from the very close planting.   |
| T62      | <i>Livistona chinensis</i>        | 蒲葵           | 164       | 7          | 5                | Fair      | Good             | Fair                 | Medium        | Medium                              | 9.09                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Leaning due to competition from the very close planting.   |
| T63      | <i>Livistona chinensis</i>        | 蒲葵           | 188       | 7          | 4                | Good      | Good             | Good                 | Medium        | Medium                              | 9.09                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Leaning due to competition from the very close planting.   |
| T71      | <i>Archontophoenix alexandrae</i> | 假桫欏          | 176       | 11         | 4                | Good      | Fair             | Good                 | Medium        | Medium                              | 7.44                            | Transplant to nursery                               | Transplant   | Transplant                             | Within Site (DA5)         | DA3                     | - Impact from damage on lower trunk.<br>- It is recommended to transplant to temporary location within site before transplanting to final receptor location. |
| T72      | <i>Archontophoenix alexandrae</i> | 假桫欏          | 180       | 8          | 4                | Good      | Fair             | Good                 | Medium        | High                                | 7.44                            | Transplant to nursery                               | Transplant   | Transplant                             | Within Site (DA5)         | DA3                     | - Impact from damage on lower trunk.<br>- It is recommended to transplant to temporary location within site before transplanting to final receptor location. |
| T73      | <i>Archontophoenix alexandrae</i> | 假桫欏          | 171       | 10         | 4                | Good      | Fair             | Good                 | Medium        | High                                | 7.51                            | Transplant to nursery                               | Transplant   | Transplant                             | Within Site (DA5)         | DA3                     | - Impact from damage on lower trunk.<br>- It is recommended to transplant to temporary location within site before transplanting to final receptor location. |
| T74      | <i>Archontophoenix alexandrae</i> | 假桫欏          | 173       | 11         | 4                | Good      | Fair             | Good                 | Medium        | High                                | 7.51                            | Transplant to nursery                               | Transplant   | Transplant                             | Within Site (DA5)         | DA3                     | - Impact from damage on lower trunk.<br>- It is recommended to transplant to temporary location within site before transplanting to final receptor location. |
| T120     | <i>Araucaria columnaris</i>       | 奥莱南洋杉        | 208       | 9          | 3                | Good      | Good             | Fair                 | Medium        | Medium                              | 7.49                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Most superior of the group of three.   |
| T121     | <i>Araucaria columnaris</i>       | 奥莱南洋杉        | 154       | 8          | 3                | Fair      | Good             | Fair                 | Medium        | Medium                              | 7.48                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Planting density too high.   |
| T122     | <i>Araucaria columnaris</i>       | 奥莱南洋杉        | 147       | 6          | 4                | Fair      | Good             | Fair                 | Medium        | Medium                              | 7.54                            | Retain  | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Overtopped.<br>- Natural trunk seep, typical for the species.  |
| TA1      | <i>Calistemon viminalis</i>       | 串钱柳          | 140       | 5          | 3                | Poor      | Fair             | Poor                 | Low           | Medium                              | 8.17                            | -   | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Asymmetrical canopy due to suppression.  |
| TA2      | <i>Calistemon viminalis</i>       | 串钱柳          | 123       | 5          | 4                | Poor      | Fair             | Poor                 | Medium        | Medium                              | 8.09                            | -   | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Limited distal branching.  |
| TA3      | <i>Calistemon viminalis</i>       | 串钱柳          | 165       | 5          | 5                | Poor      | Fair             | Poor                 | Medium        | Medium                              | 8.10                            | -   | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - Asymmetrical canopy due to suppression.  |
| TA4      | <i>Hyophorbe lagenicaulis</i>     | 酒瓶椰子         | 138       | 3          | 2                | Fair      | Fair             | Good                 | Low           | High                                | 8.34                            | -   | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - One of three juvenile palms.<br>- Located in a planter with three much larger ones.  |
| TA5      | <i>Hyophorbe lagenicaulis</i>     | 酒瓶椰子         | 177       | 3          | 3                | Fair      | Fair             | Good                 | Low           | High                                | 8.35                            | -   | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - One of three juvenile palms.<br>- Located in a planter with three much larger ones.  |
| TA6      | <i>Hyophorbe lagenicaulis</i>     | 酒瓶椰子         | 162       | 3          | 3                | Fair      | Fair             | Good                 | Low           | High                                | 8.33                            | -   | Retain   | Retain                                 | Within Site (DA4)         | DA4                     | - One of three juvenile palms.<br>- Located in a planter with three much larger ones.  |

| Summary of the proposed treatment to existing trees within Development Area 4&5 |                |
|---|----------------|
| Trees to be retained  | 33 nos.        |
| Trees to be transplanted  | 14 nos.        |
| Trees to be felled  | 2 nos.         |
| Trees removed or not found on site  | 1 no.          |
| <b>Total</b>  | <b>50 nos.</b> |

Note: T70 currently located in DA3 will be transplanted final location in DA5.  
10 trees currently holding in off-site nursery will be transplanted to final location in DAs4&5 (refer to separate tree schedule).

## Kwun Tong Town Centre Redevelopment Project (KTTC)

### Tree Assessment Schedule - DAs 4&5 (Sheet 2 of 2)

| SCALE      | AS SHOWN   | DATE  | SEP 2017 |
|------------|------------|-------|----------|
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 2.3 |       | REV B    |



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**Schedule of Transplanted Trees in Off-site Nursery**

Project Title: Minor Amendment to Approved S16 Planning Application Kwun Tong Town Centre Redevelopment Project (KTTC) Main Site

(Extracted from the Revised Tree Preservation Scheme and Tree Removal Application Approved by PlanD in 2012 for Main Site and 2013 for Yuet Wah Street Site)

| Tree No. | Botanical Name               | Chinese Name | Tree Size |            |                  | Tree Form<br>(Good/Fair/Poor) | Health Condition<br>(Good/Fair/Poor) | Amenity Value<br>(High/Medium/Low) | Survival Rate after Transplantation<br>(High/Medium/Low) | Soil Level at Root Collar (mPD) | Recommendation   |  |  | Current Location of Trees | Final Location of Trees | Remarks   |
|----------|------------------------------|--------------|-----------|------------|------------------|-------------------------------|--------------------------------------|------------------------------------|--|---------------------------------|--|--|--|---------------------------|-------------------------|---|
|          |                              |              | DBH (mm)  | Height (m) | Crown Spread (m) |                               |                                      |                                    |  |                                 | Approved TRA in 2012<br>(Application No. TPB/A/K14/576)  | Updated TRA in 2016<br>(Application No. TPB/A/K14/727) | Updated TRA in Current Submission 2017 |                           |                         |   |
| T15      | <i>Crataeva unilocularis</i> | 樹頭菜          | 0.31      | 5          | 4                | Fair                          | Good                                 | Medium                             | Medium   | 8.87                            | Transplant to nursery  | in off-site nursery                                    | Transplant                             | in off-site nursery       | DA5                     | Tree was found with leaning trunk and dead branch.  |
| T16      | <i>Bombax ceiba</i>          | 木棉           | 0.19      | 7          | 4                | Fair                          | Good                                 | Medium                             | Medium   | 8.93                            | Transplant to nursery  | in off-site nursery                                    | Transplant                             | in off-site nursery       | DA5                     | Tree established in tree pit.   |
| T17      | <i>Crataeva unilocularis</i> | 樹頭菜          | 0.26      | 7          | 4                | Good                          | Good                                 | Medium                             | Medium   | 8.93                            | Transplant to nursery  | in off-site nursery                                    | Transplant                             | in off-site nursery       | DA5                     | Tree was found in good tree form.   |
| T19      | <i>Bombax ceiba</i>          | 木棉           | 0.2       | 6          | 4                | Fair                          | Good                                 | Medium                             | Medium   | 8.79                            | Transplant to nursery  | in off-site nursery                                    | Transplant                             | in off-site nursery       | DA4                     | Tree was established in restricted tree pit which is difficult to form complete rootball for transplantation. |
| T20      | <i>Bombax ceiba</i>          | 木棉           | 0.19      | 6          | 4                | Poor                          | Fair                                 | Low                                | Low  | 8.76                            | Transplant to nursery  | in off-site nursery                                    | Transplant                             | in off-site nursery       | DA4                     | Tree was established in restricted tree pit which is difficult to form complete rootball for transplantation. |
| T123     | <i>Albizia lebbek</i>        | 大葉合歡         | 0.11      | 6          | 4                | Poor                          | Fair                                 | Low                                | Medium   | 8.86                            | Transplant to nursery  | in off-site nursery                                    | Transplant                             | in off-site nursery       | DA5                     | Tree was found close to stone wall and it is difficult to form complete rootball.                             |
| T124A    | <i>Melia azedarach</i>       | 楝            | 0.11      | 4          | 3                | Fair                          | Poor                                 | Low                                | Low  | 8.87                            | Transplant to nursery  | in off-site nursery                                    | Transplant                             | in off-site nursery       | DA5                     |   |
| T125     | <i>Cassia suiattensis</i>    | 黃槐           | 0.12      | 2          | 4                | Poor                          | Fair                                 | Low                                | Medium   | 8.97                            | Transplant to nursery  | in off-site nursery                                    | Transplant                             | in off-site nursery       | DA5                     | Tree was hardly pruned with poor tree form.   |
| T126     | <i>Mangifera indica</i>      | 芒果           | 0.15      | 4          | 4                | Good                          | Good                                 | Medium                             | Medium   | 8.83                            | Transplant to nursery  | in off-site nursery                                    | Transplant                             | in off-site nursery       | DA5                     |   |
| T127     | <i>Cassia suiattensis</i>    | 黃槐           | 0.11      | 4          | 3                | Poor                          | Poor                                 | Low                                | Low  | 8.93                            | Transplant to nursery  | in off-site nursery                                    | Transplant                             | in off-site nursery       | DA5                     | Poor tree form with leaning trunk.  |
| T94*     | <i>Aleurites moluccana</i>   | 石栗           | 0.51      | 10         | 8                | Good                          | Good                                 | High                               | Medium   | 18.83                           | Transplant<br>Approved under separate application (No. A/K14/577-1)<br>of Yuet Wah Street Site |  |  | in off-site nursery       | DA2                     | Transplant to the Main Site. Co-dominant stems with included bark.  |
| T98*     | <i>Aleurites moluccana</i>   | 石栗           | 0.51      | 10         | 8                | Good                          | Good                                 | High                               | Medium   | 19.26                           |  |  |  | in off-site nursery       | DA2                     | Transplant to the Main Site. Co-dominant stems with included bark.  |
| T103*    | <i>Aleurites moluccana</i>   | 石栗           | 0.48      | 12         | 9                | Good                          | Good                                 | High                               | Medium   | 19.81                           |  |  |  | in off-site nursery       | DA2                     | Transplant to the Main Site.  |
| T106*    | <i>Livistona chinensis</i>   | 蒲葵           | 0.25      | 7          | 3                | Good                          | Good                                 | High                               | High   | 20.63                           |  |  |  | in off-site nursery       | DA2                     | Transplant to the Main Site.  |

\* 4 nos. of transplanted trees T94, T98, T103 and T106 from DA1 (Yuet Wah Street Site) will be transplanted to final location in DA2.

| Summary of the proposed treatment to transplanted trees holding in off-site nursery |                |
|---|----------------|
| Trees to be retained  | 0 no.          |
| Trees to be transplanted  | 14 nos.        |
| Trees to be felled  | 0 no.          |
| Trees removed or not found on site  | 0 no.          |
| <b>Total</b>  | <b>14 nos.</b> |

Kwun Tong Town Centre Redevelopment Project (KTTC)

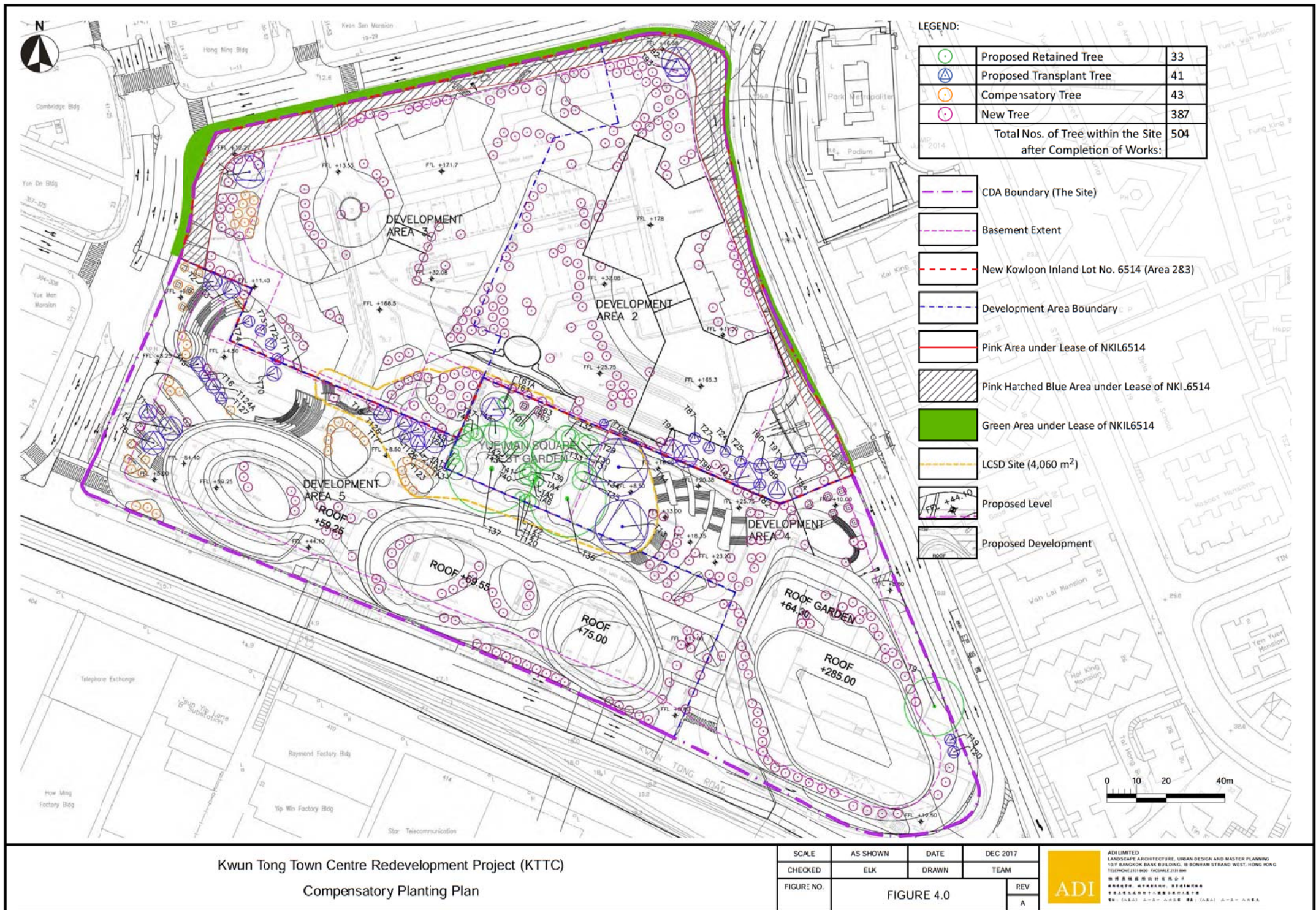
Tree Schedule - Transplanted Trees in Off-site Nursery

|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | SEP 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 2.4 |       | REV<br>B |



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中國上海辦事處：上海南京路100號上海銀行大廈10樓





Kwun Tong Town Centre Redevelopment Project (KTTC)  
Compensatory Planting Plan

|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 4.0 |       | REV<br>A |

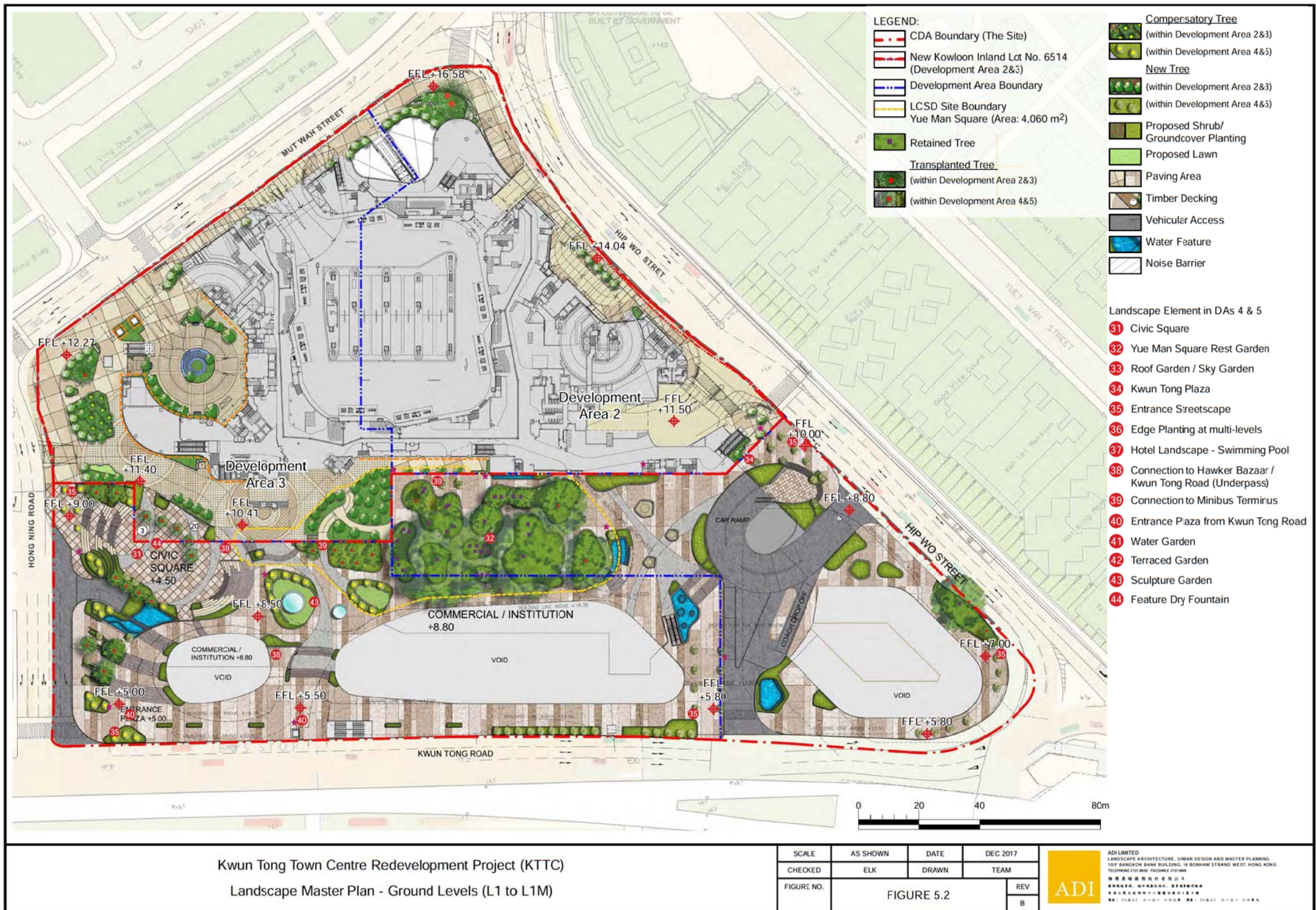




Kwun Tong Town Centre Redevelopment Project (KTTC)

Landscape Master Plan - Combined





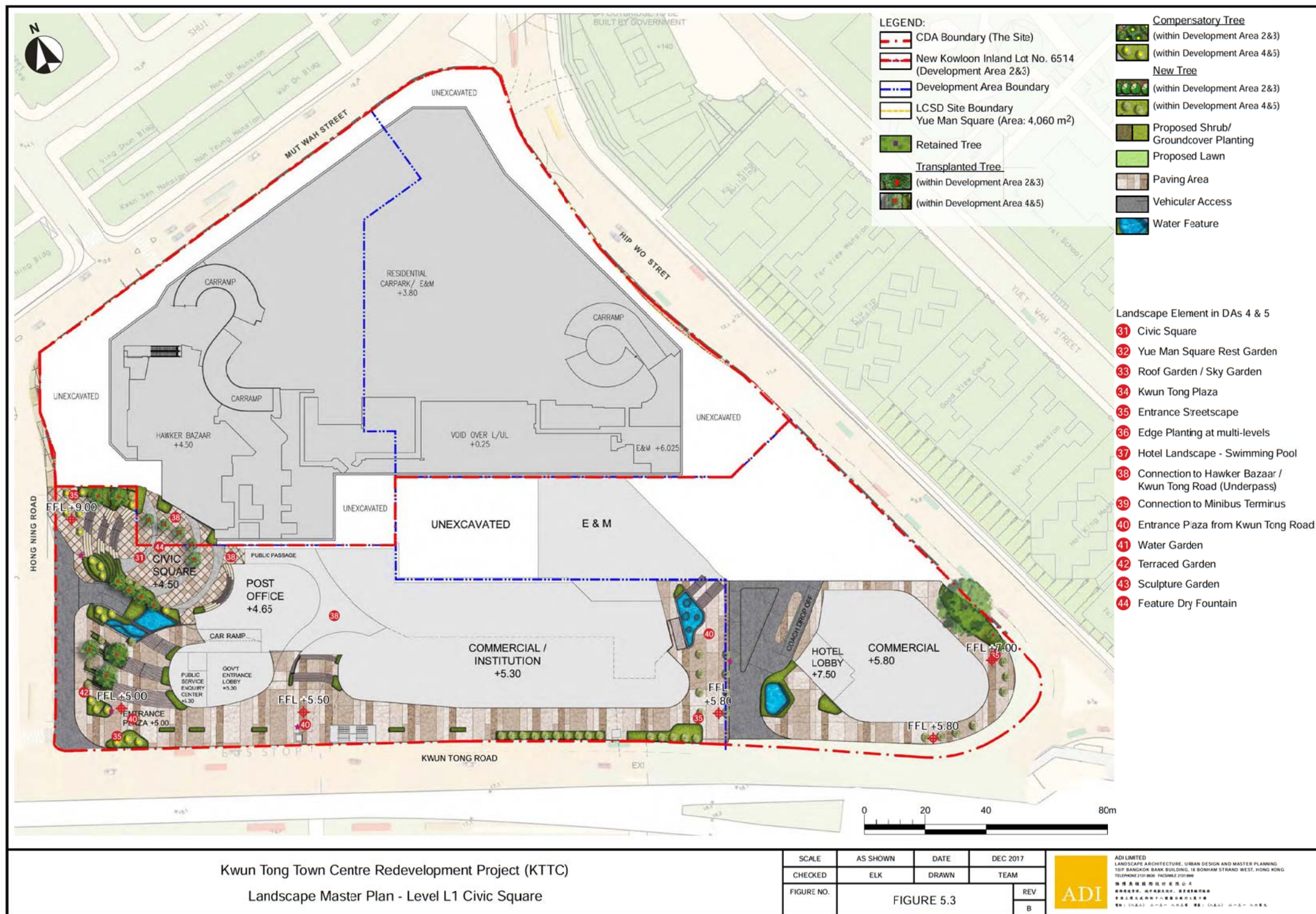
Kwun Tong Town Centre Redevelopment Project (K TTC)  
Landscape Master Plan - Ground Levels (L1 to L1M)

|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 5.2 |       | REV<br>B |



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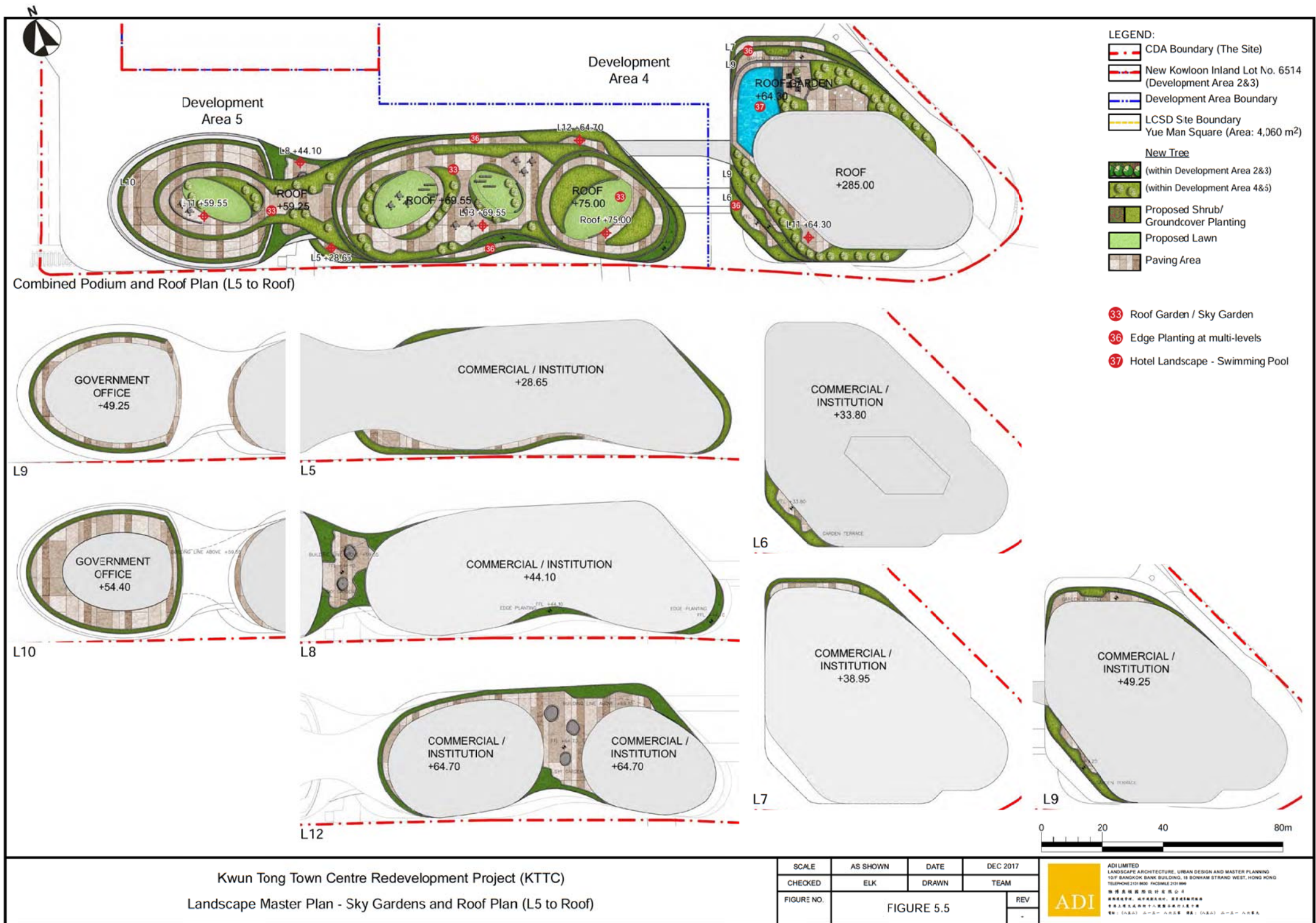




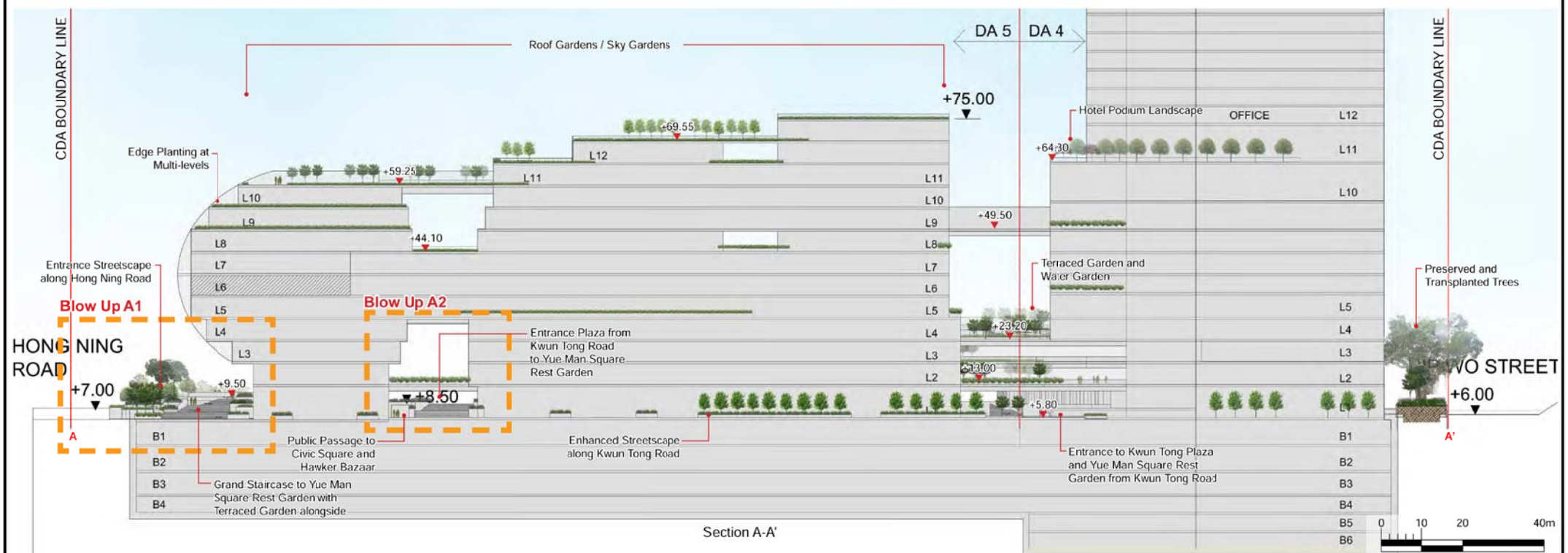
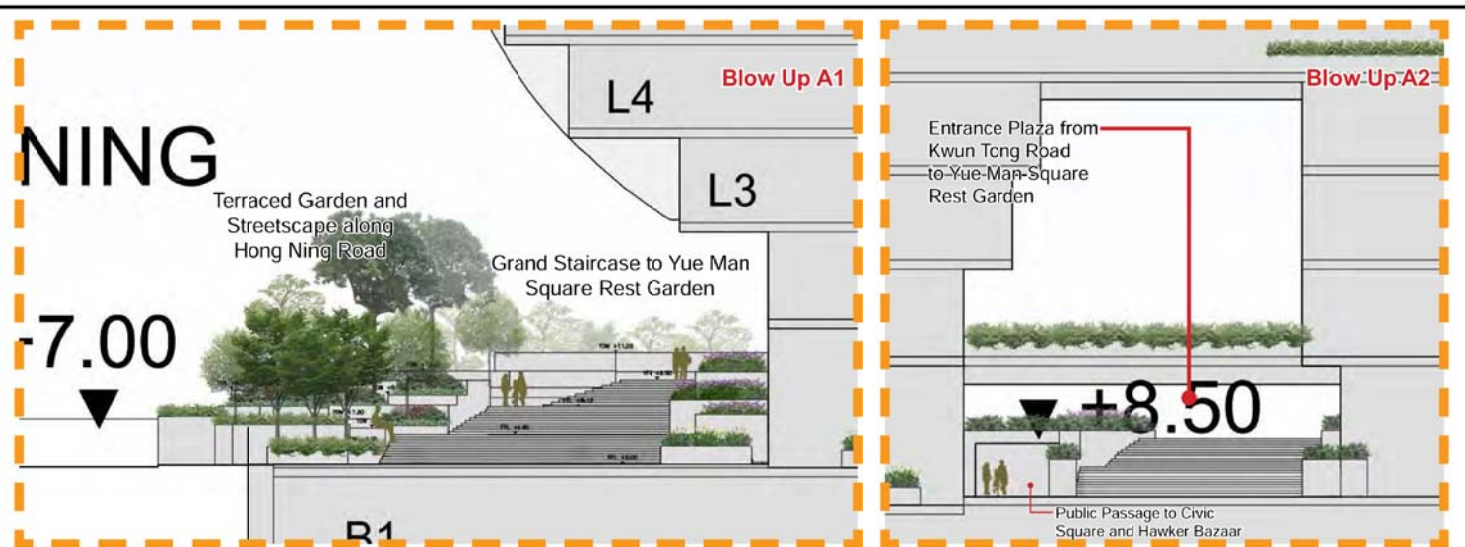
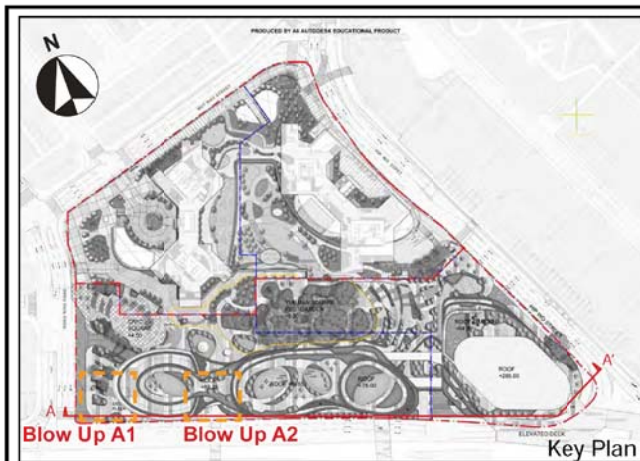
Kwun Tong Town Centre Redevelopment Project (KTTC)  
Landscape Master Plan - Terraced Gardens (L2 to L4)

|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 5.4 |       | REV      |

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Kwun Tong Town Centre Redevelopment Project (K TTC)

Landscape Section A

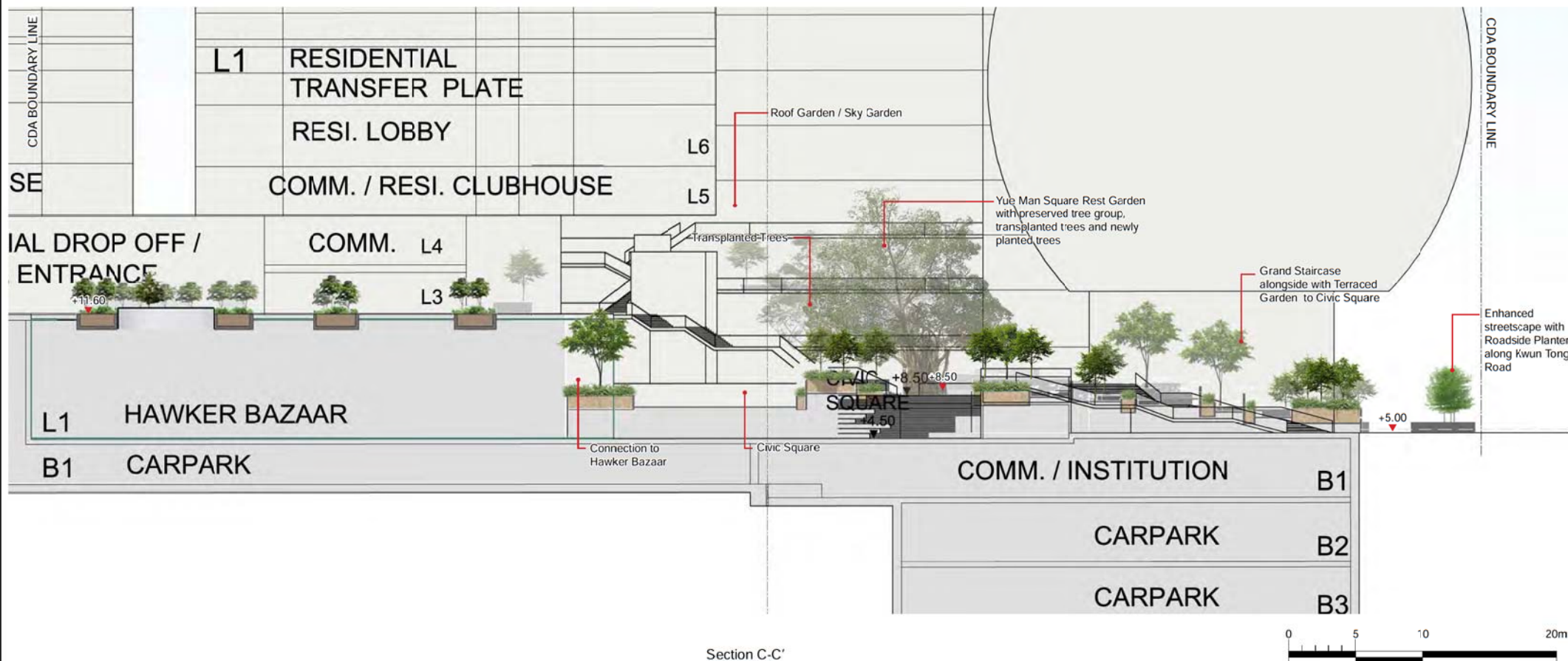
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| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 6.1 |       |          |
| REV        | A          |       |          |

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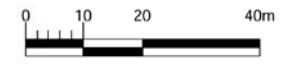
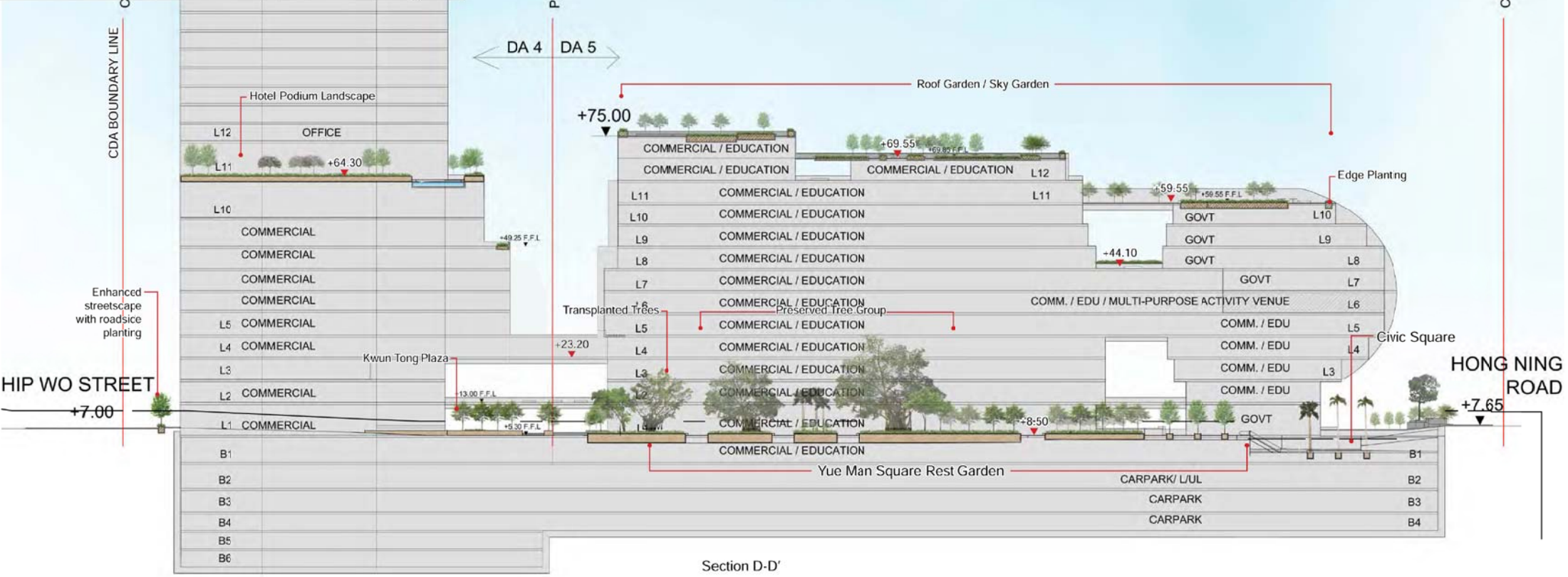
Kwun Tong Town Centre Redevelopment Project (K TTC)

Landscape Section C

|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 6.3 |       | REV      |
|            |            |       | A        |



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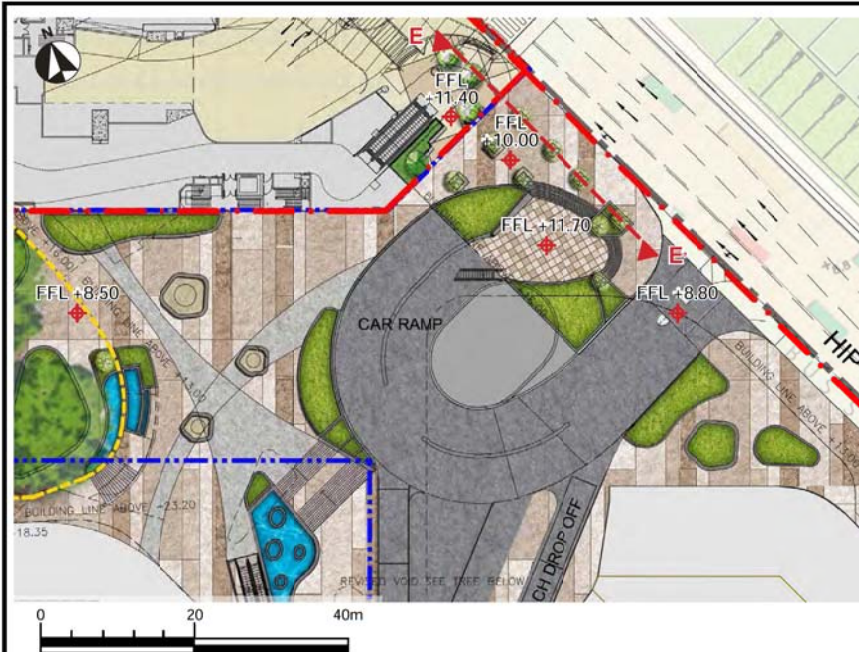


Kwun Tong Town Centre Redevelopment Project (KTTCC)  
Landscape Section D

|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 6.4 |       | REV<br>A |

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Kwun Tong Plaza  
Entrance to Yuen Man Square and to +13.0mPD Terrace from Hip Wo Street



Key Plan

Blow-up and Section of DAs 4&5 are indicative and subject to detailed design stage.



Section E-E'

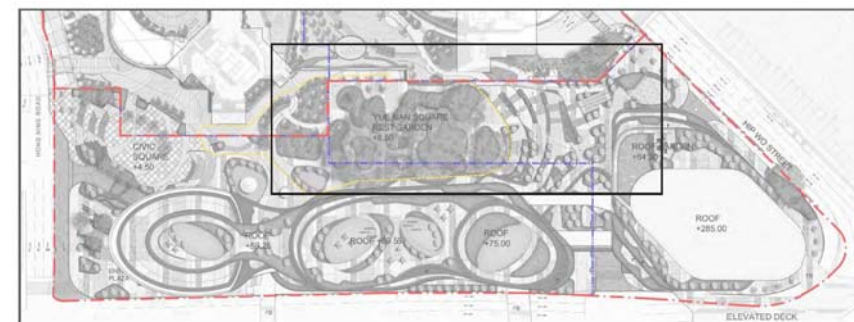
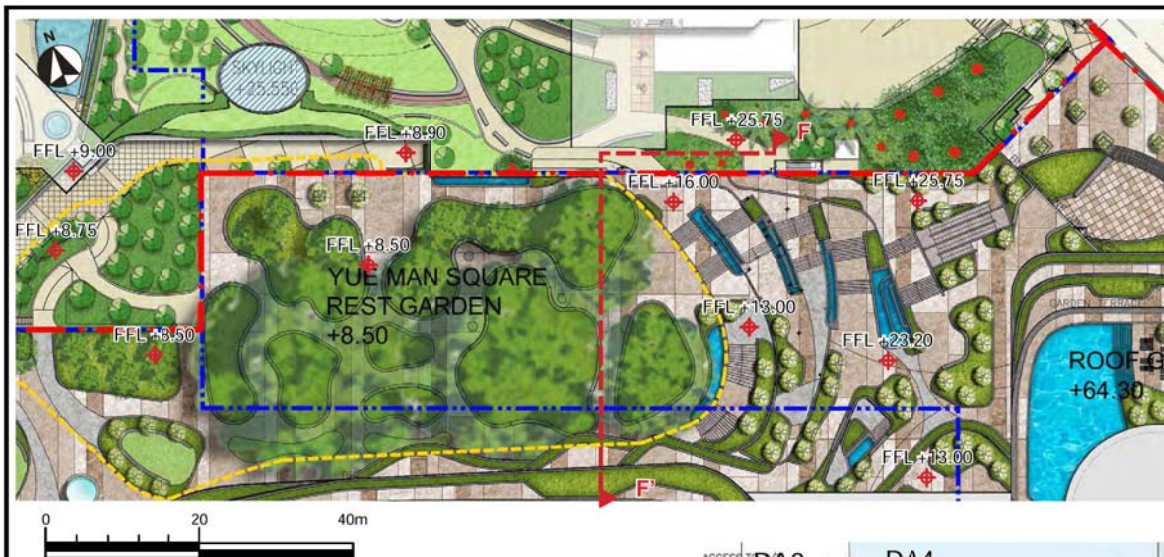
Kwun Tong Town Centre Redevelopment Project (KTTC)  
Indicative Landscape Blow-up Plan and Section Sheet 1 of 6

|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 6.5 |       | REV<br>B |



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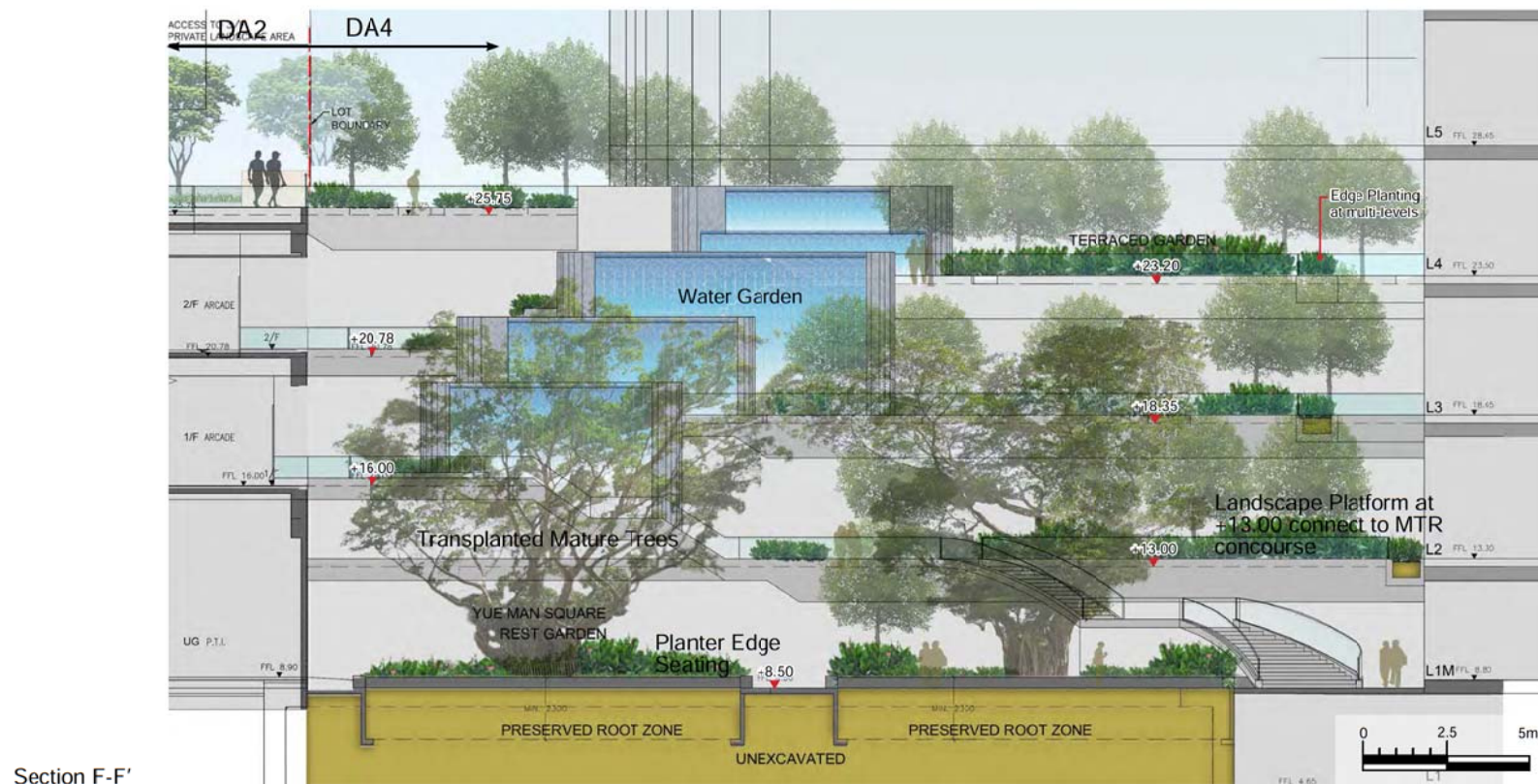




Key Plan


Blow-up and Section of DAs 4&5 are indicative and subject to detailed design stage.

Yue Man Square Rest Garden  
Connections to DA2 Levels +16.00, +20.75 and +25.75mPD

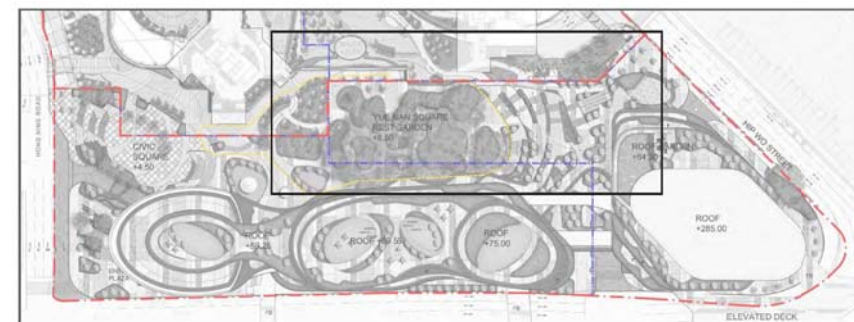


Section F-F'

Kwun Tong Town Centre Redevelopment Project (KTTC)  
Indicative Landscape Blow-up Plan and Section Sheet 2 of 6

|            |            |       |          |     |   |
|------------|------------|-------|----------|-----|---|
| SCALE      | AS SHOWN   | DATE  | DEC 2017 |     |  <div>ADI LIMITED<br/>LANDSCAPE ARCHITECTURE, URBAN DESIGN AND MASTER PLANNING<br/>10/F BANGKOK BANK BUILDING, 18 BONHAM STRAND WEST, HONG KONG<br/>TELEPHONE 2131 9600 FACSIMILE 2131 9608<br/>德律風 德律風 德律風 德律風 德律風 德律風 德律風 德律風 德律風 德律風<br/>香港中環德輔道西18號香港銀行大廈10樓<br/>電話：(八五五) 二一三一九六〇〇 傳真：(八五五) 二一三一九六〇八</div> |
| CHECKED    | ELK        | DRAWN | TEAM     |     |   |
| FIGURE NO. | FIGURE 6.6 |       |          | REV |   |
|            |            |       |          | B   |   |

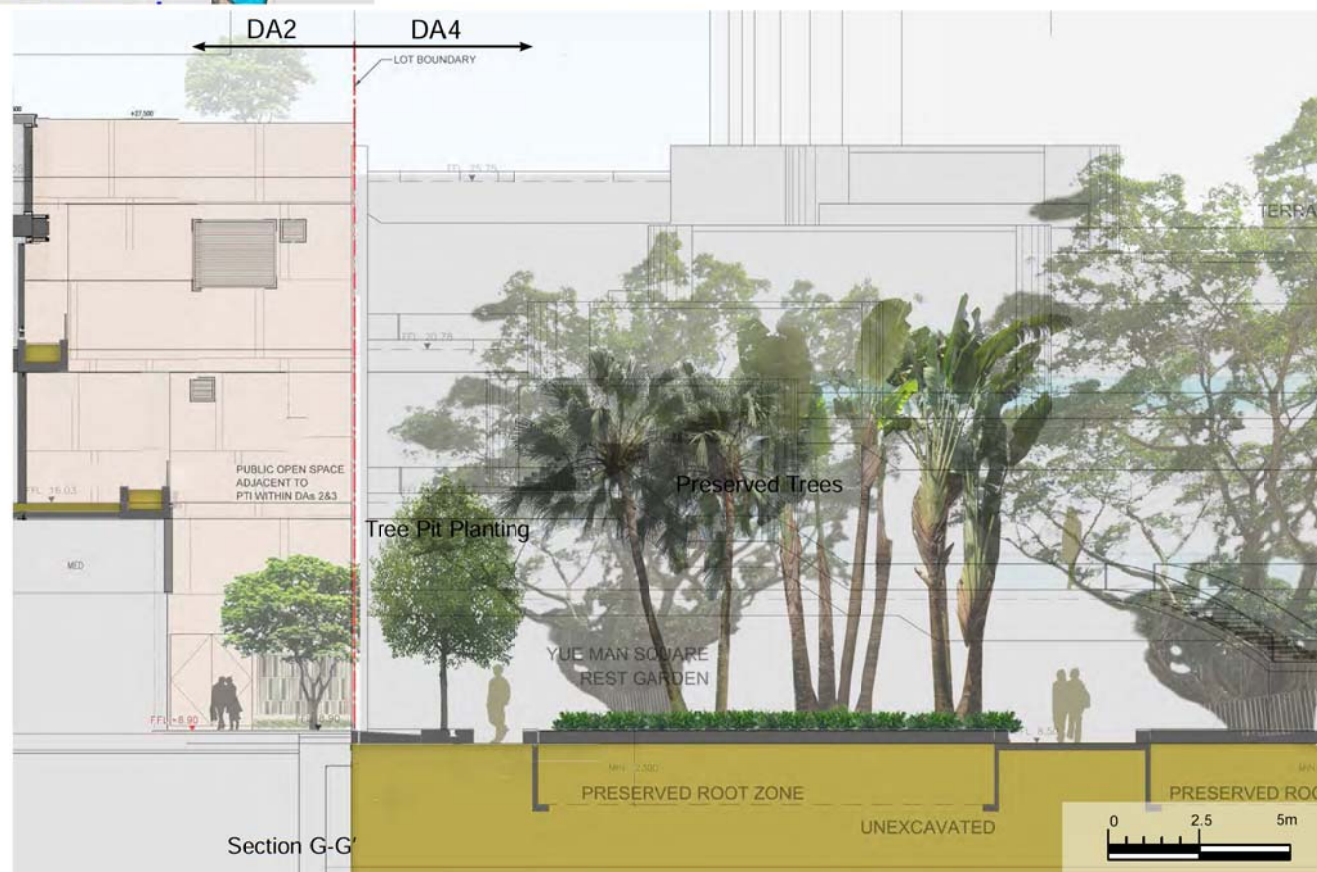




Key Plan

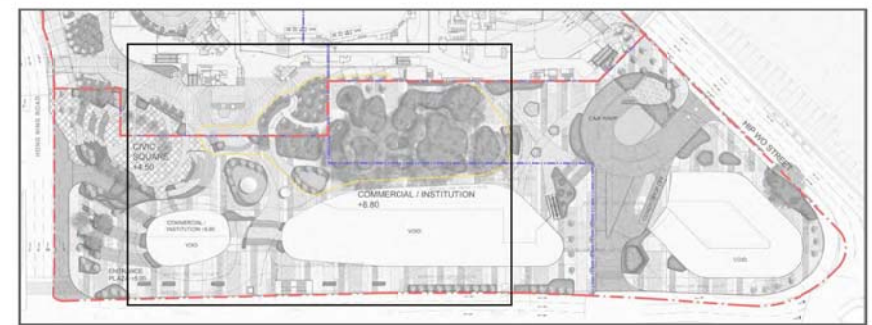
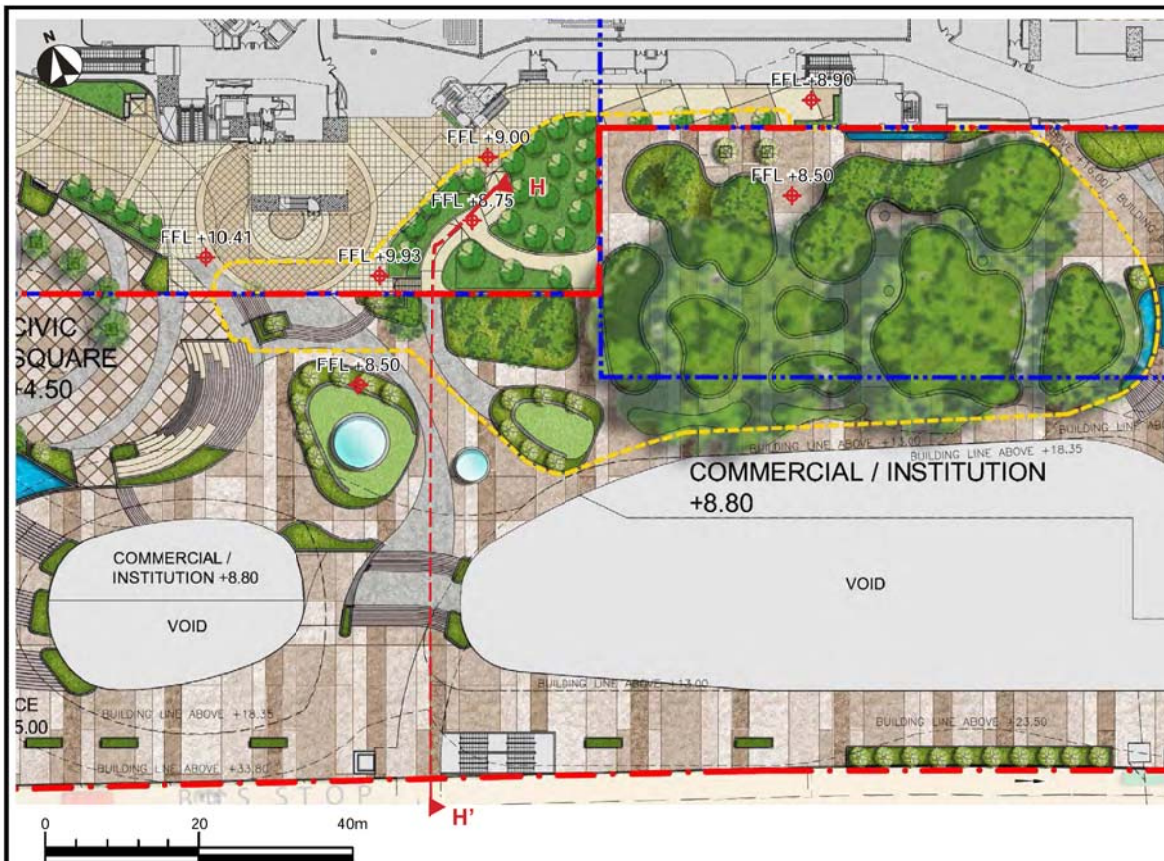
Blow-up and Section of DAs 4&5 are indicative and subject to detailed design stage.

Yue Man Square Rest Garden  
Connection to Mini-bus Terminus



|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 6.7 |       | REV<br>B |

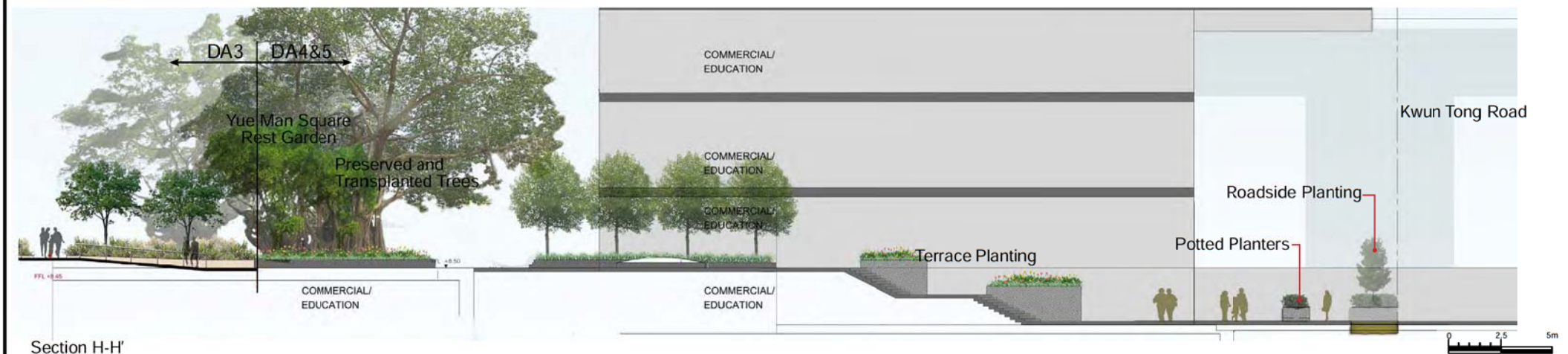




Key Plan

Blow-up and Section of DAs 4&5 are indicative and subject to detailed design stage.

Yue Man Square Rest Garden  
Connection to DA3 and Kwun Tong Road



Section H-H'

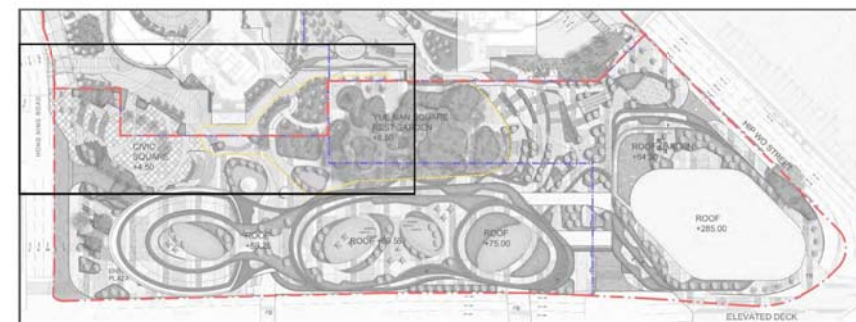
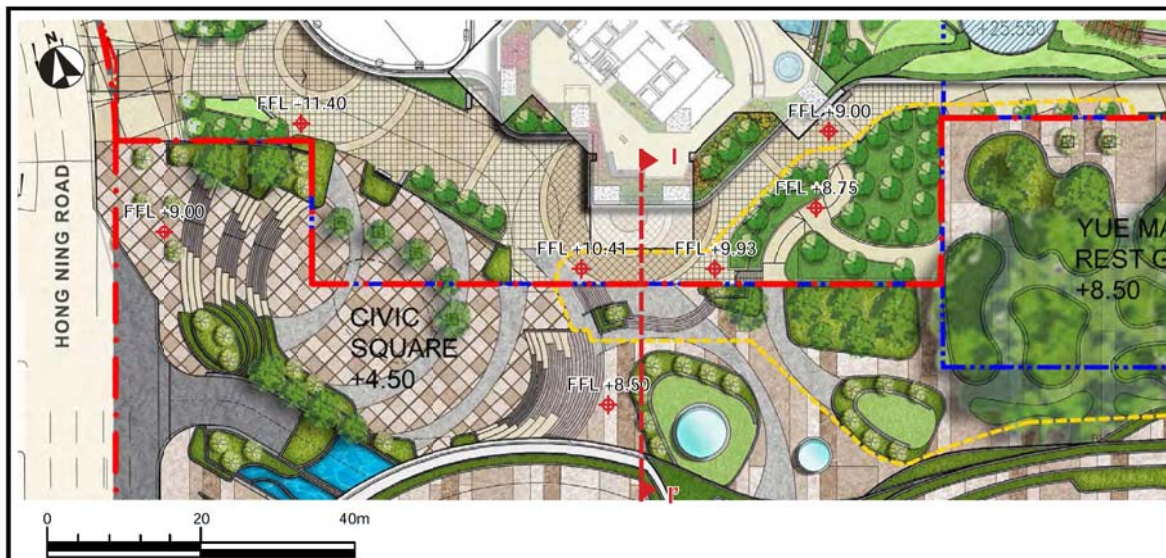
Kwun Tong Town Centre Redevelopment Project (K TTC)  
Indicative Landscape Blow-up Plan and Section Sheet 4 of 6

|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 6.8 |       | REV<br>B |



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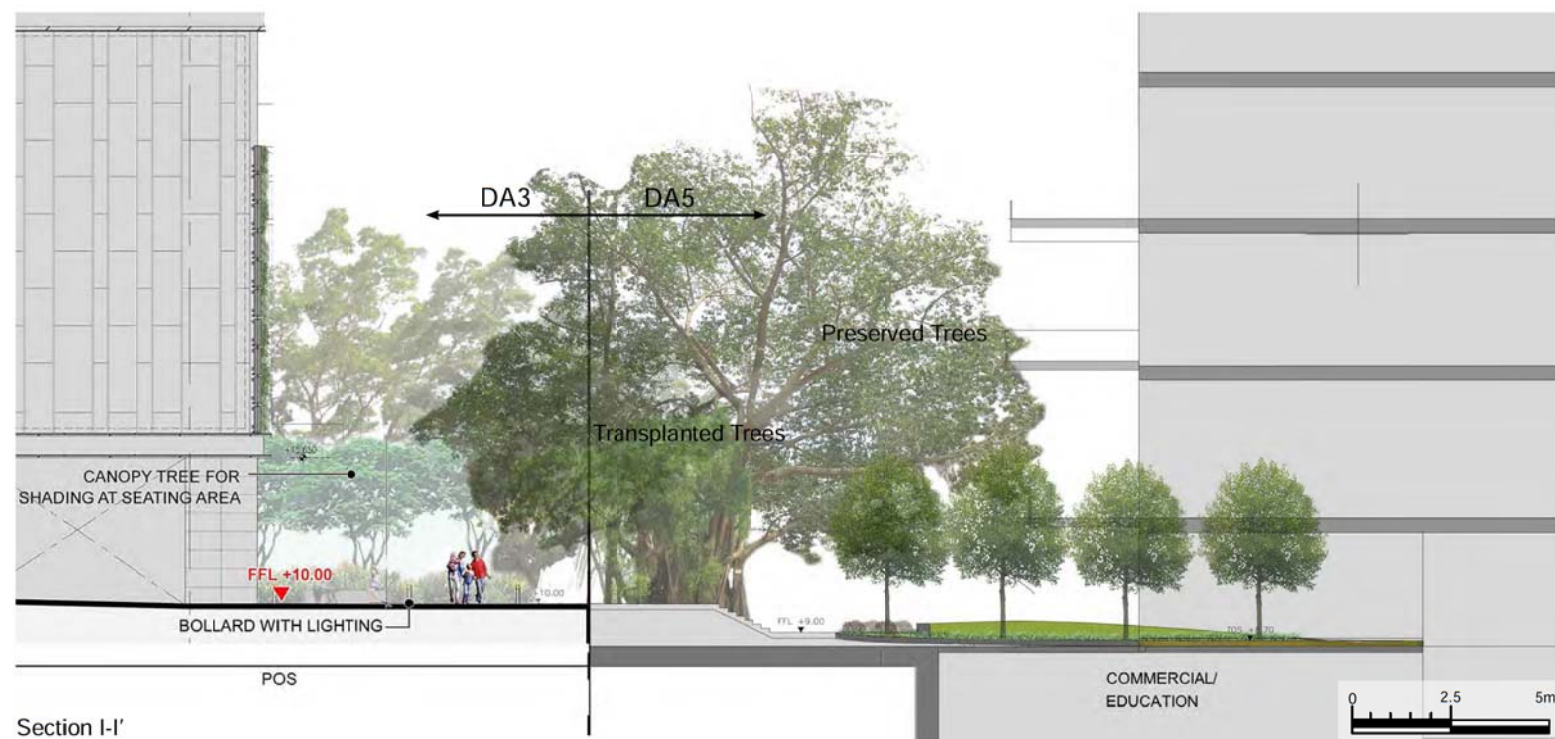




Key Plan

Blow-up and Section of DAs 4&5 are indicative and subject to detailed design stage.

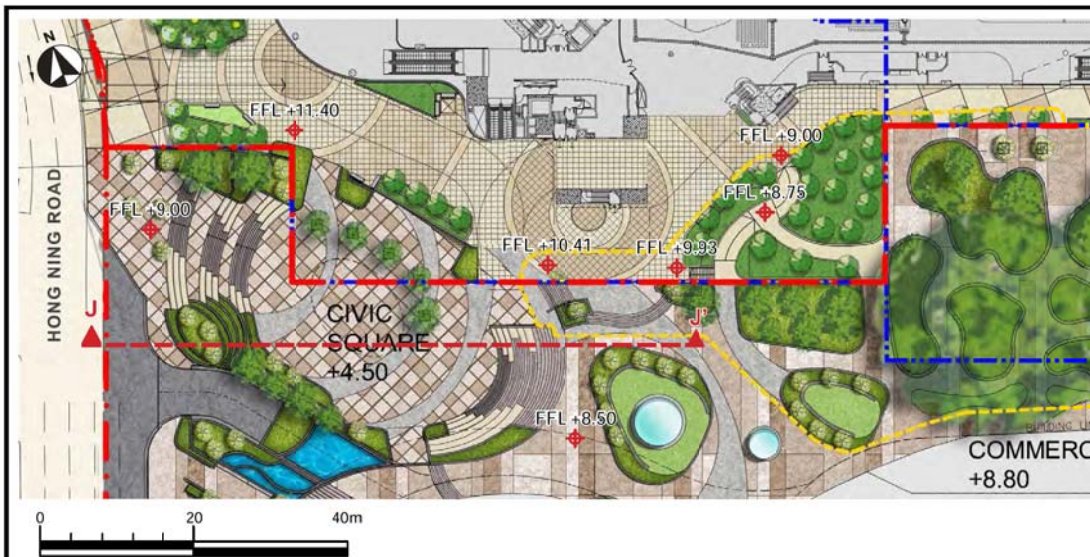
Yue Man Square Rest Garden  
Connection to DA3 and the Garden



Section I-I'

|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 6.9 |       | REV<br>B |





Key Plan

Blow-up and Section of DAs 4&5 are indicative and subject to detailed design stage.

**Civic Square**  
Connection to Hawker Bazaar from Hong Ning Road, to Yue Man Square Rest Garden to DA3



Section J-J'

Kwun Tong Town Centre Redevelopment Project (KTTC)  
Indicative Landscape Blow-up Plan and Section Sheet 6 of 6

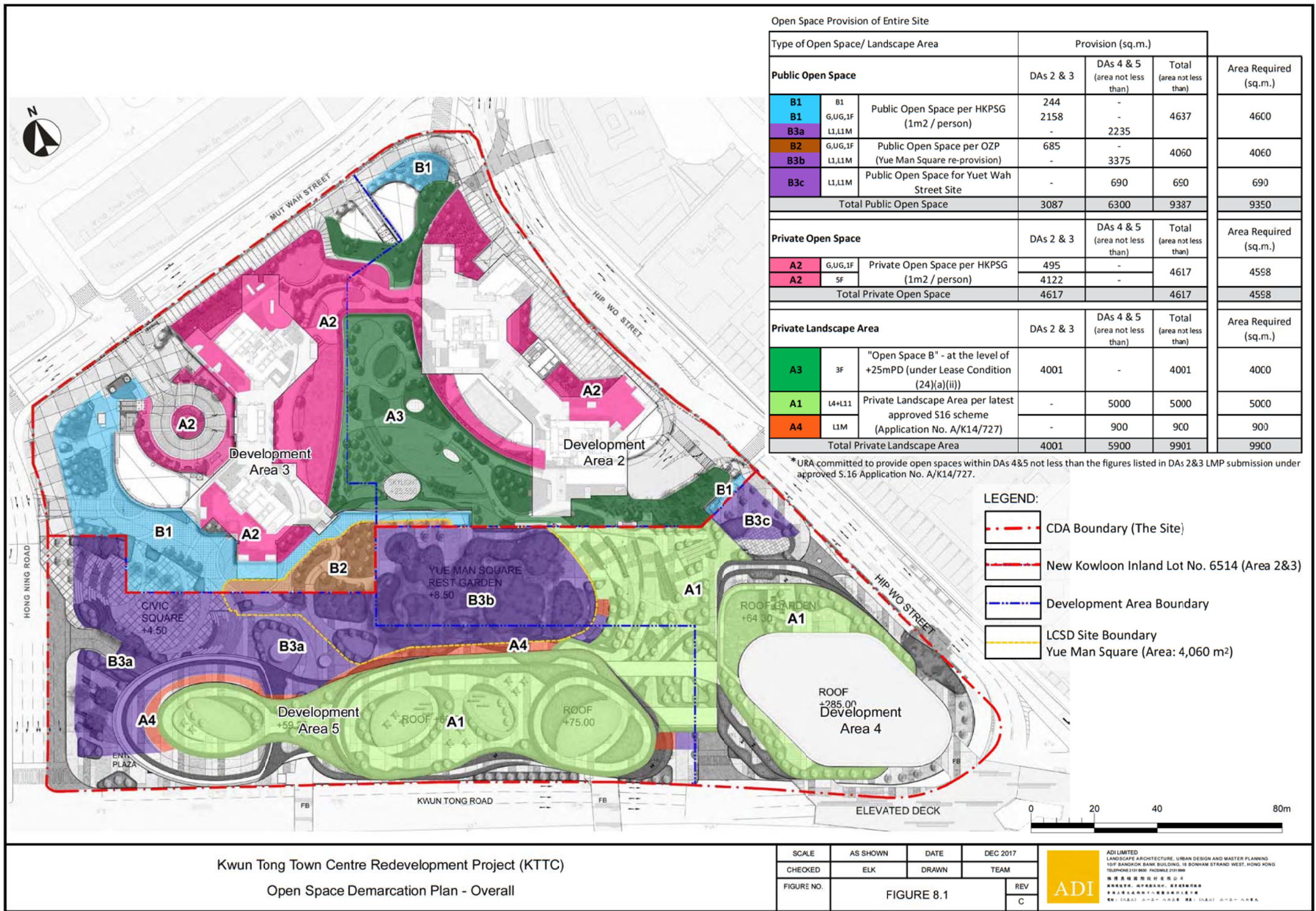
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|------------|-------------|-------|----------|
| SCALE      | AS SHOWN    | DATE  | DEC 2017 |
| CHECKED    | ELK         | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 6.10 |       | REV<br>B |

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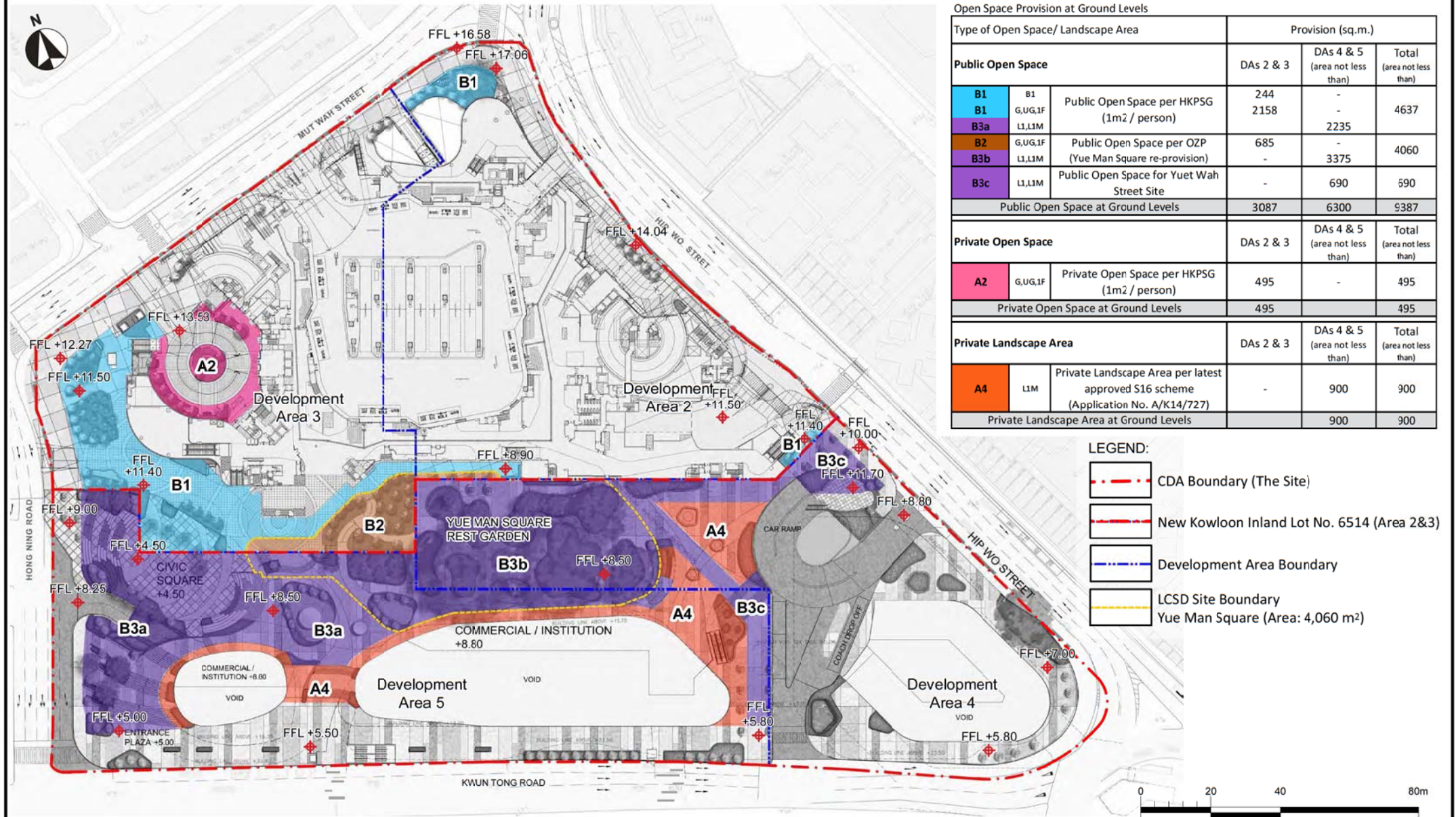












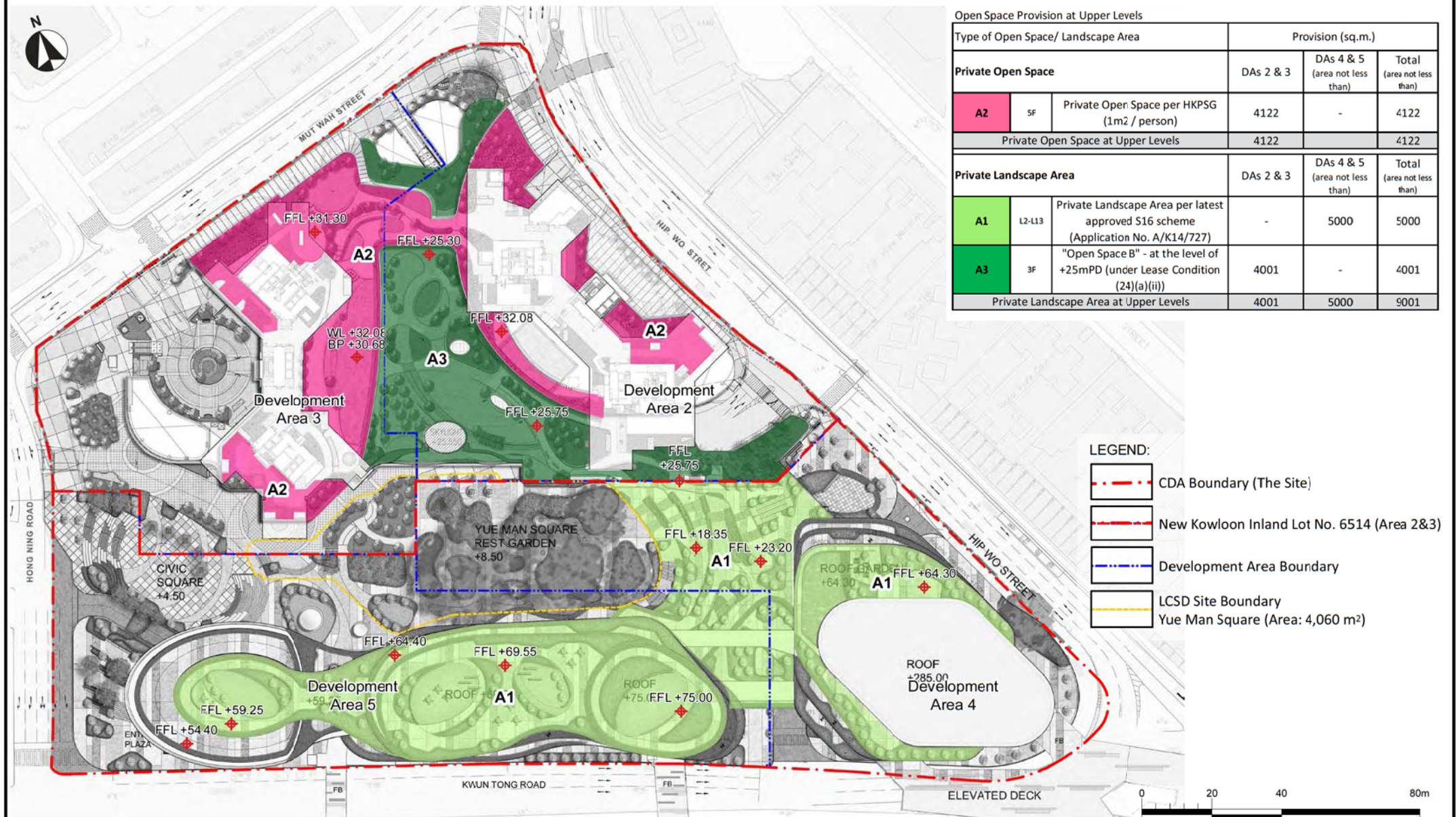
Kwun Tong Town Centre Redevelopment Project (K TTC)  
Open Space Demarcation Plan - at Ground Levels (L1/ L1M of DAs 4&5)

|            |            |       |          |
|------------|------------|-------|----------|
| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 8.2 |       | REV<br>C |

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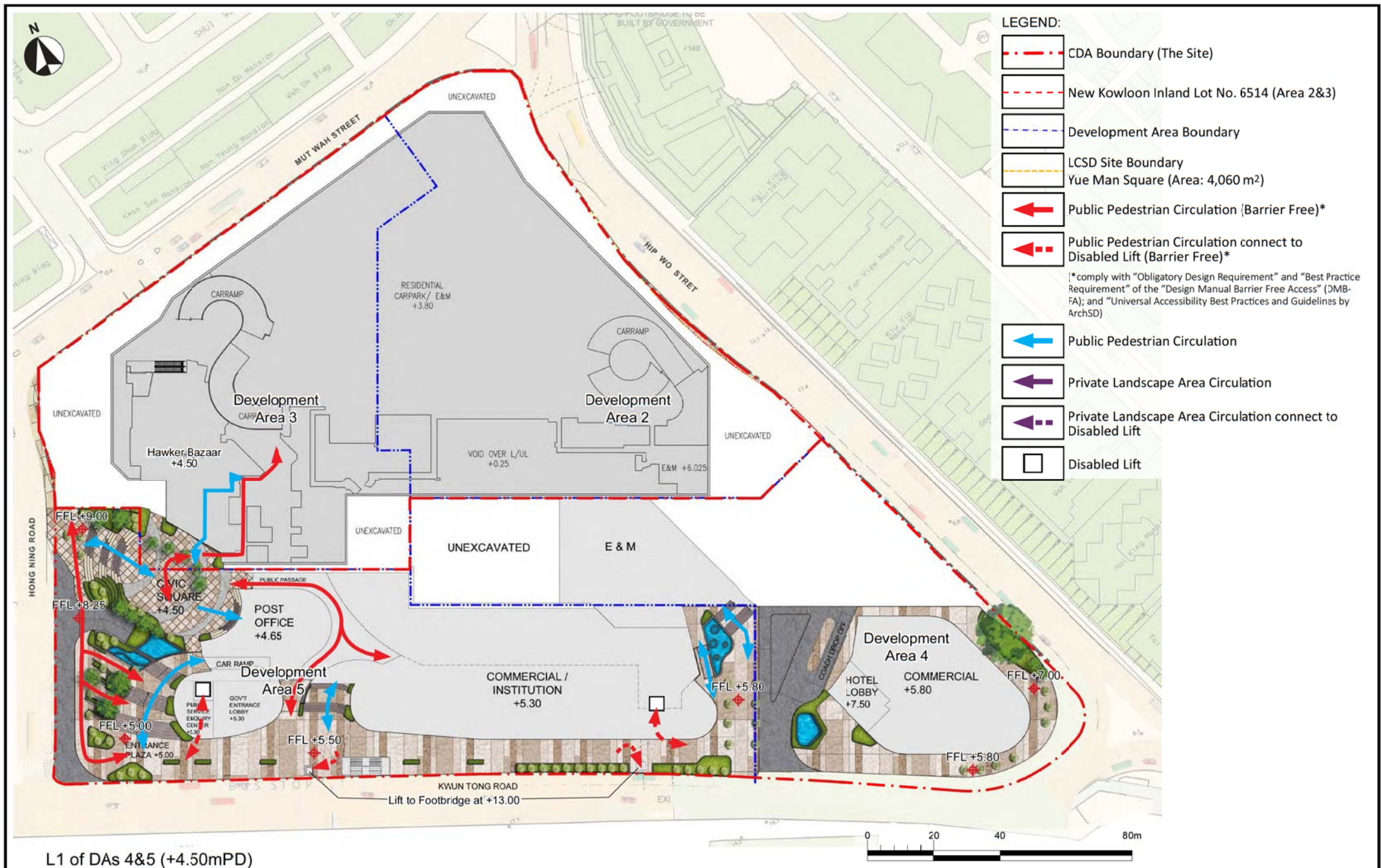
Kwun Tong Town Centre Redevelopment Project (K TTC)  
Open Space Demarcation Plan - Upper Levels (L2 to Roof of DAs 4&5)

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| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
| CHECKED    | ELK        | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 8.3 |       | REV<br>C |

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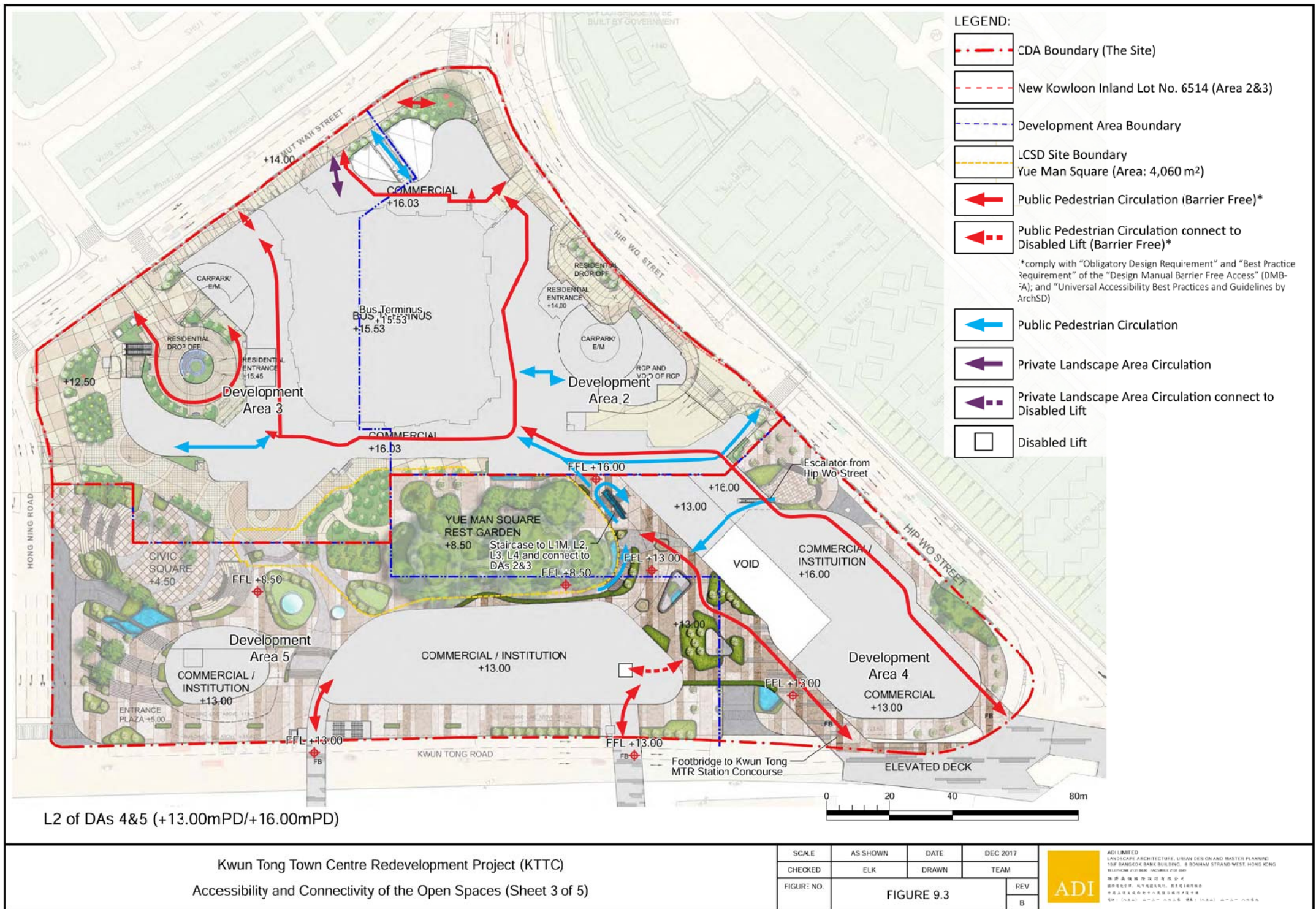
L1 of DAs 4&5 (+4.50mPD)

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| SCALE      | AS SHOWN   | DATE  | DEC 2017 |
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| FIGURE NO. | FIGURE 9.1 |       | REV<br>B |





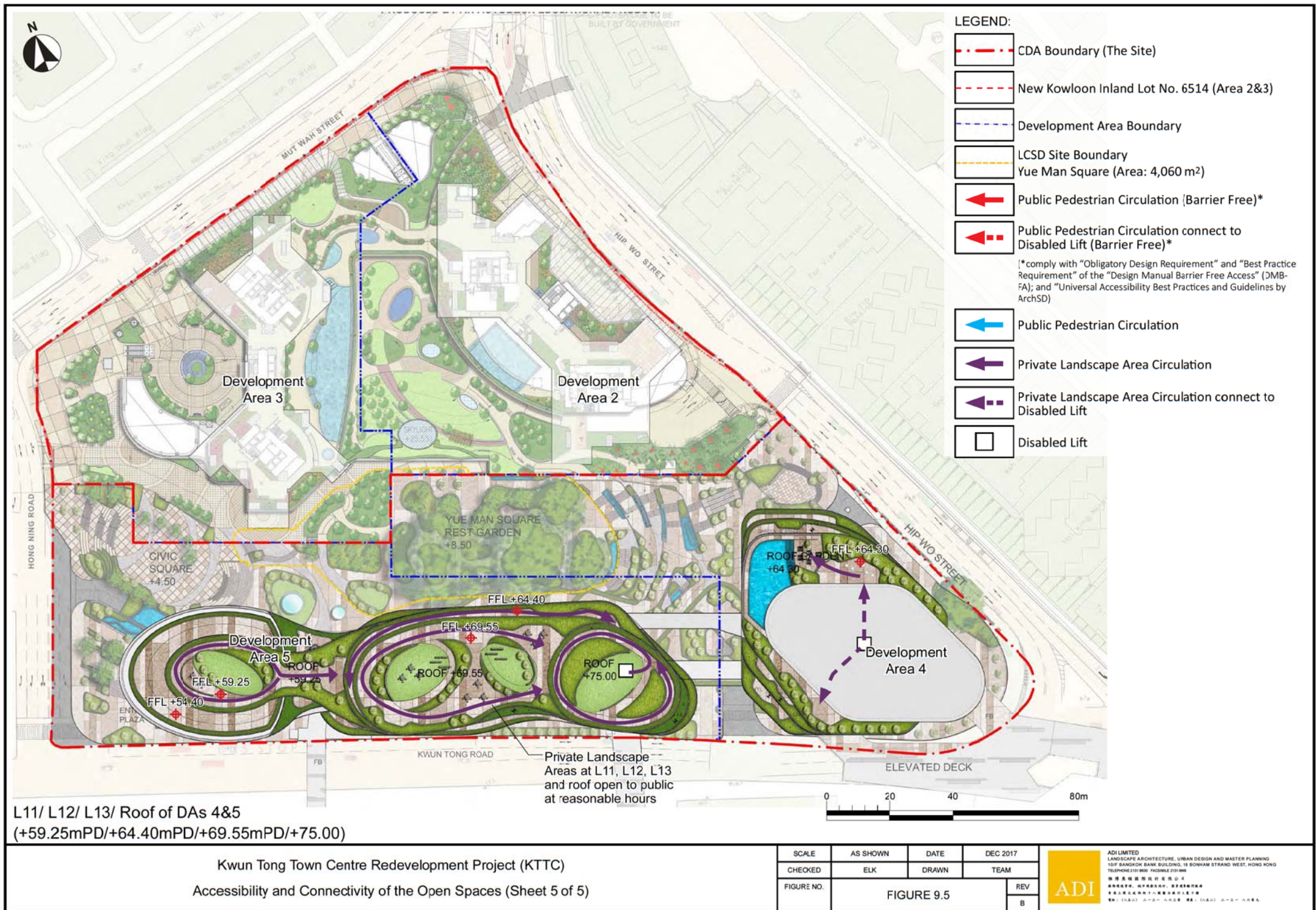




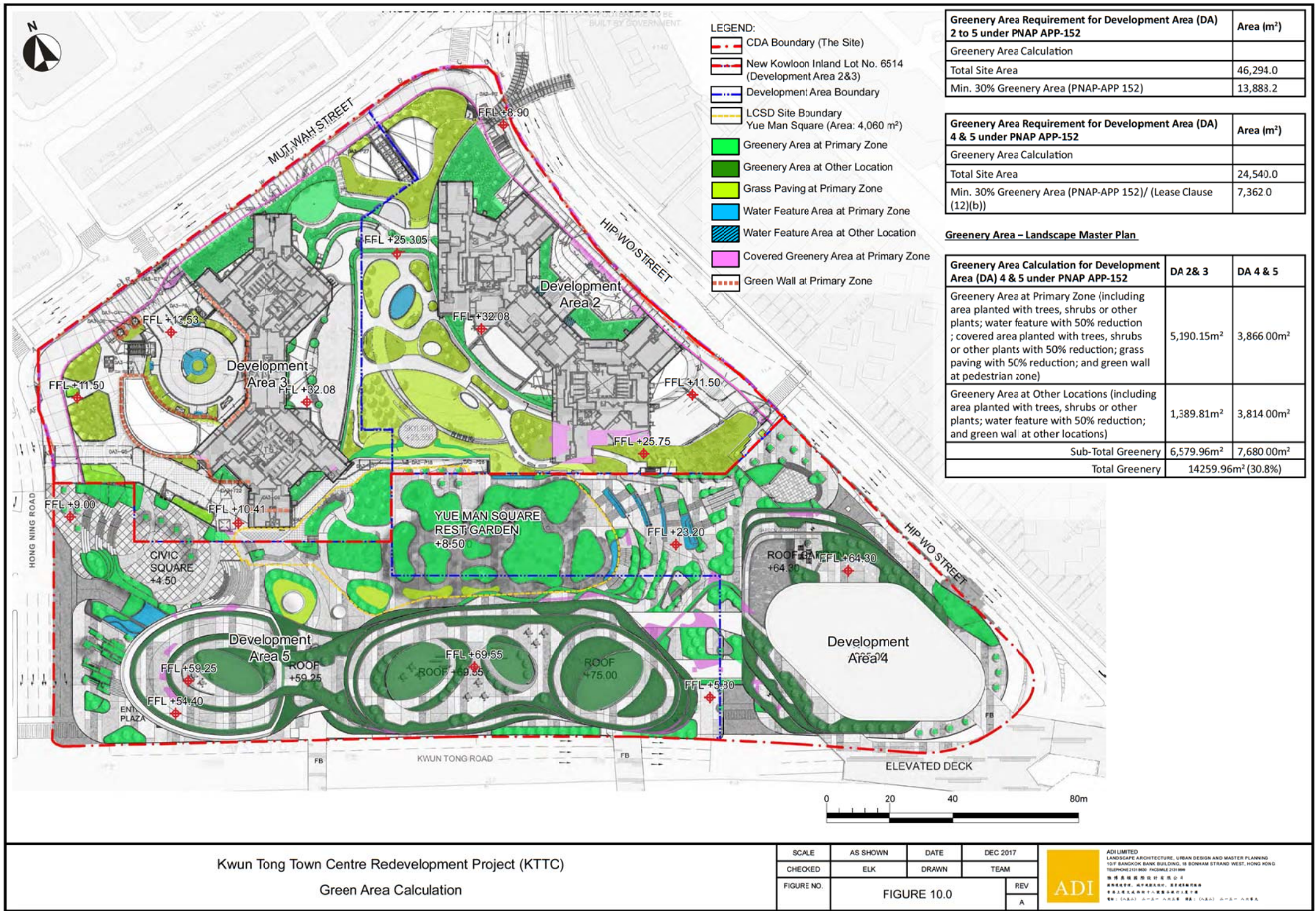




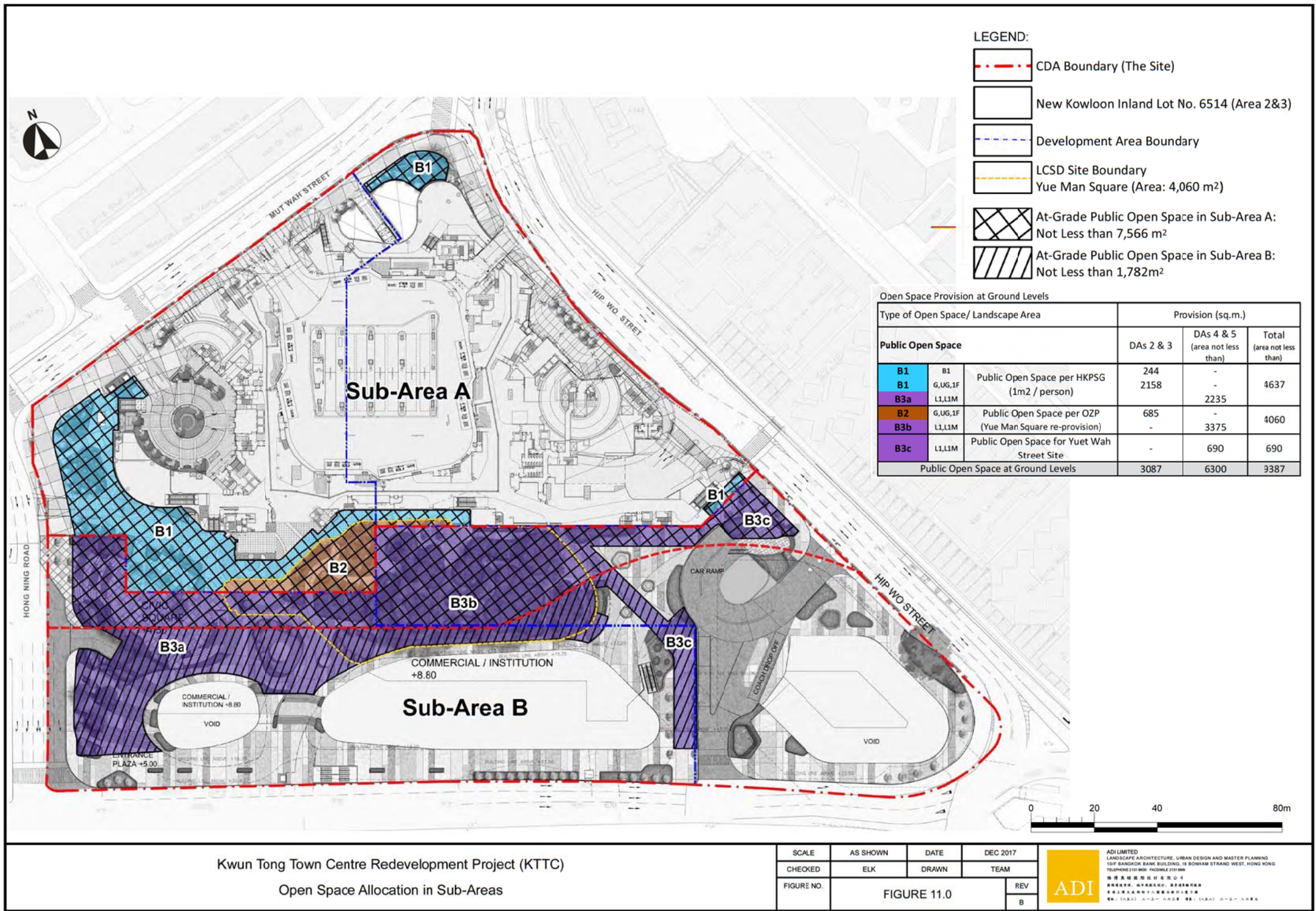












Kwun Tong Town Centre Redevelopment Project (K TTC)  
Open Space Allocation in Sub-Areas

|            |             |       |          |
|------------|-------------|-------|----------|
| SCALE      | AS SHOWN    | DATE  | DEC 2017 |
| CHECKED    | ELK         | DRAWN | TEAM     |
| FIGURE NO. | FIGURE 11.0 |       | REV<br>B |



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## **Annex 4: Visual Impact Assessment**



## Visual Impact Assessment Kwun Tong Town Centre (KTTC)

### 1. INTRODUCTION

- 1.1 The application site (Main Site) which forms a major portion of the proposed Kwun Tong Town Centre (KTTC) Development (**Figure 1** refers) is to form part of a comprehensively planned development. The Notes of the Development Scheme Plan No. S/K14S/URA1/2 stated that it is intended that the development of the sites and their adjacent component parts are to contribute to the comprehensive regeneration of Kwun Tong. The principal land uses to be included within the development are to comprise residential, government and/or commercial uses with the provision of open space and other community and supporting facilities. The Comprehensive Development Area zoning aims to enhance vitality and achieve an improvement in environmental and traffic conditions in the town centre through comprehensive redevelopment, restructuring the street pattern, promoting efficient land use and to provide Government, Institutional and or Community (GIC) facilities and public open space. The combination of the development initiatives will not only regenerate Kwun Tong but will also give it a new image.
- 1.2 On 27th April 2015, the Section 16A Class B Amendment (No. A/K14/576-3) with 1869 units of residential flats was approved by the Town Planning Board (TPB). A Section 16 application No. TPB/A/K14/727(Approved Scheme) was submitted in Aug 2015, and proposed an increased in the number of residential flats from 1869 units to 1999 units with minor modifications to the podium design and the Master Layout Plan (MLP) from the approved Section 16A Class B Amendment (No. A/K14/576-3). A new Section 16 is submitted to increase the building height of the landmark tower from 260mPD to 285mPD and a redesign of the commercial buildings and open space framework (Revised Scheme). In response to views collected at the public consultation in 2008, an ‘egg shaped’ G/IC building, cascading building form, terraced landscape decks, water features, etc. have been provided.
- 1.3 The purpose of this report is to assess the visual impacts of the built form and height profile of the Master Layout Plan (MLP) in the context of present and likely future development.

### 2. BACKGROUND

- 2.1 Kwun Tong was built as a satellite town in 1950's, not so much as a self-contained town, but rather as a manufacturing industry node. By the 1970's it provided employment for 15% of the territory's industrial workforce. In the 1980's, however, the Kwun Tong Industrial rapidly declined as a consequence of the restructuring of the Hong Kong economy. The government responded by promoting the area as a new business zone.
- 2.2 The private developers have responded positively to the business zone recognising that the accessibility provided by nearby MTR Stations provided excellent development preconditions. Grade A office buildings (e, g, Millennium City I, 2, 3, 5, 6 & Landmark East) and a mixed commercial/office development (APM) have successfully been introduced along Kwun Tong Road in response to the strong demand for affordable quality office, retail and entertainment floor spaces. More redevelopments are in the pipeline (several planning applications and building plan approvals are in progress). These will contribute to the further regeneration and development of the area and its realisation as a commercial hub. Development Area 2 and 3 will form a constituent part of this regeneration process.

### 3. OVERALL DEVELOPMENT MIX

- 3.1 The Kwun Tong Town Centre redevelopment initiative proposes a balanced mix of hotel, offices, retail, government and community facilities, residential and open space to sustain and indeed enhance the role and vitality of the town centre in both day and night. The hotel and offices are located with a proposed commercial tower at the junction of Kwun Tong Road and Hip Wo Street adjacent to the Kwun Tong MTR Station. A series of landscaped terraces are provided in the northern portion of the site which will be abutted by residential towers.
- 3.2 Buildings have been carefully disposed to optimise air circulation by taking advantage of the direction of the prevailing wind. The design of the development adopts a stepped terrace profile. A series of building setbacks, extensive greening and landscape treatments have been incorporated into the design to maximize the spatial experience and enhance the environmental quality of

Development Area 2 and 3 of the KTTC (refer to the overall MLP is shown at **Figure 2** and the **Schedule of Accommodation** for the Main Site is shown in Table 1 below).

The development mix for this application is as follows:

**Table 1 Schedule of Accommodation for KTTC**

|                                    |   |
|------------------------------------|---|
| Description                        |   |
| Development Scheme Area (m2)       | 48,860                                  |
| CDA Zone Area (m2)                 | 46,294                                  |
| No. of Residential Towers          | 4                                       |
| No. of Commercial Towers           | 1                                       |
| Total Gross Floor Area (GFA in m2) | 373,420                                 |
| Residential                        | 138,980                                 |
| Commercial/ Retail                 | 112,280                                 |
| Office                             | 65,860                                  |
| Hotel                              | 32,000                                  |
| GIC (incl.PTI)                     | 24,300                                  |
| Maximum Building Height (mPD)      |   |
| Residential Towers                 | 165-178                                 |
| Commercial Tower                   | 285                                     |
| No. of Storeys                     |   |
| Residential Towers                 | 42-48                                   |
|                                    | (plus 4 storeys PTI & basement carpark) |
| Commercial Towers                  | 12-64                                   |
|                                    | (plus 6 storeys PTI & basement carpark) |
| Public Open Space- at grade (m2)   | Not less than 9,348                     |

- 3.3 The commercial and residential portions are distributed to the south and north respectively to address PTI requirement, neighbourhood pedestrian circulation, noise compliance, and preservation of two Registered Old and Valuable Trees. Commercial and retail podiums are located along Kwun Tong Road. The maximum height of the Commercial Tower is +285mPD. An observation deck is provided at the top floor of the commercial tower to maximise the spatial experience.
- 3.4 Compared with the previous congested building layout, the residential development has adopted a permeable design in terms of building disposition and building height to maximise air ventilation and through views. The residential portion consists of four residential towers that will accommodate 1999 nos. of residential units. The building disposition generally follows the scheme that is approved in Section 16A (No. A/K14/727).
- 3.5 As stated earlier, to signifying the prominence of a town centre in KTTC, a revised height building for the landmark tower from 260mPD to 285mPD (main roof) is proposed (9.8% increase in height). There may be some architectural features and M&E structures on the roof (non GFA accountable). The planning and design justifications are as follows:
- The **office floor-to-floor height** is proposed to be increased from 4m in the Approved Scheme to 4.3m in the Revised Scheme. 4m is considered too low for current market norm (for reference. Hysan Place is 4.5m);
  - The environmental benefits gained from a **smaller tower footprint** would require extra floors to accommodate the permitted GFA, and
  - To accommodate GFA concessions gained via fulfilling SBD guidelines such as E&M spaces, and to fulfil other structural requirements.

- 3.6 There is no height restriction specified for the KTTC-Main Site in the Development Scheme Plan (DSP) and the Planning Brief. It is specifically stipulated in the explanatory statement of the DSP and the PB that the proposed building height of any development should be supported by a visual impact assessment.

#### 4. VISUAL CONTEXT

- 4.1 The Kwun Tong area is surrounded by hills from the north to the southeast. There are a number of existing and planned high-rise developments on the hillsides. These include Anderson Quarry, Po Tat Estate, Sau Mau Ping Estate, Sau Mau Ping Disciplined Services Quarters, Shun Lee Estate, Shun Tin Estate, Shun On Estate, Shun Chi Court, and Laguna City.
- 4.2 The Kwun Tong Business Area south of Kwun Tong Road is currently undergoing gradual transformation from Industrial into business area. The visual context in Kwun Tong would subsequently be transformed when more new high-rise buildings are completed in accordance with the permissible building heights from 100mPD to 200mPD as stipulated in the Outline Zoning Plans. As such, the proposed 285mPD commercial tower and 165mPD to 178mPD residential towers in the KTTC - Main Site redevelopment project is considered compatible in a district undergoing the transformation process.
- 4.3 Currently the area of existing public open space in the Main Site is only 2,650m<sup>2</sup>. This includes Yue Man Square Rest Garden, Hong Ning Road Children's Playground and other pocket open spaces scattered in the Main Site. The lack of open space and greening in the existing town centre is another characteristic of the visual context.
- 4.4 Furthermore, most of the existing buildings within the town centre neighbourhood were built in the 1960's and are comprised of a repetitive uniform and monotonous architectural style. They are also in a degraded condition. The progressive introduction of more innovative and varied building designs will enhance the town centre image and the physical and visual environment.

#### 5. VISUAL QUALITY

##### 5.1 Visual Quality of the Redevelopment Project

The proposed development at the Main Site will improve the visual quality of the town centre through the generous provision of greening and open spaces, setting back of building lines to allow wider pavements, innovative building design, variation in building heights, wide gaps between buildings, urban windows and segregation of vehicular and pedestrian traffic, etc.

##### 5.2 Visual Quality of the Commercial Tower

The current rhombus slanted form tower is located at the busiest corner of the redevelopment site. The rounded corners of the tower have softened its presence despite its height as a landmark building. The shape maximises views in all four directions by avoiding direct frontage to neighboring tall buildings. The large round corners on either end create ideal office orientations facing the harbour to the South East and mountains to the North West. The tower connects seamlessly with Kwun Tong MTR station and gives people quick access to the office lobby. The tower tapers in towards the top to reduce building bulk, increase permeability and views and improve day-lighting to open spaces below. High performance clear glass is envisioned for the tower's curtain wall to minimize reflections to neighbouring buildings and to maximize views out to the surroundings.

##### 5.3 Visual Quality of the Composite Commercial and GIC Building

The composite commercial and GIC building is located at a very prominent location of the Site at the junction of Kwun Tong Road and Hong Ning Road. The Building responds accordingly with a "egg shaped" and cascading form with terraced landscape decks and water features that reveals and draws pedestrians into the Civic Square and Yue Man Square rest garden on Hong Ning Road and urban window off Kwun Tong Road. The iconic egg shape of this block at the corner defines the street and anchors this busy intersection. The GIC office occupies three floors (L8 to L10) in DA5 retail podium with a dedicated entrance off the pedestrian plaza at street level. The office portion and retail portion are housed in the egg shaped building block, the office stands out from the retail portion through podium setback, material change and transparency to create an iconic form at this prominent corner. The retail podium bulk has been reduced to improve sightline from DA2 & DA3 podium roof garden and allow more natural light and ventilation to Yue Man Square rest garden.

Terraces at upper levels scale back the podium and provide opportunities for view and al-fresco dining. Retail pavilions have been introduced to activate the green rooftop and promote communal activities. Also, the building bulk is reduced for better aero-dynamic, permeability and better day-lighting at the pedestrian level.

##### 5.4 Visual Quality of the Residential Towers

The inclusion of a stepped building height profile will add interest and visual variety to the local skyline. The commercial tower located at the south-eastern corner of the Main Site would be the tallest tower. Development height would gradually step down towards the residential towers and to the Development Area 1 - Yuet Wah Street Site. The staggered disposition of towers and the inclusion of wide building separation will optimise the appearance of the development. The separation of towers will also optimise the area realisable as landscaped open spaces. The open spaces can correspondingly serve as breezeways and visual corridors and contribute to the enhancement of the visual quality of KTTC

##### 5.5 Visual Quality of Public Open Space

The integrated public open space is divided into three parts, namely, the Civic Square, the Yue Man Square rest garden and the Entrance Plazas. The Civic Square is a multi-purpose open space abutting Hong Ning Road and cultural functions which provides a large opening to welcome the people entering KTTC from the west. There is a grand staircase from an open space as the Entrance Plaza at the junction of Kwun Tong Road and Hong Ning Road that provide connection for the pedestrian flow to the Yue Man Square rest garden and Civic Square. This allows pedestrian flow from Kwun Tong Road entering the Civic Square and the GIC building with the environment of more greenery and water feature. The Yue Man Square rest garden will be densely planted to create a tranquil retreat in the town center to enhance visual quality of the environment and to delineate separation from the surrounding public realm. The entrance plaza abuts Kwun Tong Road creating an entrance to the Yue Man Square rest garden, with the arrangement of landscape and steps leading to the garden. Retail shops, cafes, PTI entrance and escalator to basement retail will be provided to support and complement the open spaces. 24 hour access through these open spaces is available through secondary passageways along Kwun Tong Road and Hip Wo Road.

#### 6. CRITERIA TO MEASURE VISUAL QUALITY

##### 6.1 Reference to Urban Design Guidelines (HKPSG, Chapter 11)

Pursuant to Urban Design Guidelines (UDG), the following urban design considerations are particularly important and relevant to deliver a desirable built form for KTTC in commensurate with the natural and existing built environment unique to Hong Kong.

##### 6.1.1 Ridgeline Preservation (Para. 6.2.9 of Urban Design Guidelines)

For public enjoyment of the panoramic views over the dramatic ridgelines in the Hong Kong Metropolitan Area Quarry Bay Park has been designated as a strategic vantage point to appreciate the views to the ridgeline Lion Rock - Kowloon Peak. The proposed KTTC Redevelopment will be outside the protected ridgeline view from Quarry Bay. It is seen in front of a major mountain pass - for passage or Castle Peak Bay Road connecting Sal Kung and Kowloon East. It will not, therefore, render any visual impact upon the integrity of the ridgeline.

##### 6.1.2 Using High Quality Architectural Design Towers helping to define Town Images with Recognisable Skyline (Para. 6.2.13 of Urban Design Guidelines)

It is appreciated that the most recognizable cities in the world are often characterized by a number of towers which are generally notably taller than the general building profile. Towers with high quality architectural design at suitable locations can help to cast visual impression of a city. KTTC is considered qualified as a location for such a landmark because physically, KTTC will render little impact upon the integrity of the Kowloon ridgeline, and functionally, KTTC remakes a town centre for a non-CBD office node serving a multi-purpose hub that accommodates a public transport interchange, shopping, leisure and civic activities.



### 6.1.3 *Creating responsive and quality streetscape for public realm (Para 6.2.34 of Urban Design Guidelines)*

It is proposed that KTTC should achieve the following main goals for streetscape that are enshrined in the Guidelines by:

- Ensuring that, wherever possible, all components at street level are of the high quality in terms of design, materials and construction;
- Aiming for coherence and compatibility;
- Creating as much as possible pedestrian-oriented and pedestrian interested space in core areas; and
- Catering for human scale and the needs of the disabled/elderly.

### 6.2 Reference to Planning Brief

6.2.1 The Planning Brief for the Main Site has put down particular considerations with respect to the specific site opportunities and constraints. The following are the main planning and design considerations for overall visual outlook:

- Create good quality public realm, including open spaces, streetscape and maintain active street frontage and activities;
- Increase visibility and permeability of the town centre;
- Provide visual relief and diversity in height and massing of developments;
- Avoid wall effect, particularly along Kwun Tong Road;
- Reinforce the town centre character;
- Provide varying building height profile and sensitive layout and disposition to achieve better air ventilation;
- Building setbacks have been provided along Hong Ning Road, Mut Wah Street, Hip Wo Street and Kwun Tong Road to enhance pedestrian circulation;
- The building height of the composite residential/commercial development in Sub-Area A should take into account the high density residential development in the surrounding area; and
- The building height of the commercial development proposed in Sub-Area B should take into account the building height of the Kwun Tong Business Area and to achieve an iconic node for the town centre.

6.2.2 The MLP presented in this Application has duly incorporated the above urban design considerations during scheme preparation. This VIA report will review past findings and confirm whether the scheme as proposed can continue to deliver a centrepiece development in Kwun Tong district, and provide a positive visual attribute within the district and the local neighbourhood.

At the district level, the KTTC Redevelopment should help to define a more recognizable skyline with the emerging redevelopments in the Kwun Tong Business Area. The commercial building to be developed in KTTC will create an accentuation to the stepping heights planned for the Kwun Tong Business Area in the Outline Zoning Plan. It will provide a modest landmark to the district, visible but not intrusive when viewed from the key district vistas both uphill and from the Harbour Side.

## 7. VISUAL IMPACT ANALYSIS

The visual impact of the future KTTC Redevelopment has been assessed with respect to representative district views that are accessible to the public. The building height of commercial tower is set at 285mPD and the height of the 4 nos. of residential towers range from 165mPD to 178mPD. Perspectives indicating visual compatibility and visual permeability are illustrated by photomontages included in this submission.

### 7.1 District Views Assessment

#### 7.1.1 *Vantage Point Identification*

For district viewpoints, one set of proposed residential building heights and a +285mPD commercial tower has been selected to assess the visual impact of the proposed development scheme in Table 5 and as shown in the photomontages in the enclosed Annex E. The analysis reveals that the proposed commercial building of +285mPD would have low to moderate impact. Reasons for the analysis are explained as follows:

Please refer to **Figure 3**.

**Table 4 Selected District View Vantage Point**

| View | Vantage Point                    | Distance | Level  | Remarks  |
|------|----------------------------------|----------|--------|--|
| V1   | Quarry Bay Park                  | 2.7 km   | 12mPD  | Strategic Vantage Point South of KTTC                                  |
| V2   | Kai Tak Runway                   | 1.2 km   | 7mPD   | Future Strategic Vantage Point & Tourism Node South of KTTC            |
| V3   | Hong Ning Road Recreation Ground | 0.4 km   | 45mPD  | Local open space North of KTTC   |
| V4   | Kwun Tong Recreation Ground      | 0.5 km   | 25mPD  | Local open space North of KTTC   |
| V5   | Sai Tso Wan Recreation Ground    | 1.1 km   | 85mPD  | Local open space East of KTTC  |
| V6   | Devil's Peak                     | 2.8 km   | 170mPD | Mountain side lookout point overlooking the district East of KTTC      |
| V7   | Black Hill                       | 2 km     | 310mPD | Mountain side lookout point overlooking the district NorthEast of KTTC |

**Table 5 Visual Impact of KTTC Main Site at Selected District Viewpoints**

|   |                      |
|---|----------------------|
| Commercial Building Height / Residential Tower Height | 285mPD/ (165-178mPD) |
| Vantage Point   |                      |
| Quarry Bay Park (V1)                                  | Low to moderate      |
| Kai Tak Runway (V2)                                   | Low                  |
| Hong Ning Road Recreation Ground (V3)                 | Low                  |
| Kwun Tong Recreation Ground (V4)                      | Low to moderate      |
| Sai Tso Wan Recreation Ground (V5)                    | Low to moderate      |
| Devil's Peak (V6)                                     | Low to moderate      |
| Black Hill (V7)                                       | Low to moderate      |

#### 7.1.2 *High-rise at the Backdrop*

As indicated by red lines of the photomontage (View V1), the maximum building heights as stipulated in the Outline Zoning Plans and the existing high-rise buildings in East Kowloon are already quite significant. As such, the proposed 285mPD building would be visible but is not considered to be intrusive. It will contribute to the creation of an interesting and discernible height profile. The visual impact is low.

Since the visual context in Kwun Tong will continue to change when more new high-rise buildings are completed up to 200mPD as permitted under the prevailing Outline Zoning Plan, the visual impact of the proposed development scheme is considered acceptable.

#### 7.1.3 *No Ridgeline Issues*

The proposed KTTC redevelopment site has the backdrop of the mountain pass which is indeed not the section of ridgelines/peaks recommended for conservation under the HKPSG urban design guidelines. The existing buildings in the Kwun Tong industrial area are already above the mountain pass as viewed from Quarry Bay Park and therefore the proposed commercial building at KTTC would not further adversely affect the situation.

#### 7.1.4 Not a Waterfront Site

The KTTC is located at least 700m away from the waterfront. The proposed building, therefore, would not have any adverse impact on visual permeability from the Harbour.

#### 7.1.5 Assessment Result

From a district perspective, the proposed building at approximately 285mPD is more acceptable since its visual impact on the surrounding environment is negligible to low. Although there would be permanent loss of some existing open views so that there would be some adverse visual impacts of slight significance from district viewpoints. No significant visual obstruction would be imposed on the vicinity and it would be visually compatible with the surrounding environment with clusters of tall buildings, which is in line with the cityscape of a town centre. The residential towers also would not generate negative visual impacts since their building heights are lower than the 200mPD height stipulated in the Outline Zoning Plan for the street block immediately to the south of Kwun Tong Road.

#### 7.2 Overview Neighbourhood Assessment

Aerial photomontages (View A1, A2 and A3) from 3 main directions for the scheme have been produced showing the town centre layout which aims at respecting, integrating and benefiting the adjoining neighbourhood:



- Enhancing the pedestrian network and linkages to the adjoining areas;
- creating pedestrian friendly environment by integrating pedestrian linkages with open space and activity nodes; enhancing visual amenity to the adjoining neighbourhood with generous greenery space formed by civic squares, podium gardens and roof gardens upon building setback in the KTTC;
- Providing diversity in height and massing of development and view corridor through the KTTC for visual interests in crafting better view experiences; and
- reinforcing the town centre character with the iconic building.

#### 7.3 Local View Assessment

7.3.1 Local view renderings have been produced to illustrate the streetscape design and the integration with the neighbourhood. Local views would be enhanced from pedestrian levels. The pedestrians will enjoy exquisite and vibrant streetscape that should be delivered by the following planning and design approaches:

##### Setbacks

Adequate distance between the development and the neighbouring buildings is provided by setting back the building line from the peripheral roads. The setback enables a much better local view for the pedestrians entering the KTTC and for the neighbouring residents.

##### Building Gaps

In the current design, large building gaps are provided to allow visual corridors and urban breezeways. If the no. of building blocks has to be increased, both the no. and width of building gaps will be reduced.

##### Urban Windows

The linear retail podium structures along Kwun Tong Road will impose curtain wall effect. In order to reduce the wall effect, large urban windows, vertical greening together with sensitive elevation design are proposed to break the bulk of the linear block, particularly as viewed on the pedestrian levels.

7.3.2 Four local views have been selected to assess the visual impact of the proposed development scheme.

7.3.3 Locations of local viewpoints (L1, L2, L3 and L4) are shown in Figure 4. As shown in the photomontages in the enclosed, the results are listed in Table 6 below. The analysis reveals that the scheme has low to moderate visual impact at street level.

**Table 6 Visual Impact of KTTC Main Site at Selected Local Viewpoints of Different Commercial Building Heights**

| Commercial Building Height / Residential Tower Height<br>Vantage Point | 285mPD/ (165-178mPD) |
|--|----------------------|
| Hip Wo Street/Mut Wah Street (L1)                                      | Low                  |
| Mut Wah Street (L2)  | Low                  |
| Hip Wo Street/Kwun Tong Road (L3)                                      | Moderate             |
| Hong Ning Road (L4)  | Low to Moderate      |

#### 7.3.4 Assessment Result

In summary, from the local views, the proposed development scheme is favoured and considered acceptable. Although the residential developments adjacent to the redevelopment site would have some existing open views to be blocked by the new buildings so that there would be some adverse visual impacts of slight significance, it would be visually compatible with the surrounding environment of a town centre cityscape. The operation of the redevelopment would constitute an intermediate magnitude of change to the existing local views dependant on the viewing distance at different viewpoints.

### 8 . VISUAL IMPACT MITIGATION MEASURES

#### 8.1 Setback of Buildings

Adequate distance between the redevelopment Site and the neighbouring buildings is provided by setting back the building line from the peripheral roads. The setback enables a much better local view for the pedestrians entering the KTTC and for the neighbouring residents.

#### 8.2 Landscape Treatments

Visual relief would be provided by comprehensive tree planting within the site.

#### 8.3 Water Features

A variety of water features will be provided in different areas within the development site to achieve the uniqueness of the area, but at the same time linking them together by using a similar design language within a cohesive landscape. It creates a relaxed atmosphere offering respite from urban life and improving the visual quality of the town centre.

#### 8.4 Generous Green Coverage For the Redevelopment Site

With generous green coverage for the redevelopment site with green ratio amounted to more than 30% of the whole redevelopment site, the visual amenity of Kwun Tong district can be improved. The KTTC would become one of the greenest urban areas in Hong Kong.

#### 8.5 Vertical Greening

Vertical greenery techniques would be employed where practical to ensure greenery being maximized throughout the redevelopment, softening the built forms and extending garden areas beyond their normal boundaries. The application of vertical greening can help soften the visual impacts associated with building bulk and reducing glare and enhance visual comfort in the vicinity.

#### 8.6 Interesting Building Design

The proposed development scheme could add architectural interest and enhance the cityscape of the Kwun Tong district.

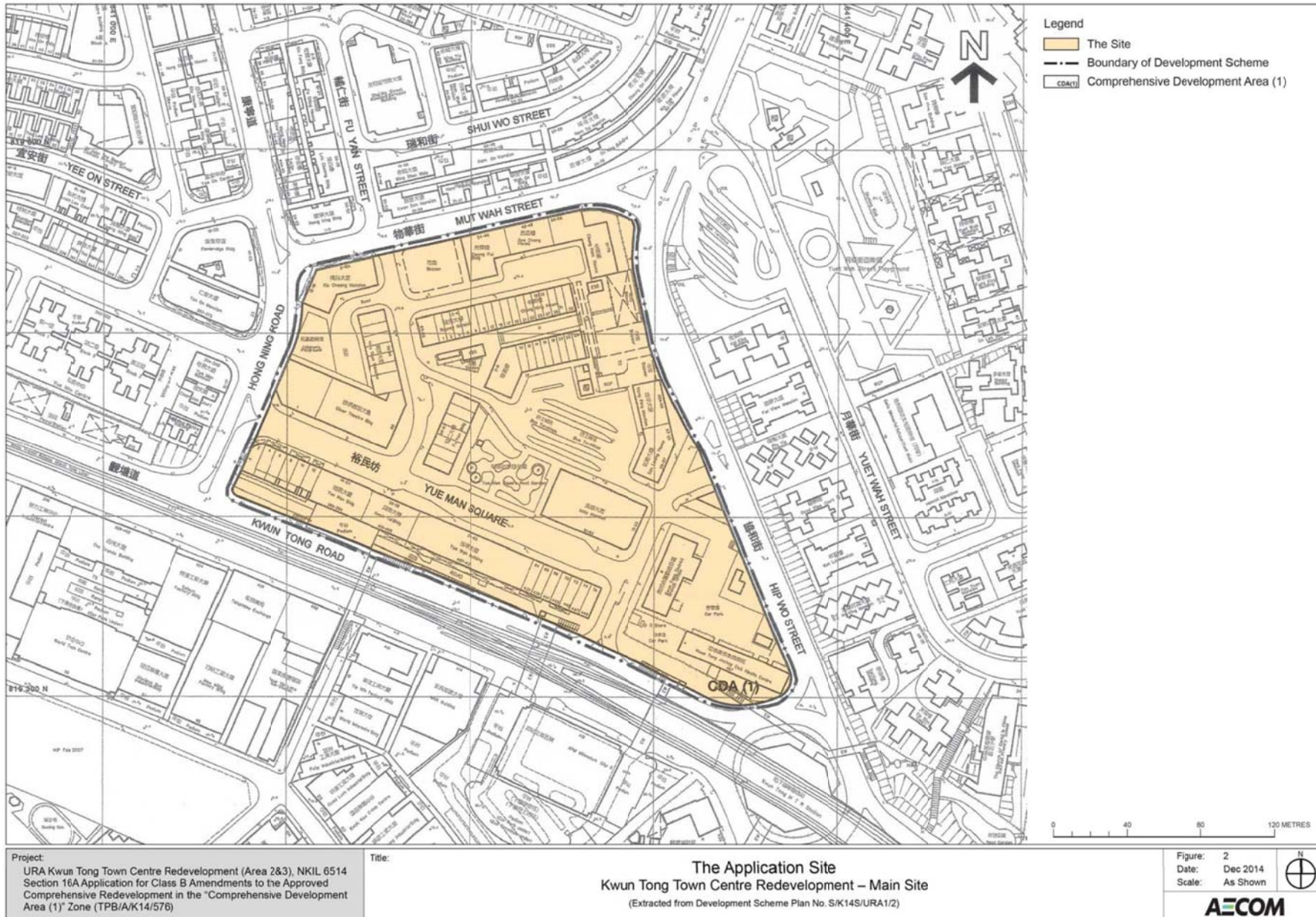


## 9. CONCLUSION

- 9.1 It is concluded that the visual impact of a building height of 285mPD on the surrounding environment is negligible to moderate. Since the existing high rise buildings in East Kowloon are already quite significant, the 285mPD building is visible from the various vantage points (such as Quarry Bay Park and Kai Tak Runway) but not visually intrusive. Besides, there is no ridgeline problem as the sections of the ridgeline at the backdrop of KTTC does not form part of the ridgeline recommended for preservation in the Urban Design Guideline, and the existing buildings in the Kwun Tong Industrial Area are already higher than the mountain pass at the back. Moreover, it is not a waterfront site and would not affect the visual permeability from the Harbour.
- 9.2 At a local level, the VIA reveals that the 285mPD building would have low to moderate visual impact at street level because of a slimmer building bulk.
- 9.3 As compared with the Approved Scheme, the increase in building height is 25m (9.8%), an increase which is not very evident when sighted from afar. The proposed increase would not only enable a higher floor to floor height to meet modern day standard for Grade A office, it will also bring along environmental gain resultant from a slimmer building. The view corridors and setbacks are comparatively wider as compared with the Approved Scheme. Beside, as an observation deck will be provided on the top floor, a higher building height will maximize the views from the deck to various part of Kowloon East and Hong Kong Island. The VIA also indicated that a landmark building of 285mPD should be identifiable as a reference point for the town centre from all vantage points, particularly from the Kai Tak Runway, Devil's Peak and Black Hill.
- 9.4 To conclude, the proposed development scheme is considered visually acceptable and does not conflict with the aspirations of the local community and serves to address the need for more greening and at-grade open spaces that will be conducive to enhancing the visual quality and permeability of the town centre.

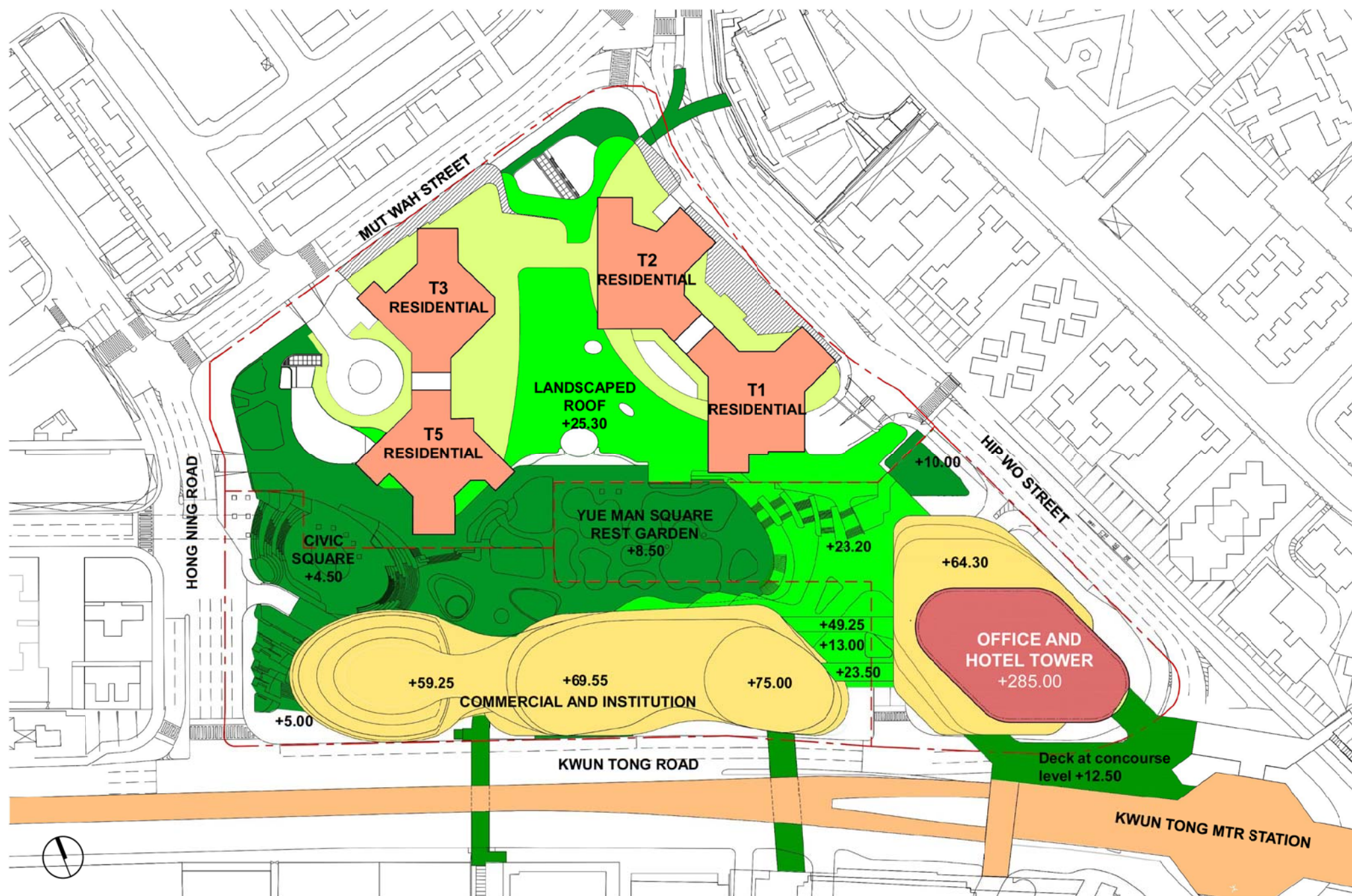
## Appendix E VISUAL IMPACT ASSESSMENT

Figure 01- Site Plan – KTTC Main Site





**Appendix E VISUAL IMPACT ASSESSMENT**  
**Figure 02- Overall Master Layout Plan**





## Appendix E VISUAL IMPACT ASSESSMENT

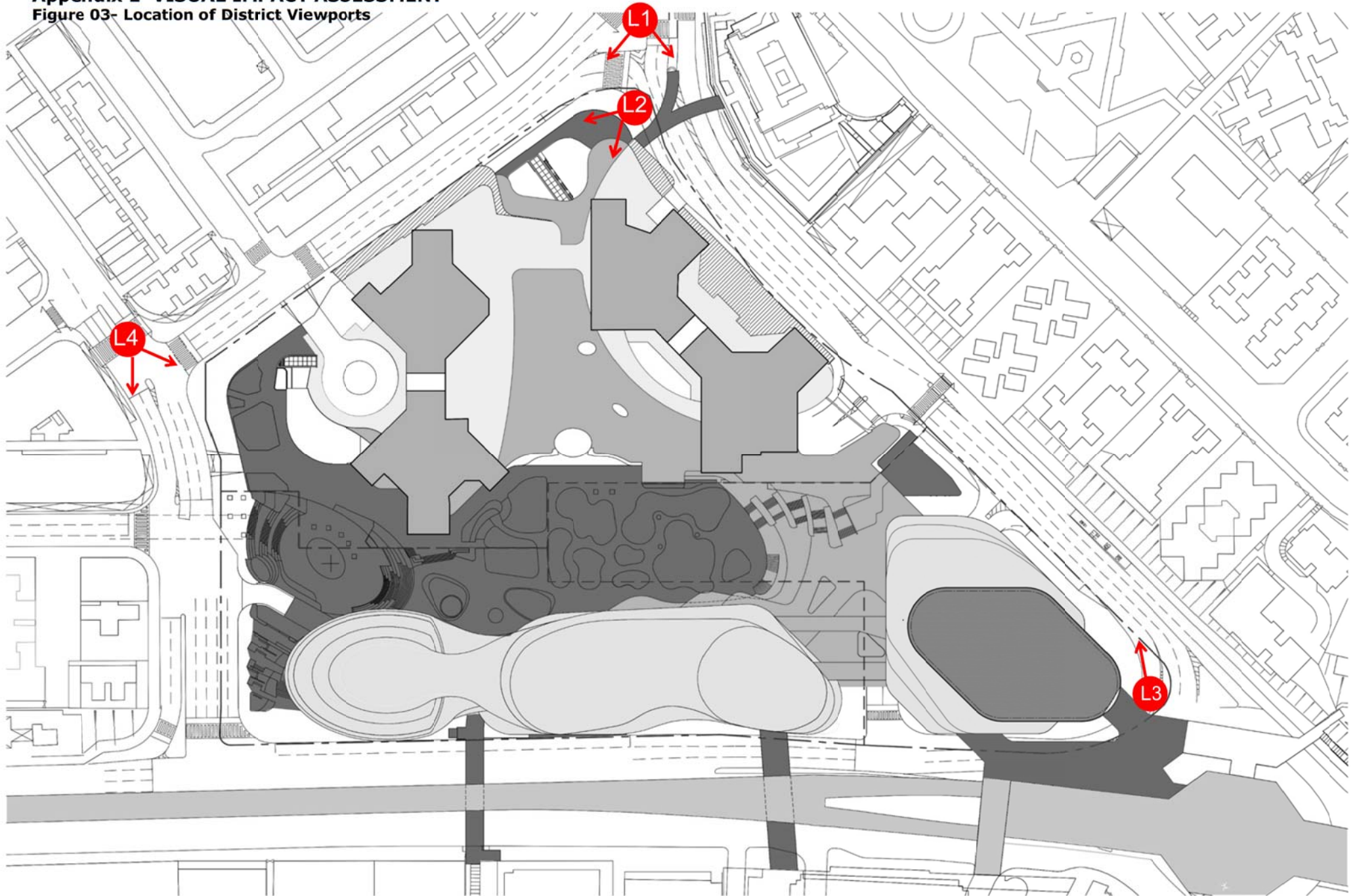
Figure 03- Location of District Viewports





## Appendix E VISUAL IMPACT ASSESSMENT

Figure 03- Location of District Viewports





## Appendix E VISUAL IMPACT ASSESSMENT

### Approved Scheme

View A1



View A2



View A3



View V1





## Appendix E VISUAL IMPACT ASSESSMENT

### Revised Scheme

View A1



View A2



View A3



View V1





## Appendix E VISUAL IMPACT ASSESSMENT

### Approved Scheme

View L1



View L2



View L3



View L4





## Appendix E VISUAL IMPACT ASSESSMENT

### Revised Scheme

View L1



View L2



View L3



View L4





## Appendix E VISUAL IMPACT ASSESSMENT

### Revised Scheme

V1. VIEWED FROM QUARRY BAY PARK



VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +260MPD)



VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +285MPD)

V2. VIEWED FROM KAI TAK RUNWAY



VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +260MPD)



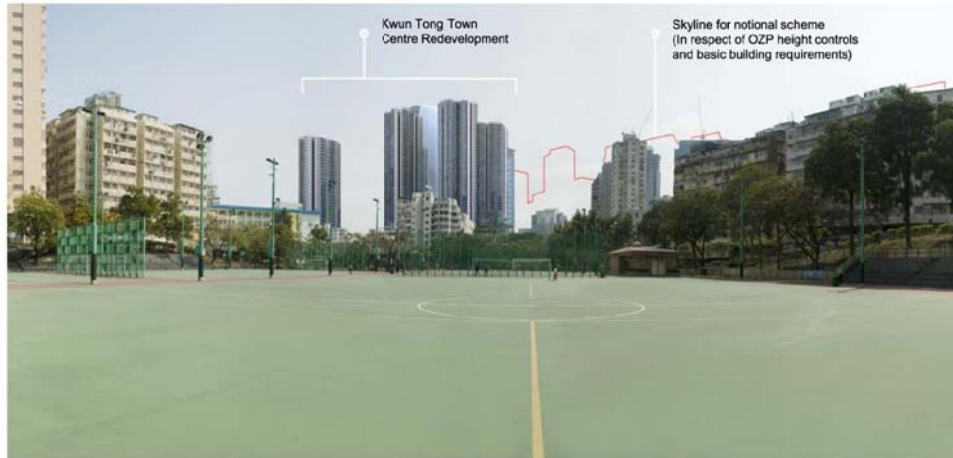
VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +285MPD)



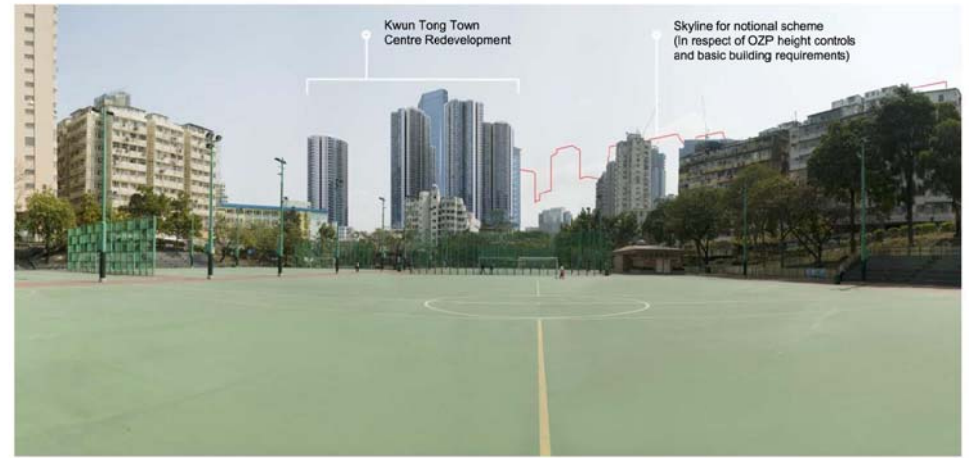
## Appendix E VISUAL IMPACT ASSESSMENT

### Revised Scheme

V3. VIEWED FROM HONG NING RECREATION GROUND

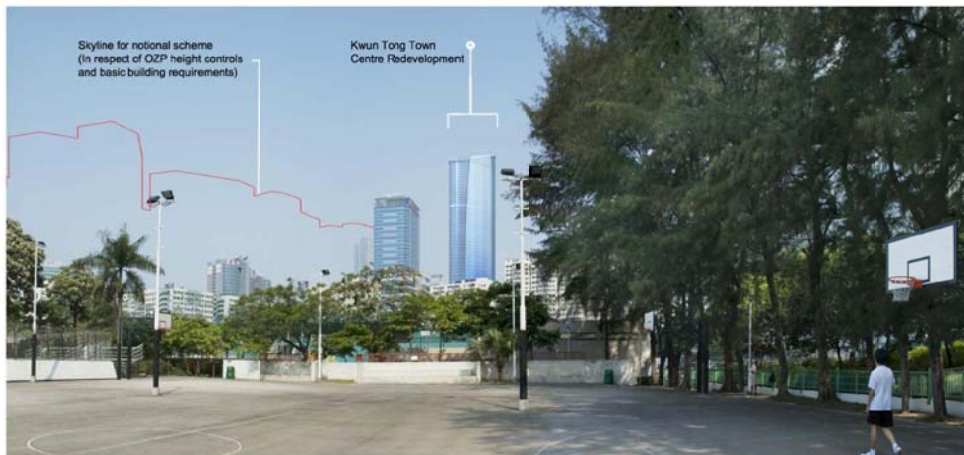


VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +260MPD)

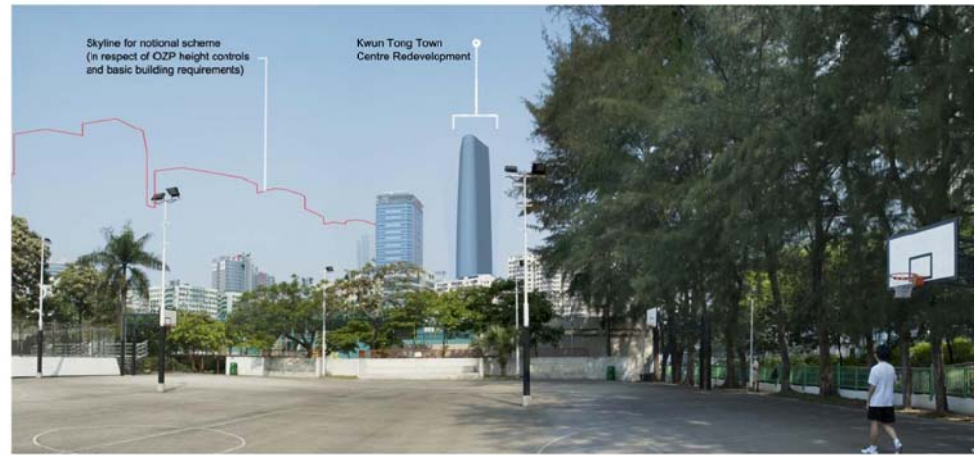


VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +285MPD)

V4. VIEWED FROM KWUN TONG RECREATION GROUND



VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +260MPD)



VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +285MPD)



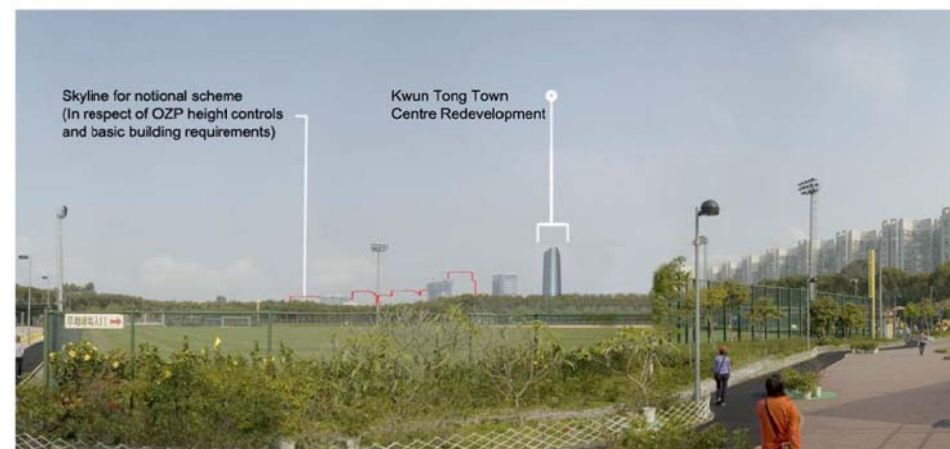
## Appendix E VISUAL IMPACT ASSESSMENT

### Revised Scheme

V5. VIEWED FROM SAI TSO WAN RECREATION GROUND



VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +260MPD)



VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +285MPD)

V6. VIEWED FROM DEVIL'S PEAK



VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +260MPD)



VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +285MPD)



## Appendix E VISUAL IMPACT ASSESSMENT

### Revised Scheme

V7. VIEWED FROM BLACK HILL



VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +260MPD)



VIEW WITH PROPOSED DEVELOPMENT (COMMERICAL TOWER: +285MPD)

## **Annex 5: Air ventilation assessment (AVA)**





Kwun Tong Town Centre Development  
Quantitative Air Ventilation Assessment

Prepared by:  
**Ramboll Environ Hong Kong Limited**

Date:  
**Dec 2017**

Reference Number:  
**R5737\_V1.5**

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## Contents

|   | Page      |
|---|-----------|
| <b>1. INTRODUCTION .....</b>                                    | <b>1</b>  |
| 1.1 BACKGROUND AND OBJECTIVES .....                             | 1         |
| 1.2 SUBJECT SITE AND ITS ENVIRONS .....                         | 1         |
| 1.3 BASELINE SCHEME .....                                       | 1         |
| 1.4 PROPOSED SCHEME .....                                       | 2         |
| <b>2. SITE WIND AVAILABILITY .....</b>                          | <b>4</b>  |
| 2.1 SITE WIND AVAILABILITY DATA .....                           | 4         |
| 2.2 TOPOGRAPHY .....  | 6         |
| 2.3 BUILDING LANDSCAPE .....                                    | 6         |
| 2.4 SUMMARY OF EXISTING AND FUTURE SITE WIND AVAILABILITY ..... | 6         |
| <b>3. QUANTITATIVE ASSESSMENT METHODOLOGY .....</b>             | <b>8</b>  |
| 3.1 ATMOSPHERIC CONDITIONS .....                                | 8         |
| 3.2 CFD CODE AND MAJOR PARAMETERS .....                         | 8         |
| 3.3 TEST POINT LOCATION .....                                   | 9         |
| <b>4. QUANTITATIVE ASSESSMENT RESULT .....</b>                  | <b>10</b> |
| 4.1 SPATIAL AVERAGE WIND VELOCITY RATIO .....                   | 10        |
| 4.2 DISCUSSION .....  | 12        |
| 4.3 DIRECTIONAL ANALYSIS .....                                  | 13        |
| <b>5. CONCLUDING SUMMARY .....</b>                              | <b>18</b> |

## Figures

- Figure 1: The Location of the Subject Site and its Environs  
 Figure 2: Windrose Diagram representing  $V_{\infty}$  of the Area under Concern  
 Figure 3a: Perimeter and Overall Test Points selected for Initial Study  
 Figure 3b: Perimeter and Overall Test Points selected for Initial Study (Close up for northwest area)  
 Figure 3c: Perimeter and Overall Test Points selected for Initial Study (Close up for northeast area)  
 Figure 3d: Perimeter and Overall Test Points selected for Initial Study (Close up for southwest area)  
 Figure 3e: Perimeter and Overall Test Points selected for Initial Study (Close up for southeast area)  
 Figure 3f: Special Test Points and Test Points selected in the Subject Site  
 Figure 4: Assessment Area and Surrounding Area for CFD Model Simulation  
 Figure 5: Building Height of Surrounding Development  
 Figure 6: Wind Velocity Ratios of Individual Test Points for Baseline Scheme (Annual)  
 Figure 7: Wind Velocity Ratios of Individual Test Points for Proposed Scheme (Annual)  
 Figure 8: Wind Velocity Ratios of Individual Test Points for Baseline Scheme (Summer)  
 Figure 9: Wind Velocity Ratios of Individual Test Points for Proposed Scheme (Summer)  
 Figure 10: Building Name for the Surrounding Developments  
 Figure 11: Master Layout Plan of the Baseline Scheme  
 Figure 12: Master Layout Plan of the Proposed Scheme

## Appendices

- Appendix A: Layout of the Baseline Scheme  
 Appendix B: Layout of the Proposed Scheme  
 Appendix C: Domain Size, CFD Model in Different Views, Contour Plots of Simulation Results  
 Appendix D: Detailed Wind Velocity Ratios  
 Appendix E: Wind Profile Curve

# 1. Introduction

## 1.1 Background and Objectives

- 1.1.1 The proposed development is located at Kwun Tong Town Centre Redevelopment Site (Main Site).
- 1.1.2 Ramboll Environ Hong Kong Limited is commissioned to conduct air ventilation assessment based on the proposed development under the current section 16 planning application.
- 1.1.3 This report contains an quantitative (using CFD) assessment of the air ventilation impact with respect to the Baseline Scheme (i.e. previous approved Master Layout Plan) and the Proposed Scheme to evaluate the potential air ventilation impact on the existing pedestrian wind environment. All the surrounding buildings, major noise barriers, elevated structures, planned and committed developments in the Surrounding Area have been modelled in the simulation.

## 1.2 Subject Site and its Environs

- 1.2.1 **Figure 1** shows the location of the Subject Site and its environs.
- 1.2.2 The Subject Site is located at the inner part of the Kwun Tong area. Kwun Tong Road is located immediate south of the Subject Site, whilst Hip Wo Street, Mut Wah Street and Hong Ning Road are located to the east, north and west of the Subject Site respectively. Dense built developments are located in the vicinity of the Subject Site.
- 1.2.3 The Subject Site is surrounded by medium to high rise buildings, separated by Hip Wo Street, Mut Wah Street and Hong Ning Road. Kwun Tong Road, Kwun Tong MTR Station and the elevated Kwun Tong Line are located along the southern boundary of the Subject Site. High-rise commercial buildings, such as Millennium City 1, Millennium City 6, APM Millennium City V and the AIA Tower and AXA tower are situated south of the Subject Site. The building heights of these buildings are shown in the **Figure 5** and the building names for the surrounding developments are shown in the **Figure 10**. These developments would affect the wind flow within the Kwun Tong area. Therefore, the wind speed within the Kwun Tong area will be reduced. On the other hand, the wind would enhance the flow along the road alignments.

## 1.3 Baseline Scheme

- 1.3.1 **Appendix A** and **Figure 11** shows the layout of the Baseline Scheme (Approved Scheme).
- 1.3.2 Generally, the proposed development can be divided into two parts, the commercial development in DA 4 and 5 and four residential towers on top of a podium with PTI below in DA 2 and 3.

- 1.3.3 The Proposed Scheme can be divided into two zones, i.e. one is development areas 2 and 3 (DA2 and 3) and the second one is development area 4 and 5 (DA4 and 5).
- 1.3.4 For DAs 2&3 the four residential towers are integrated with the podium and an enclosed PTI. Residential towers T1 and T2 are located at the eastern side of the podium and residential towers T3 and T5 are located at the western side of the podium with an open space located in between. The building heights of the residential towers are ranging from 165 mPD (Tower T1) to 178 mPD (Tower T2). The level of the podium is at various levels from 16 mPD to 35 mPD. The latest layout of the DA2 and 3 were adopted in this study.
- 1.3.5 At DA4 and 5, south of the DA2 and 3, commercial development consists of one office/hotel tower with maximum height of 260 mPD. The government office building is integrated with the retail development; and there are two openings at the lower floors of the retail portion with one immediate next to the government office building; and the other connecting to the Kwun Tong Square. It must be noted that the height of the office/hotel tower was originally proposed to be 280mPD; but the approved building height has been reduced to 260 mPD under the planning application of A/K14/576.

## 1.4 Proposed Scheme

- 1.4.1 **Appendix B** and **Figure 12** shows the layout of the Proposed Scheme.
- 1.4.2 The development design remain unchanged for DA 2 and 3 in this study.
- 1.4.3 In response to the public's views, URA decided to advance the detailed architectural and landscape design of DA4 and 5, with an aim to integrate design elements of these public aspirations as far as practicable, as our commitment to maintain the 'essence' of the design intention as contained in the previously approved Master Layout Plan. These particularly included a civic landmark Government offices cum commercial building at DA5, stepped height profile for DA5 commercial building and cascading garden design with water and landscape features within the public open spaces at DAs 4&5, as well as enhanced connections to the MTR Kwun Tong Station.
- 1.4.4 Located at the southeast portion of the site within DA4, a high-rise office and hotel tower (at 285mPD) on top of a retail podium (at 65.3mPD). A retail bridge connecting DA4 and the podium of DA 2 and 3 is located to the northwest of the podium of DA4.
- 1.4.5 DA 5 is located at the southwest portion of the Subject Site and has a mid-rise tower with building height 72.7mPPD. There is a bridge connecting two parts of the mid-rise tower within DA5. Landscape decks are provided from the MTR station and DA4 and 5.
- 1.4.6 There are three building separation provided within DA4 and DA5:
  - Around 40m building separation (above 23.2mPD) along northeast/southwest between Tower 1 of DA 2&3 and podium of DA 4.
  - Around 42m building separation (at ground level) along northeast/southwest between the podium of DA 2&3 and podium of DA 4.



- Around 16m building separation along southeast/ northwest between office and hotel tower in DA4 and composite commercial building (at the roof 72.7mPD) in DA5.
- Around 20m building separation (at ground level) along northeast/ southwest between composite commercial and GIC building within DA5.
- Around 29m building separation along east/ west between Tower 5 of DA 2&3 and office tower (at the roof 72.7mPD) of DA5.
- Around 14m air path along east/west between DA2&3 and DA4&5 site.

## 2. Site Wind Availability

### 2.1 Site Wind Availability Data

- 2.1.1 According to the Planning Department website, a meso-scale Regional Atmospheric Modeling System (RAMS) was used to produce a simulated 10-year wind climate at the horizontal resolution of 0.5km x 0.5km covering the whole territory of Hong Kong. The simulated wind data represents the annual, winter and summer wind condition at various level, i.e. 200m, 300m, 500m above terrain.
- 2.1.2 This evaluation is not intended as a detailed study of the air ventilation performance, and hence it is therefore considered acceptable to use the simulated RAMS data for Site Wind Availability as a basis point. The use of RAMS data is preferred as it can reflect the effect of topography in the surrounding area to wind availability.
- 2.1.3 The RAMS data is directly extracted from the Planning Department website for site wind availability data (i.e. X: 091, Y: 041).
- 2.1.4 **Figure 3** shows the relevant windrose diagram at Grid X: 091, Y: 041 representing the frequency and wind speed distribution at 500m of the district concerned for both annual and summer condition. The windrose result below indicates the dominance of each of the 16 wind directions and distribution of wind speed. According to the windrose, the annual prevailing wind directions are from NNE to SE whereas summer prevailing wind directions are from ESE to SW.
- 2.1.5 **Table 1** shows a summary of the simulated site wind availability data at 500m including probability of occurrence and average wind speed. In this quantitative air ventilation assessment, the Computational Fluid Dynamics (CFD) tool will be employed. According to the Technical Guide, simplification of wind data for the Initial Study has been adopted. The wind directions with highest probability of occurrence are selected for assessment purpose. 11 wind directions were selected with overall frequency of occurrence equivalent to 90.6% and 86.2% respectively of the time in a year for both annual and summer condition.

**Table 1 Summary of Simulated Site Wind Availability Data ( $V_{\infty}$ ) and Wind Direction for the Subject Site at 500m (Grid X:091, Y:041)**

| Percentage Occurrence (%) for Wind Speed Ranges: |              |              |                               |
|--|--------------|--------------|-------------------------------|
| Wind Angle (Direction)                           | Annual       | Summer       | Designated Wind Profile Curve |
| 0 (N)  | 2.4%         | 0.8%         | 3                             |
| 22.5 (NNE)                                       | 5.0%         | 1.0%         | 0*                            |
| 45 (NE)  | 8.0%         | 1.7%         | 0*                            |
| 67.5 (ENE)                                       | 15.7%        | 3.2%         | 0*                            |
| 90 (E)   | 19.6%        | 9.1%         | 0*                            |
| 112.5 (ESE)                                      | 10.7%        | 9.1%         | 1*                            |
| 135 (SE)   | 6.8%         | 7.3%         | 1*                            |
| 157.5 (SSE)                                      | 4.5%         | 8.0%         | 1*                            |
| 180 (S)  | 4.3%         | 9.2%         | 1*                            |
| 202.5 (SSW)                                      | 5.8%         | 12.8%        | 2*                            |
| 225 (SW)   | 6.1%         | 14.4%        | 2*                            |
| 247.5 (WSW)                                      | 4.1%         | 10.4%        | 2*                            |
| 270 (W)  | 2.9%         | 6.6%         | 2                             |
| 292.5 (WSW)                                      | 1.4%         | 2.8%         | 3                             |
| 315 (NW)   | 1.2%         | 2.2%         | 3                             |
| 337.5 (NNW)                                      | 1.3%         | 1.1%         | 3                             |
| <b>TOTAL Selected*</b>                           | <b>90.6%</b> | <b>86.2%</b> |                               |

\* Selected wind direction and wind profile curve for quantitative AVA study

## 2.2 Topography

2.2.1 The Subject Site is located to the west of Hip Wo Street, which is elevated gradually from 6.1mPD to 17.6mPD. Sau Mau Ping is located about 800m to the northeast of the Subject Site at about 90mPD level. Crocodile Hill is located around 500m to the northwest of the Subject Site with about 80mPD. Kwun Tong Typhoon Shelter is located about 800m to the southwest of the Subject Site.

## 2.3 Building Landscape

2.3.1 The Subject Site, is bounded by Hip Wo Street to the east, Kwun Tong Road to the south, Hong Ning Road to the west and Mut Wah Street to the north.

2.3.2 Generally, there are dense building structures near the Subject Site. There are a number of mid-rise residential buildings located along Hip Wo Street. Yuet Wah Street Playground is located to the further northeast of the Subject Site and it is anticipated that wind from east-northeasterly can be facilitated to the Subject Site. Hence the wind availability for these directions are considered to be optimal. For the North direction, closely packed residential buildings are located along Mut Wah Street. There is a cluster of old industrial buildings further south of the Subject site.

2.3.3 On the other hand, there are some high-rise developments located to the south of the Subject Site. i.e. APM, One Pacific Centre, Kwun Tong View. It is anticipated that some winds from the southern direction may be blocked. Besides, there are many industrial buildings located further south of the Subject Site. Some high-rise commercial buildings (i.e. Millennium City Phase 1 and Millennium City Phase six) are located to the southwest of the Subject Site. Tsun Yip Street Playground is located to further south of the Subject Site. **Figure 10** shows the name of the building immediate surrounding the Subject Site. High podium design means the lower portions of the developments are impermeable.

2.3.4 **Figure 4** shows the building landscape within the assessment and surrounding area; while **Figure 5** shows the building height of the surrounding development.

## 2.4 Summary of Existing and Future Site Wind Availability

2.4.1 According to Table 1, the annual prevailing wind directions for the Subject Site are mainly from NNE to SE. For NNE and NE wind, Hip Wo Street would act as an air corridor and cause wind flow to the Subject Site. From the NE direction, it is anticipated that some winds will be obstructed by the mid-rise buildings which are located to the east of the Subject Site. But due to the high topography from the northeast of the Subject Site, it is likely that some winds can flow downward to the areas near the Subject Site.

2.4.2 For E and ENE wind, it is observed that Kwun Tong Road is the main air corridor. Since there are no high topographic regions or high rise building clusters to the east of the Subject Site, it is anticipated the wind availability to the Subject Site will not be affected strongly.



- 2.4.3 For ESE and SE wind, incoming wind flow would be obstructed by mid-rise buildings to the southeast. (i.e. Liadro Centre, Kwun Tong Industrial Centre) hence wind availability of the Subject Site and downwind regions would be obstructed.
- 2.4.4 For the summer prevailing wind directions for the site are from SSE to WSW. It is observed that some high-rise buildings (i.e. APM, One Pacific Centre) are located to the southwest of the Subject Site, it is anticipated that these high-rise buildings will obstruct part of the wind flow and reduce the wind availability to the Subject Site. Due to the blockage of the high-rise buildings, Kwun Tong Road may act as a main air corridor near the Subject Site.

### 3. Quantitative Assessment Methodology

#### 3.1 Atmospheric Conditions

- 3.1.1 Simulated wind profile curves are extracted from the Planning Department's website using RAMS site wind availability data and directly adopted for this quantitative AVA. **Appendix E** shows the wind profile curves for grid X: 091, Y: 041.
- 3.1.2 Wind profile curves 0, 1 and 2 would be utilized for quantitative AVA according to the selected wind directions in **Table 1**.
- 3.1.3 For elevation from 0 to 10m where wind profile information is not available, the wind speed is assumed based on fitted Log Law and measured wind speed value at 10m from the RAMS site wind availability data for each wind profile curve.
- 3.1.4 The wind profile of 0m to 10m is interpolated and then combined with the wind profile curves on RAMS site wind availability data.

#### 3.2 CFD Code and Major Parameters

- 3.2.1 A quantitative assessment based on requirement for Initial Study stipulated in the technical guide was conducted for the purpose to verify the air ventilation performance for the Proposed Scheme over the Baseline Scheme.
- 3.2.2 The quantitative assessment was conducted using a commercial CFD code, FLUENT. FLUENT model had been widely applied for various AVA research and studies worldwide. The accuracy level of the FLUENT model was very much accepted by the industry for AVA application.
- 3.2.3 Realizable K-epsilon turbulence which gives better prediction of separation and vortices are adopted for air ventilation assessment as recommended in COST action C14.
- 3.2.4 The assessment area is determined by the height (H) of the highest building within the surrounding area (i.e. Proposed development of the Subject Site, with a building height of approximately 285m). Therefore, the assessment area shall be at least 1H (with H=285m) from the project site boundary.
- 3.2.5 The domain covers the model area of over 600m. The surrounding area is determined by 2 times the height of the highest building within the model area therefore is equivalent to at least 2H of the highest building (i.e. >2H where H=300m) from the project site boundary. It is confirmed that all major noise barriers, elevated structures, and planned / committed / existing developments in the model area have been modelled in the simulation.
- 3.2.6 **Figure 4** shows the assessment area and surrounding area for the model simulation.

- 3.2.7 The domain dimension is about 5100m x 5100m and with an elevation of 1000m. More than 9,500,000 grid cells has been defined to simulate the air flow. Given the large domain adopted in this assessment and the physical limitation on the computational resources of the CFD model, the horizontal and vertical grid size employed in the CFD model in the vicinity of the Project Area was taken as a global minimum size of 2m and was increased for the grid cells further away from the Project Area at a growth ratio of 1.6. The global maximum size of cells is 32m and smaller cell size up to 0.5m was used. Besides, four layers of prism cells (each layer of 0.5m thick) were employed above the terrain and podium of Subject Site. The blockage ratio is less than 3%.
- 3.2.8 The windward boundary is defined as inflow with the wind profile defined. The leeward boundary is defined as outflow. The sky and lateral boundaries are defined as symmetric boundary condition.
- 3.2.9 **Appendix C** shows the domain size and the CFD model in different views. **Appendix E** shows the wind profile curve adopted.
- 3.2.10 The advection terms of the momentum and viscous terms are resolved with the second order numerical schemes. The scaled residuals are converged to an order of magnitude of at least  $1 \times 10^{-4}$  as recommended in COST action C14.

### 3.3 Test Point Location

- 3.3.1 A total of 184 test points are selected including 30 numbers of perimeter test point defined along the boundary of the Subject Site, 144 numbers of overall test point within the assessment area and 10 special test point. The overall test point generally represents important pedestrian areas such as sitting out area and pedestrian walkway. Additionally, 21 numbers of special test points are defined within the Subject Site for different sensitive areas. All test points are located at 2m above ground level except the test point for footbridge (T101-T103) and the special test points of the podium within the Subject Site. Test points' height for the footbridge is about 8m and the test points for within the Subject Site is taken at 2m above the ground or podium level. **Figures 3a to 3e** shows the tests points selected for quantitative air ventilation assessment. **Figure 3f to 3h** shows the test points selected within the Subject Site and special test points.

## 4. Quantitative Assessment Result

### 4.1 Spatial Average Wind Velocity Ratio

- 4.1.1 The wind velocity ratio (VR) under a specific wind direction at a test point is calculated by dividing the simulated wind speed at the test point under this wind direction with the velocity at gradient height under the same wind direction.
- 4.1.2 **Table 2** showed the site spatial average velocity ratio (SVR), local spatial average velocity ratio (LVR) and average VR of other focused areas.
- 4.1.3 The wind velocity ratios of individual test points are shown in **Figure 6** and **Figure 7** for the Baseline Scheme and Proposed Scheme respectively for annual situation.
- 4.1.4 The wind velocity ratios of individual test points are shown in **Figure 9** and **Figure 10** for the Baseline Scheme and Proposed Scheme respectively for summer situation.
- 4.1.5 **Appendix D** shows VR colour plot at pedestrian level and the VR color plot for the podium level of the Subject Site. **Appendix E** shows the detailed VR result for tested wind directions.

**Table 2 Summary of Spatial Average Wind Velocity Ratios (VR) between Baseline Scheme and Proposed Scheme**

| Spatial Average Wind Velocity Ratio (VR)              | Test Pints                 | Baseline Scheme | Proposed Scheme |
|---|----------------------------|-----------------|-----------------|
| <b>Annual Wind Situation</b>                          |                            |                 |                 |
| SVR   | P01-P30                    | 0.13            | 0.12            |
| LVR   | P01-P30, T001-T144         | 0.09            | 0.09            |
| Mut Wah Street  | P01-P06                    | 0.14            | 0.14            |
| Wan Hon Street  | T001-T003                  | 0.08            | 0.09            |
| PCCW Training and Development Centre                  | T004-T005                  | 0.05            | 0.05            |
| CCC Kei Chi Secondary School                          | T006-T008                  | 0.05            | 0.05            |
| Ka Lok Street   | T009-T011                  | 0.06            | 0.06            |
| Shui Ning Street                                      | T012-T016                  | 0.04            | 0.05            |
| Hong Ning Road Playground                             | T017-T022, T141, T142      | 0.07            | 0.08            |
| Shung Yan Street                                      | T023-T026                  | 0.05            | 0.05            |
| Shui Wo Street  | T027-T033                  | 0.05            | 0.05            |
| Hong Ning Road  | P001, P027-P030, T034-T036 | 0.09            | 0.09            |
| Ming Chi Street and Ming Chi Street Recreational Area | T037-T039                  | 0.04            | 0.04            |
| Tung Ming Street                                      | T040-T044                  | 0.07            | 0.07            |
| Ning Po College                                       | T045-T046                  | 0.03            | 0.03            |
| Hang On Street  | T047-T049                  | 0.04            | 0.04            |
| Yee On Street   | T050-T052                  | 0.04            | 0.04            |
| Luen On Street  | T053-T055, T47, T50        | 0.06            | 0.07            |
| Ngau Tau Kok Road                                     | T056-T060, T063, T140      | 0.10            | 0.10            |
| Horse Shoe Lane                                       | T060-T063                  | 0.11            | 0.12            |



|   |                                |      |      |
|---|--------------------------------|------|------|
| Kwun Tong Road  | P17-P27, T064-T070, T133, T138 | 0.12 | 0.12 |
| Fuk Tong Road   | T071-T073                      | 0.06 | 0.07 |
| Road next to Leung Faat Memorial Church               | T074-T075                      | 0.05 | 0.06 |
| Yuet Wah Street                                       | T076-T087                      | 0.07 | 0.07 |
| Tin Heung Street                                      | T088-T090                      | 0.05 | 0.05 |
| Tsz Loi Lane  | T091-T092                      | 0.04 | 0.04 |
| Yuet Wah Street Playground                            | T093-T095                      | 0.08 | 0.08 |
| Hip Wo Street   | P07-P16, T096-T099, T139       | 0.13 | 0.13 |
| Fu Yan Street   | T100-T101                      | 0.04 | 0.04 |
| Footbridge  | T102-T104                      | 0.17 | 0.17 |
| How Ming Street                                       | T105-T111, T123, T134          | 0.11 | 0.12 |
| Tsun Yip Street Playground                            | T112-T116                      | 0.09 | 0.09 |
| Tsun Yip Street                                       | T109, T117-T120, T135          | 0.10 | 0.11 |
| Hoi Yuen Road   | T121-T124, T136                | 0.14 | 0.14 |
| Shing Yip Street                                      | T125-T128, T137                | 0.15 | 0.15 |
| Special Test Points                                   | S01-S10                        | 0.12 | 0.10 |
| <b>Summer Wind Situation</b>                          |                                |      |      |
| SVR   | P01-P30                        | 0.11 | 0.11 |
| LVR   | P01-P30, T001-T144             | 0.08 | 0.08 |
| Mut Wah Street  | P01-P06                        | 0.10 | 0.10 |
| Wan Hon Street  | T001-T003                      | 0.08 | 0.08 |
| PCCW Training and Development Centre                  | T004-T005                      | 0.05 | 0.05 |
| CCC Kei Chi Secondary School                          | T006-T008                      | 0.05 | 0.05 |
| Ka Lok Street   | T009-T011                      | 0.04 | 0.04 |
| Shui Ning Street                                      | T012-T016                      | 0.04 | 0.04 |
| Hong Ning Road Playground                             | T017-T022, T141, T142          | 0.06 | 0.06 |
| Shung Yan Street                                      | T023-T026                      | 0.03 | 0.03 |
| Shui Wo Street  | T027-T033                      | 0.04 | 0.04 |
| Hong Ning Road  | P001, P027-P030, T034-T036     | 0.07 | 0.07 |
| Ming Chi Street and Ming Chi Street Recreational Area | T037-T039                      | 0.04 | 0.04 |
| Tung Ming Street                                      | T040-T044                      | 0.06 | 0.06 |
| Ning Po College                                       | T045-T046                      | 0.03 | 0.03 |
| Hang On Street  | T047-T049                      | 0.04 | 0.04 |
| Yee On Street   | T050-T052                      | 0.04 | 0.04 |
| Luen On Street  | T053-T055, T47, T50            | 0.06 | 0.06 |
| Ngau Tau Kok Road                                     | T056-T060, T063, T140          | 0.09 | 0.09 |
| Horse Shoe Lane                                       | T060-T063                      | 0.12 | 0.12 |
| Kwun Tong Road  | P17-P27, T064-T070, T133, T138 | 0.12 | 0.12 |
| Fuk Tong Road   | T071-T073                      | 0.07 | 0.07 |
| Road next to Leung Faat Memorial Church               | T074-T075                      | 0.06 | 0.06 |
| Yuet Wah Street                                       | T076-T087                      | 0.06 | 0.06 |
| Tin Heung Street                                      | T088-T090                      | 0.05 | 0.05 |

|                            |                          |      |      |
|----------------------------|--------------------------|------|------|
| Tsz Loi Lane               | T091-T092                | 0.03 | 0.03 |
| Yuet Wah Street Playground | T093-T095                | 0.06 | 0.06 |
| Hip Wo Street              | P07-P16, T096-T099, T139 | 0.11 | 0.11 |
| Fu Yan Street              | T100-T101                | 0.04 | 0.04 |
| Footbridge                 | T102-T104                | 0.16 | 0.16 |
| How Ming Street            | T105-T111, T123, T134    | 0.12 | 0.13 |
| Tsun Yip Street Playground | T112-T116                | 0.11 | 0.11 |
| Tsun Yip Street            | T109, T117-T120, T135    | 0.11 | 0.11 |
| Hoi Yuen Road              | T121-T124, T136          | 0.12 | 0.12 |
| Shing Yip Street           | T125-T128, T137          | 0.17 | 0.17 |
| Special Test Points        | S01-S10                  | 0.08 | 0.07 |

Note:

Highlighted in **Blue** where VR higher in the Baseline Scheme

Highlighted in **Red** where VR lower in the Baseline Scheme

## 4.2 Discussion

- 4.2.1 According to the spatial average VR presented in **Table 2** above, the SVR is only slightly higher in the Baseline Scheme as compare to Proposed Scheme under annual situation (only a difference of 0.01), but comparable between two options under summer condition.
- 4.2.2 On the other hand, the LVR is the same between two schemes under both annual and summer condition.
- 4.2.3 Compare to the Baseline Scheme, the Proposed Scheme improved VR in 9 focus areas but reduced VR in only 1 focus area during annual condition. In summer the Proposed Scheme improved 1 focus area and reduced VR in 1 focus area during summer condition.
- 4.2.4 Under annual situation, spatial average VR are generally similar for both schemes. There are some improvements in VR found in the Proposed Scheme, i.e. Wan Hon Street, Shui Ning Street, Hong Ning Road Playground, Luen On Street, Horse Shoe Lane, Fuk Tong Road, Road next to Leung Faat Memorial Church, How Ming Street, Tsun Yip Street. On the other hand, VR are higher in the Baseline Scheme at some test points within the Subject Site.
- 4.2.5 Under summer situation, VR is higher in the Proposed Scheme at How Ming Street but lower in test points within the Subject Site.
- 4.2.6 It is noted that the compare to the previous proposed scheme (submitted in April 2017), the overall air ventilation performance is improved in the current Proposed Scheme. Mitigation measure adopted in current design enhanced the building permeability and wind penetration from the previous proposed scheme.

### 4.3 Directional Analysis

#### Wind performance under Wind Direction NNE

- 4.3.1 Under NNE wind, it is observed that wind availability is high at Hip Wo Street, Mut Wah Street, and Hong Ning Road Playground.
- 4.3.2 According to the contour plot, it is observed that a stronger channelized wind from the northeast at Yue Man Square Rest Garden within the Subject Site induced by the continuous façade of DA 5 site to DA 4 site (compare to the Baseline Scheme). In addition, the stronger wind also benefits the wind flow along Hong Ning Road and Yee On Street to the west of DA 5 site.
- 4.3.3 However, such stronger wind near Hong Ning Road Recreation Ground in the Baseline Scheme redistributed and diverted the wind flow near Kung Lok Road towards the north and further benefits Hong Lee Road. However, the wind flow near Kwun Tong Lok Government Secondary School is lower in the Baseline Scheme, due to the incoming wind from Kung Lok Road towards the north.
- 4.3.4 According to the contour plot, it is observed that the NNE wind pass through the Subject Site at a higher level and downwashed by the building cluster to the south of Kwun Tong Road. However, the larger building bulk of DA 4 site in the Proposed Scheme obstructed the wind flow at a higher level and therefore reduced the downwash wind induced by the building cluster to the south of Kwun Tong Road. Therefore, the VR is higher in the Baseline Scheme along Kwun Tong Road.
- 4.3.5 Also, a higher VR is observed in the Baseline Scheme to the southeast of the Subject Site near the roundabout at Kwun Tong Road. It is believed that the larger setback to Hip Wo Street in the DA 5 of Baseline Scheme enhanced more wind flow from the north to south along Hip Wo Street and benefits the roundabout at Kwun Tong Road.

#### Wind performance under Wind Direction NE

- 4.3.6 Under NE wind, a higher VR is observed in the Baseline Scheme to the southeast of the Subject Site near the roundabout at Kwun Tong Road and Hip Wo Street. It is believed that the larger setback at Hip Wo Street in DA 5 of Baseline Scheme enhanced more wind flow from the north to south along Hip Wo Street and benefits the roundabout at Kwun Tong Road.
- 4.3.7 Since more wind flow along Hip Wo Street, more wind could penetrate through the building clusters to the northeast of the Subject Site and benefits Yuet Wah Street (and Yuet Wah Street Playground).
- 4.3.8 However, the enhanced wind flow along Hip Wo Street to the east also countered the wind flow along Mut Wah Street. Therefore, the VR is higher to the north of the Subject Site in the Proposed Scheme.
- 4.3.9 It is observed that the stronger wind flow near the roundabout at Kwun Tong Road in the Baseline Scheme also countered the downwash wind by the building clusters to

the south of the Subject Site. Therefore, the VR is lower in the Baseline Scheme along Kwun Tong Road to the south of the Subject Site.

#### Wind performance under Wind Direction ENE

- 4.3.10 Under ENE wind, it is observed that the wind availability is high for the focus areas near the Subject Site (i.e. Kwun Tong Road, Hip Wo Street, Mut Wah Street and Hong Ning Road). Kwun Tong Road is the main air corridors under ENE wind.
- 4.3.11 According to the contour plot, the long façade of the DA 5 development within the Proposed Scheme also induced a stronger wake area to leeward side, i.e. a lower VR observed along Kwun Tong Road to the south of Subject Site in the Proposed Scheme.
- 4.3.12 On the other hand, the long façade of the DA 5 development within Proposed Scheme redistribute and divert more wind toward west and therefore countered some wind flow along the Hong Ning Road to the west of the Subject Site. Therefore, the VR is slightly lower in the Proposed Scheme to the west of the Subject Site at Hong Ning Road. However, the design of DA 5 of the Proposed Scheme also diverts more wind toward northwest at higher level and therefore slightly benefits Hong Ning Road and Hong Ning Road Recreation Ground to the northwest of the Subject Site.

#### Wind performance under Wind Direction E

- 4.3.13 Under E wind, it is observed that the wind availability is high for the focus areas near the Subject Site (i.e. Kwun Tong Road, Hip Wo Street and Mut Wah Street). Kwun Tong Road is the main air corridors under E wind.
- 4.3.14 It is observed that the VR is generally higher in the Proposed Scheme along the Kwun Tong Road. Since the VR is higher in the Baseline Scheme to the east of the Subject Site along Hip Wo Street due to larger setback in the DA 5, the larger wind flow at Hip Wo Street countered the wind flow along Kwun Tong Road from the east toward west.
- 4.3.15 In the Baseline Scheme, it is observed there is a higher VR at the Yue Man Square Rest Garden within the Subject Site. The stronger easterly wind along the Yue Man Square Rest Garden also benefits further downwind area to the west, e.g. Kwun Tong Road, Ngau Tau Kok Road, Luen On Street, etc. It is found that the larger building bulk in the Baseline Scheme captured more wind at higher level and downwash to lower level at Yue Man Square Rest Garden and further downwind area, i.e. Ngau Tau Kok Road.

#### Wind performance under Wind Direction ESE

- 4.3.16 Under ESE wind, it is observed that the wind availability is high for the focus areas near the Subject Site (i.e. Kwun Tong Road, Hip Wo Street and Mut Wah Street). Kwun Tong Road is the main air corridors under ESE wind.



- 4.3.17 It is observed that the VR is generally higher in the Proposed Scheme along Kwun Tong Road. Since the VR is higher in the Baseline Scheme to the east of the Subject Site along Hip Wo Street due to a larger setback in DA 5, the larger wind flow at Hip Wo Street countered the wind flow along Kwun Tong Road from the east toward west.
- 4.3.18 Similar to E wind, In the Baseline Scheme, it is observed that a higher VR at the Yue Man Square Rest Garden within the Subject Site. The stronger easterly wind along the Yue Man Square Rest Garden also benefit further downwind area to the west, e.g. Kwun Tong Road, Ngau Tau Kok Road, Luen On Street, etc. It is found that the larger building bulk in the Baseline Scheme captured more wind at higher level and downwash to lower level at Yue Man Square Rest Garden.
- 4.3.19 It is observed that there are some wind flow downwash from the higher topography near Chun Wah Road and flow toward Hong Ning Road and Hong Ning Road Recreation Ground under ESE wind. In the Baseline Scheme, the stronger wind flow from the Yue Man Square to the Hong Ning Road in the Baseline Scheme contoured along Hong Ning Road and Hong Ning Road Recreation Ground. Therefore, the VR are lower along Hong Ning Road and Hong Ning Road Recreation Ground in the Baseline Scheme.

#### Wind performance under Wind Direction SE

- 4.3.20 Under SE wind, the VR is higher along the Kwun Tong Road. It is believed that the streamline design to the southeast of the Baseline Scheme enhanced the south-easterly wind to enter the Kwun Tong Road.
- 4.3.21 A higher VR is observed in the Baseline Scheme to the east of the Subject Site along Hip Wo Street. It is believed that the larger setback to Hip Wo Street in the DA 5 of Baseline Scheme enhanced more wind flow from the south to north along Hip Wo Street.
- 4.3.22 It is observed that the VR is better along at Yue Man Square Rest Garden in the Proposed Scheme due to smaller building footprint in DA 4 site. The enhanced wind flow at Yue Man Square Rest Garden also benefited the downwind area, i.e. Ngau Tau Kok Road, Luen On Street, Hong Ning Road and Hong Ning Road Recreation Ground.

#### Wind performance under Wind Direction SSE

- 4.3.23 According to the contour plot, the podium of office and hotel tower of Proposed Scheme induced a strong channelized wind and benefited Hip Wo Street, Mut Wah Street and Yuen Wah Street. Also, some wind flow at Hip Wo Street penetrate the buildings towards west and benefit Shui Ning Street, Hong Ning Road Recreation Ground and Kung Lok Road in the Proposed Scheme.
- 4.3.24 In addition, it is observed that the wind penetration along Kwun Tong Road mainly flow from southeast to northwest. The Ball shape to the west of the Proposed Scheme allowed more wind to penetrate from Kwun Tong Road to Hong Ning Road. Therefore, the VR is higher to the west of the Subject Site.

- 4.3.25 However, such stronger wind from Kwun Tong Road to Hong Ning Road in the Proposed Scheme countered the wind flow from the Yue Man Square Rest Garden. Therefore the VR is slightly low to the downwind areas, i.e. i.e. Yee On Street, Hong Ning Road and Hong Ning Road Recreation Ground

#### Wind performance under Wind Direction S

- 4.3.26 According to the contour plot, it is observed that most of the southerly wind obstructed by the existing industrial building cluster.
- 4.3.27 Similar to the SSE wind, the egg-shape landmark building to the west of the Proposed Scheme allowed more wind to penetrate from Kwun Tong Road to Hong Ning Road. Therefore, the VR is higher to the west of the Subject Site, i.e. Ngau Tau Kok Road.
- 4.3.28 It is found that the podium of office and hotel tower of Proposed Scheme induced a strong channelized wind and benefited Hip Wo Street and Mut Wah Street. However, such stronger wind along Hip Wo street also countered the wind flow along Yuet Wah Street from the southeast to northwest and therefore reduce the wind penetration to the building cluster to the west of the Hip Wo Street. Therefore, The VR is slightly lower at Shui Ning Street in the Proposed Scheme.

#### Wind performance under Wind Direction SSW

- 4.3.29 Under SSW wind, pedestrian wind flow from SSW direction will be obstructed by high-rise developments with impermeable podium design, such as Millennium City Phase 1 and Millennium City Phase six, to the southwest of the Subject Site therefore Tsun Yip Street / Tsun Yip Lane and Hoi Yuen Road will be the air paths coming from the south southwest.
- 4.3.30 According to the contour plot, the long and flat façade in the DA 5 and the office and hotel tower of Proposed Scheme also induced a stronger wake area to leeward side to the northeast, i.e. a lower VR observed at Yue Man Square Rest Garden, Hip Wo Street, Yuet Wah Street and Yuet Wah Street Playground, Po Pui Court, etc. However, on the other hand, the stronger wind flow to the east of the Subject Site also countered the wind flow to the further east, e.g. the wind flow along Tsui Ping Road is better in the Proposed Scheme.
- 4.3.31 Therefore is a higher VR to the south of the Subject Site in the Baseline Scheme induced by downwash effect. However, with the provision of the building separation at DA5 in the Proposed Scheme, such downwash wind are wakened.

#### Wind performance under Wind Direction SW and WSW

- 4.3.32 Under SW and WSW wind, it is observed that the VR flow along Kwun Tong Road from NW to SE wind direction. Besides, the SW wind will be greatly obstructed by high-rise developments with impermeable podium design, such as Millennium City Phase 1 and Millennium City Phase six. Thus the wind availability at the Subject Site is considered very low for both Baseline and Improved Schemes. Only a small

portion of SW wind can reach Hip Wo Street and Kwan Tong Road. As wind availability is very low in both schemes, not much wind is able to reach the Subject Site and able to penetrate to the surrounding areas.

- 4.3.33 According to the contour plot, the long and flat façade in the DA 5 induced a slightly stronger channelized wind along Kwun Tong Road. Also the stronger wind flow also benefited the VR along Hip Wo Street in the Improved Scheme. Furthermore, the stronger wind along Kwun Tong Road of the Baseline Scheme slightly enhanced the wind penetration to the building cluster to the south of Kwun Tong Road (e.g. Tsun Yip Street)

## 5. Concluding Summary

- 5.1.1 The Proposed Scheme has been quantitatively evaluated with the Baseline Scheme. In response to public aspiration, the Proposed Scheme has been refined to adopt design elements similar to the Approved Scheme, eg. egg-shaped Landmark building, stepped height profile for DA 4 and 5, etc. As a result, the resultant air ventilation impacts of the Proposed Scheme are found to be similar as the Baseline Scheme. It is noted that comparing to the previous Proposed Scheme (submitted in April 2017), the overall air ventilation performance is improved in the current Proposed Scheme. Mitigation measures adopted in the current design enhanced the building permeability and wind penetration from the previous Proposed Scheme.
- 5.1.2 According to the simulation result, the SVR is comparable for both the Baseline Scheme and the Proposed Scheme under the summer condition. The LVR is the same between two schemes under both annual and summer condition.
- 5.1.3 Compare to the Baseline Scheme, the Proposed Scheme improved VR in 9 focus areas but reduced VR in only 1 focus area during annual condition. In summer the Proposed Scheme improved 1 focus area and reduced VR in 1 focus area only.
- 5.1.4 Under the annual situation, spatial average VR are generally similar for both schemes. There are some improvements in VR for the Proposed Scheme, i.e. Wan Hon Street, Shui Ning Street, Hong Ning Road Playground, Luen On Street, Horse Shoe Lane, Fuk Tong Road, Road next to Leung Faat Memorial Church, How Ming Street, Tsun Yip Street. The VR are higher in the Baseline Scheme at only some test points within the Subject Site.
- 5.1.5 Under summer situation, VR is higher in the Proposed Scheme along How Ming Street but lower in only some test points within Subject Site.
- 5.1.6 In conclusion, the air ventilation performance is generally similar for both Baseline and Proposed Scheme. The Proposed Scheme would not encounter significant adverse impact to the surrounding from an air ventilation point of view. There are no significant difference between the Baseline Scheme and Proposed Scheme from an air ventilation point of view.



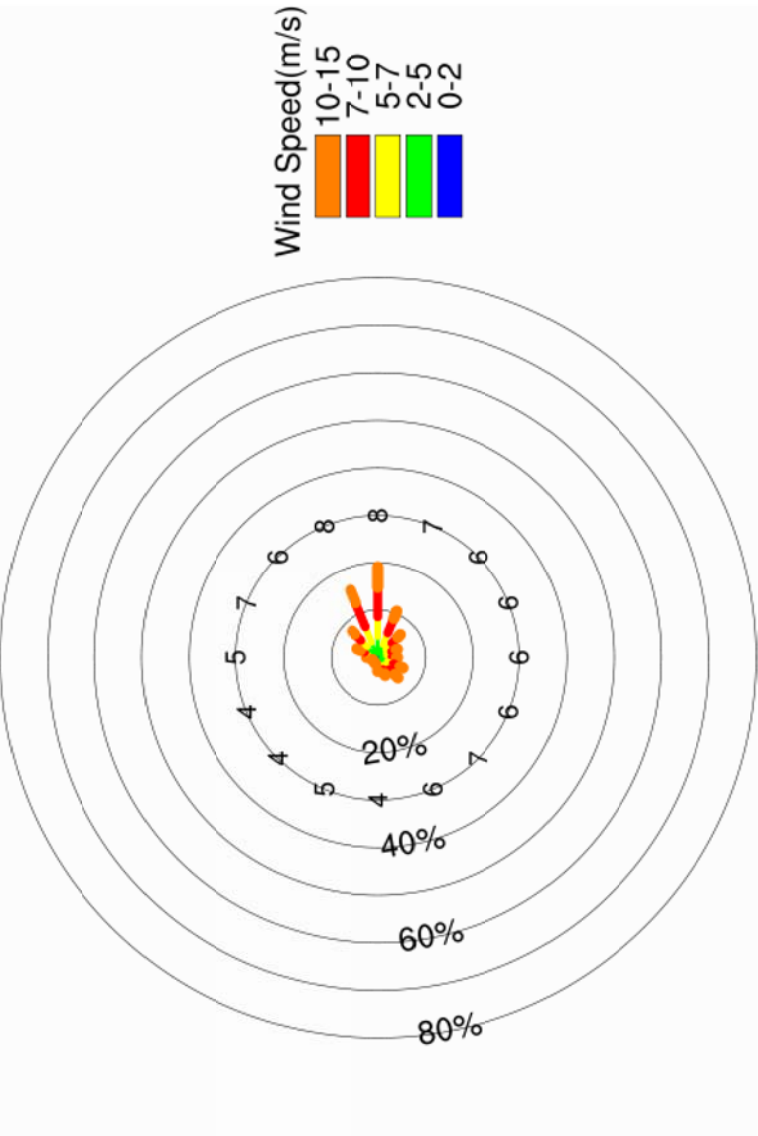
**FIGURES**



|  |                 |
|--|-----------------|
| <b>Figure:</b> 1   | RAMBOLL ENVIRON |
| <b>Title:</b> The Location of the Subject Site and Its Envrions  | Drawn by: JL    |
| <b>Project:</b> Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment | Checked by: SLo |
|  | Rev.: 1.0       |
|  | Date: Apr 2017  |

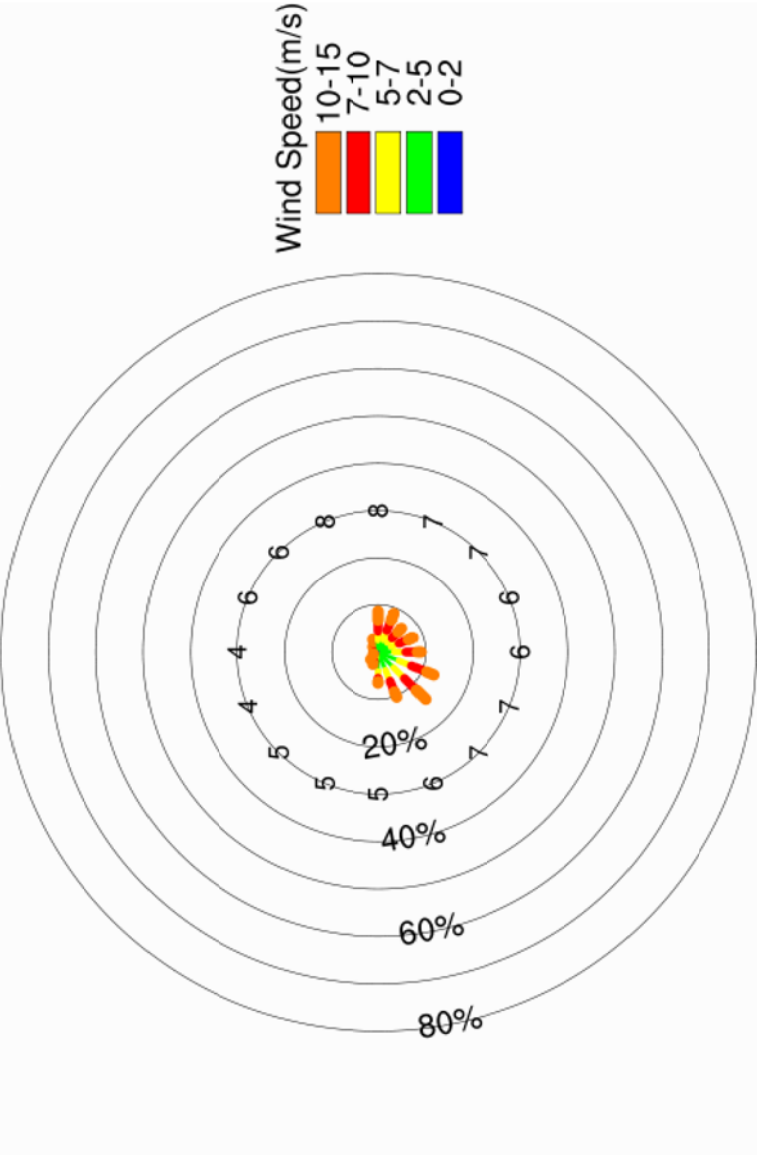


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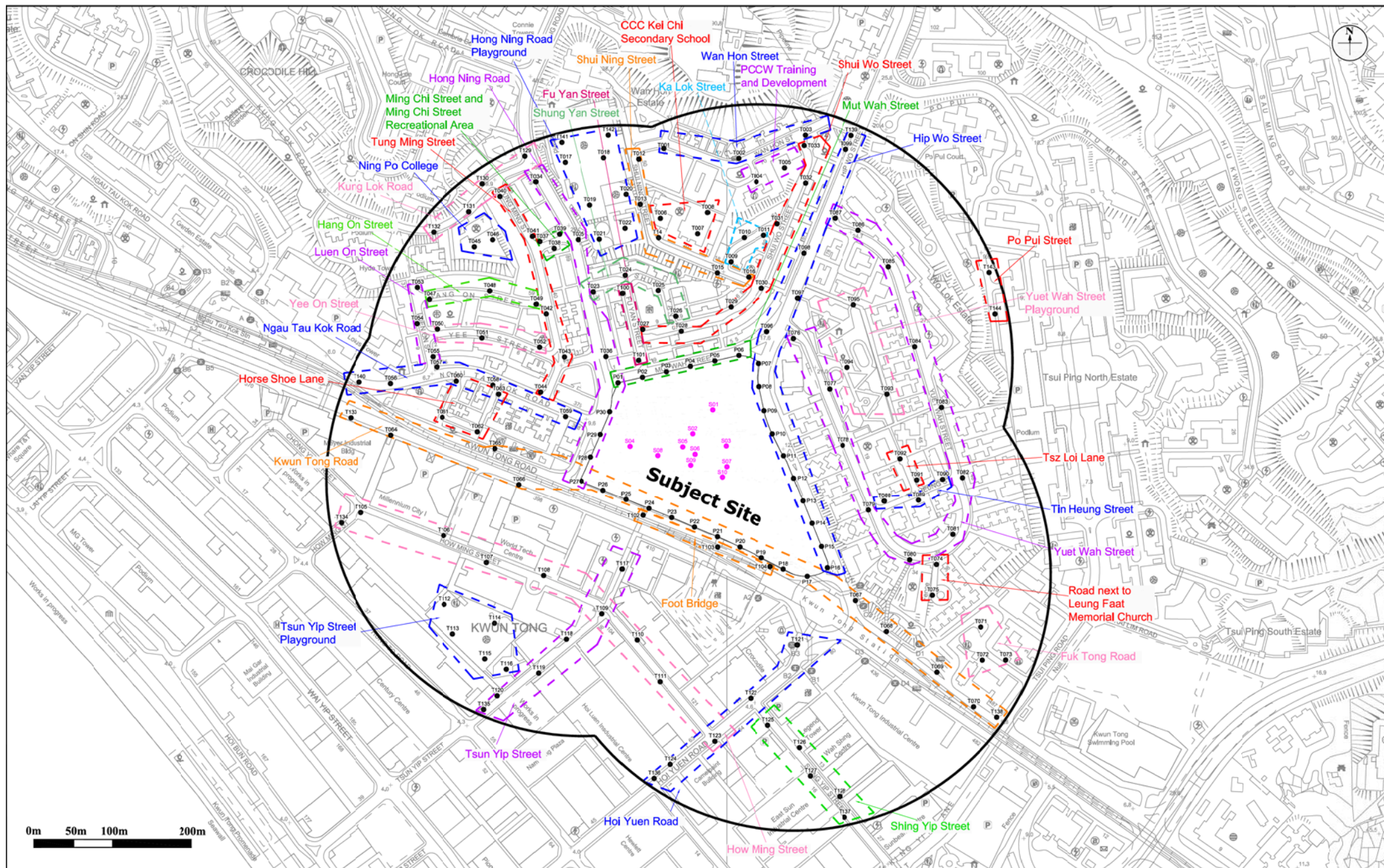
Annual Wind Rose

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Summer Wind Rose

|  |                 |
|--|-----------------|
| Figure: 5  | RAMBOLL ENVIRON |
| Title: Windrose Diagram representing V∞ of the Area under Concern                                  | Drawn by: J.L   |
| Project: Kwun Tong Town Centre Development (DA 4 and 5)<br>Quantitative Air Ventilation Assessment | Checked by: SLo |
|  | Rev.: 1.0       |
|  | Date: Apr 2017  |



**Figure:** 3a

**Title:** Perimeter and Overall Test Points selected for Initial Study

**Project:** Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment

**RAMBOLL** ENVIRON

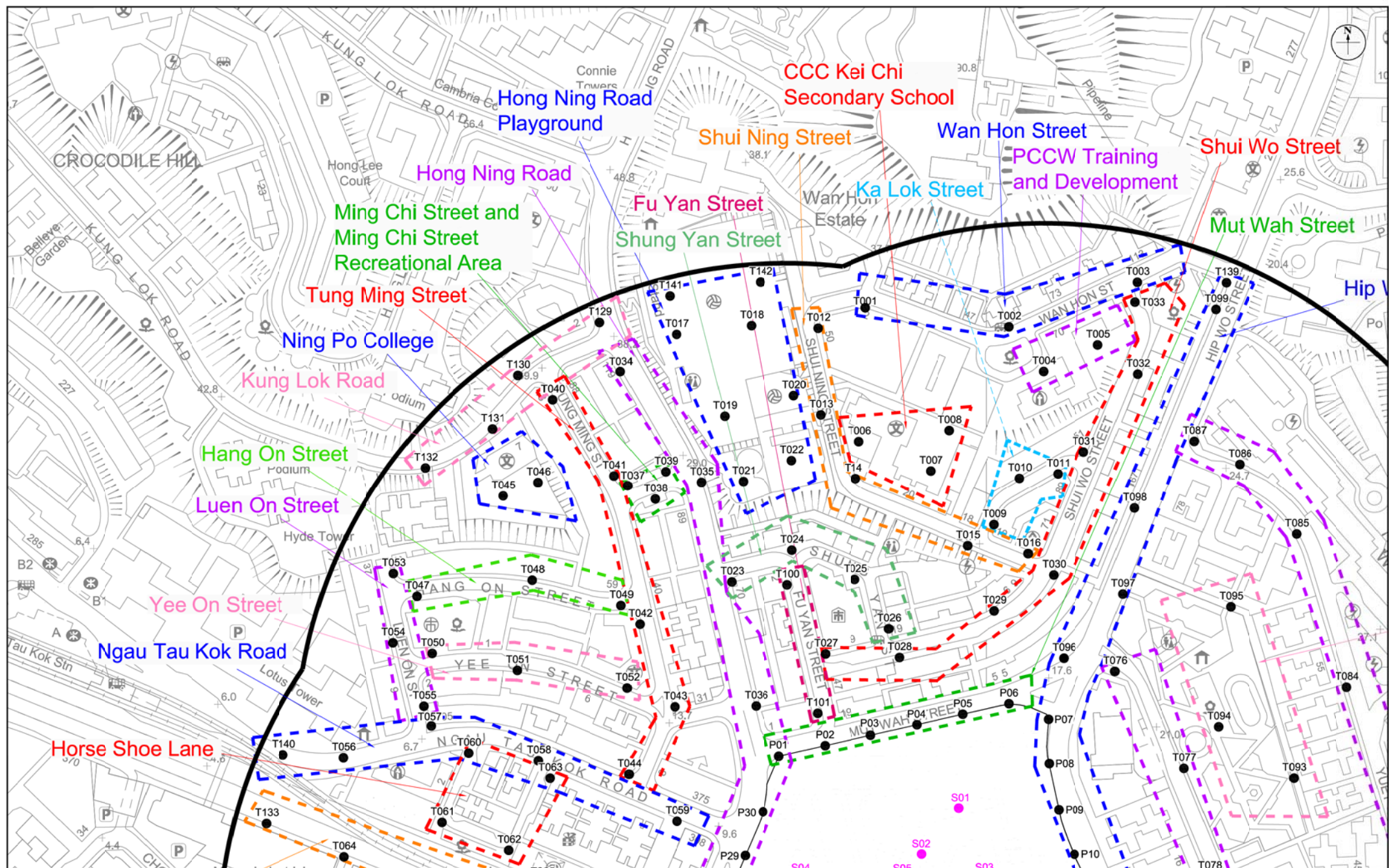
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Rev.: 1.2

Date: Sep 2017





**Figure:** 3b

**Title:** Perimeter and Overall Test Points selected for Initial Study (Close up for northwest area)

**Project:** Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment

**RAMBOLL** ENVIRON

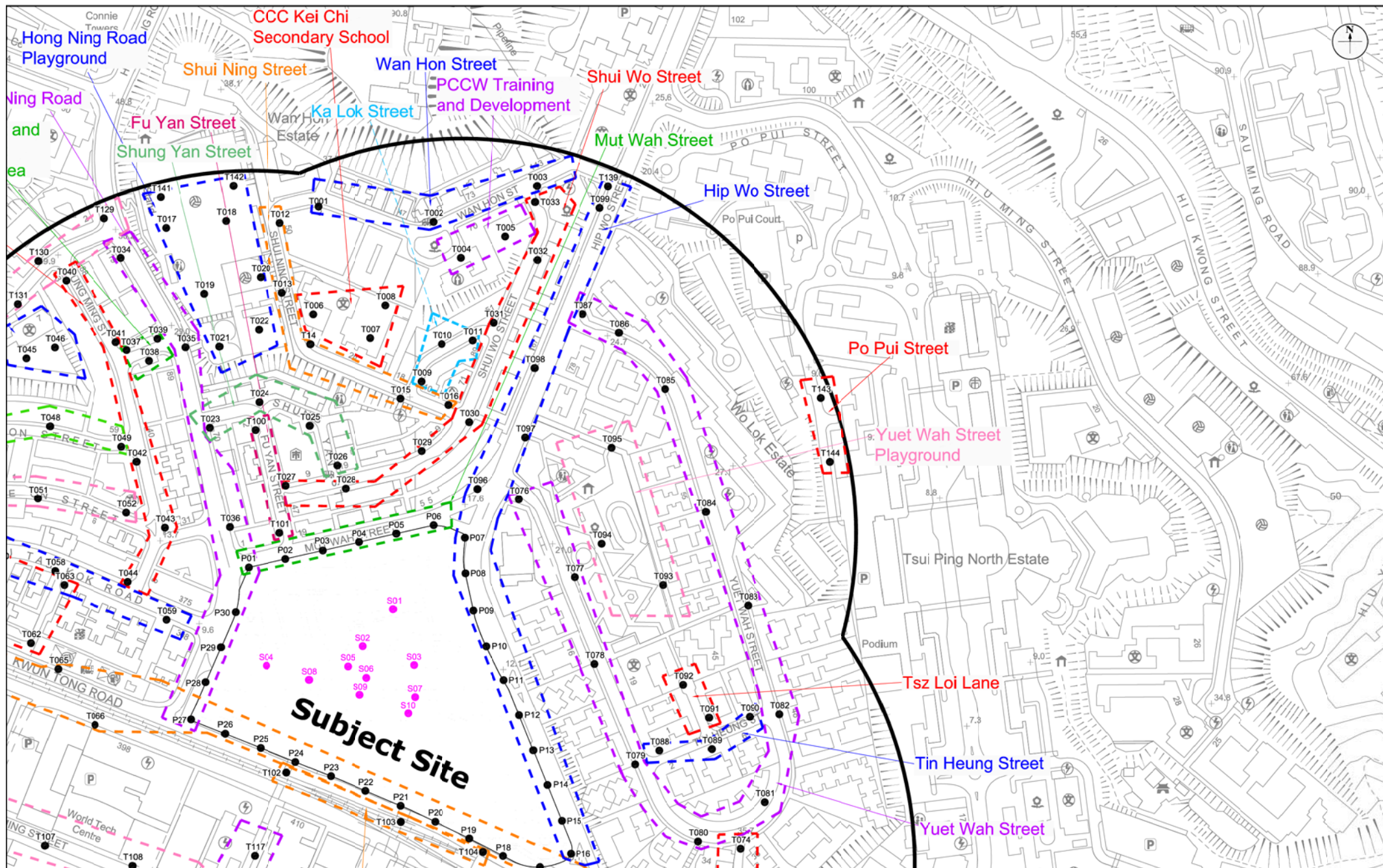
Drawn by: JL

Checked by: SLo

Rev.: 1.2

Date: Sep 2017





**Figure:** 3c

**Title:** Perimeter and Overall Test Points selected for Initial Study (Close up for northeast area)

**Project:** Proposed Redevelopment in “Comprehensive Development Area (1)” zone, Kwun Tong Town Centre Main Site

**RAMBOLL ENVIRON**

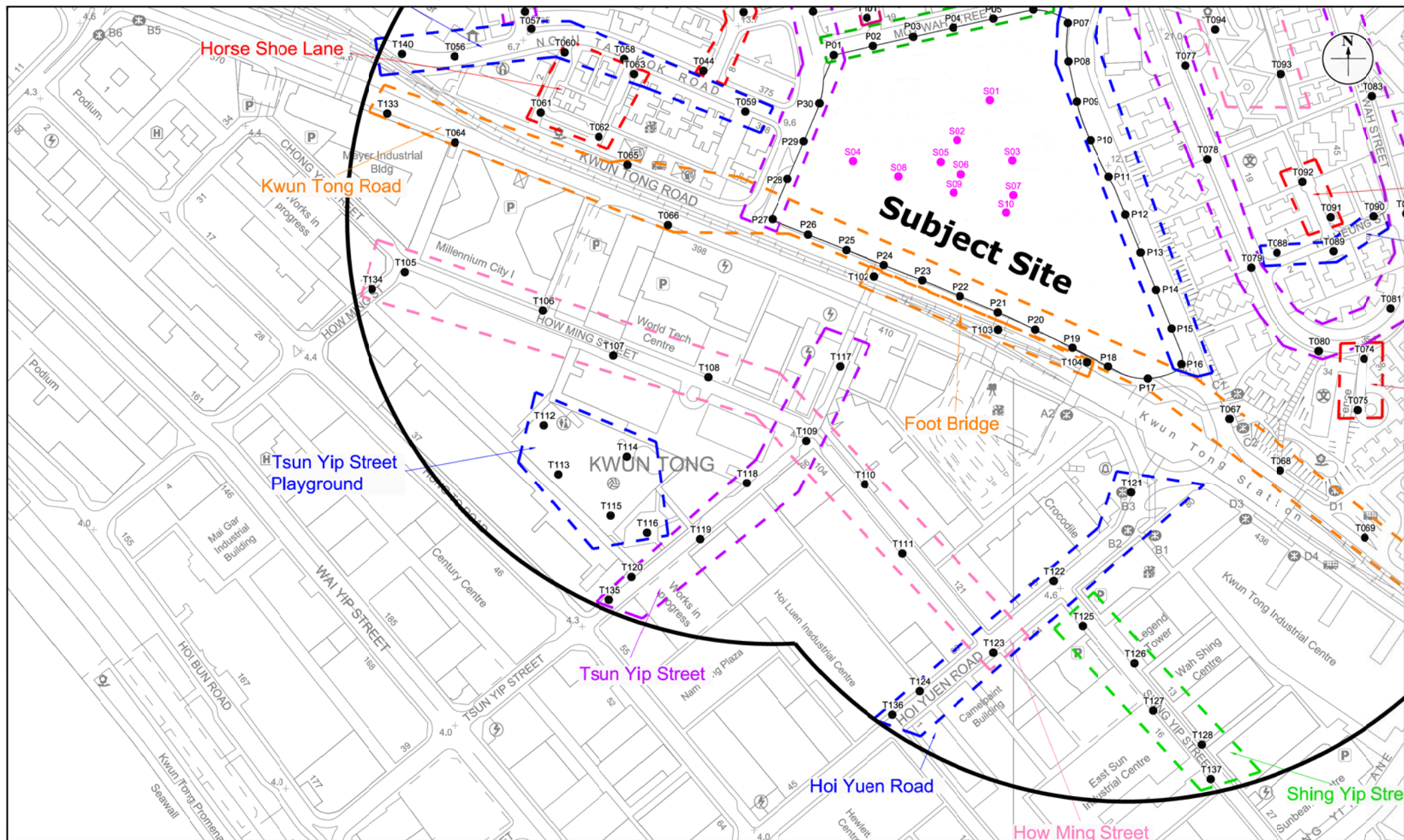
Drawn by: JL

Checked by: SLo

Rev.: 1.2

Date: Sep 2017





**Figure:** 3d

**Title:** Perimeter and Overall Test Points selected for Initial Study (Close up for southwest area)

**Project:** Proposed Redevelopment in “Comprehensive Development Area (1)” zone, Kwun Tong Town Centre Main Site

**RAMBOLL** ENVIRON

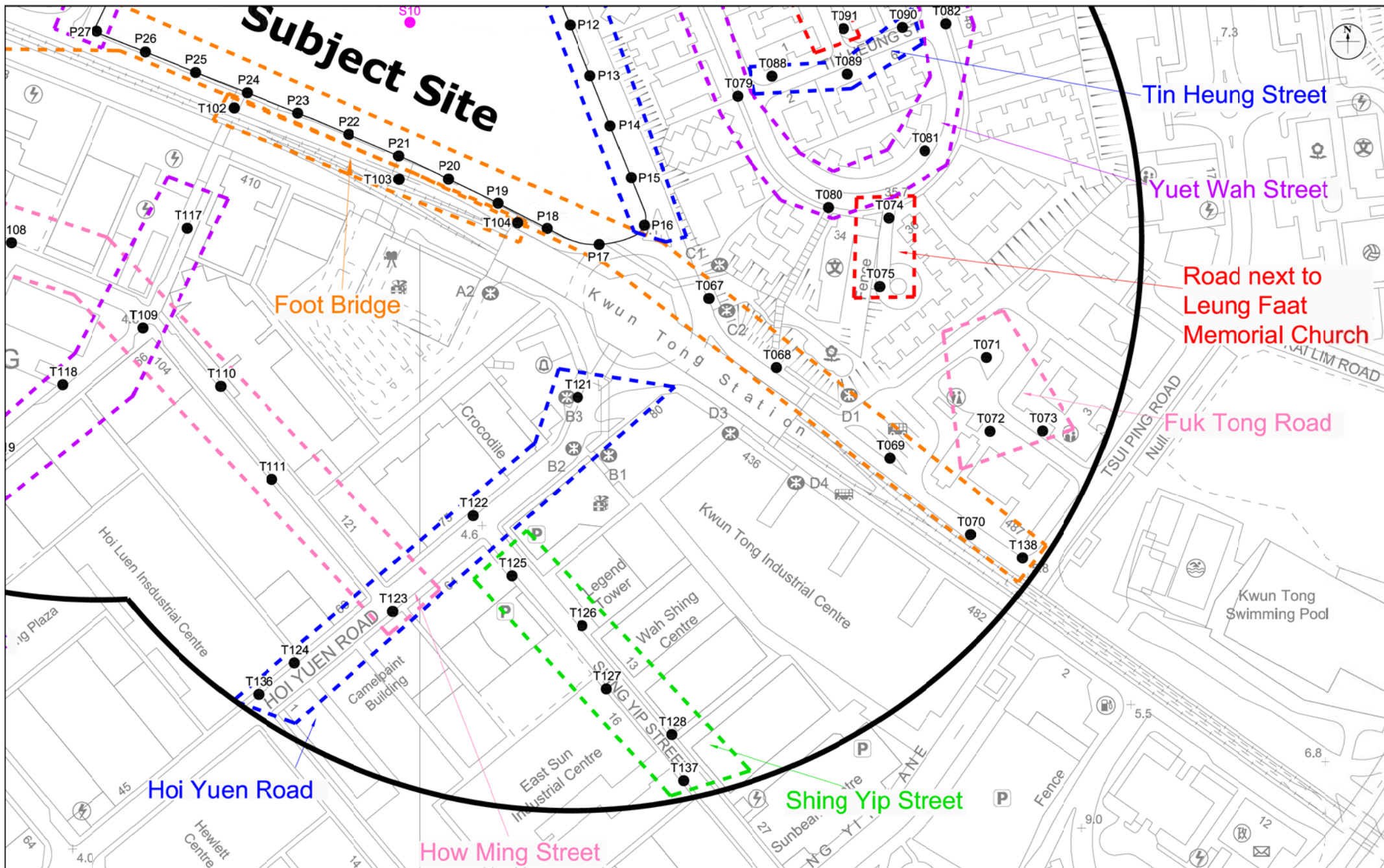
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Rev.: 1.2

Date: Sep 2017





**Figure:** 3c

**Title:** Perimeter and Overall Test Points selected for Initial Study (Close up for southeast area)

**Project:** Proposed Redevelopment in “Comprehensive Development Area (1)” zone, Kwun Tong Town Centre Main Site

**RAMBOLL** ENVIRON

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Date: Sep 2017





**Figure:** 3f

**Title:** Special Test Points and Test Points selected in the Subject Site (Baseline Scheme)

**Project:** Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment

**RAMBOLL ENVIRON**

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Date: Sep 2017



Figure: 3g

Title: Special Test Points and Test Points selected in the Subject Site (Proposed Scheme)

Project: Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment

**RAMBOLL** ENVIRON

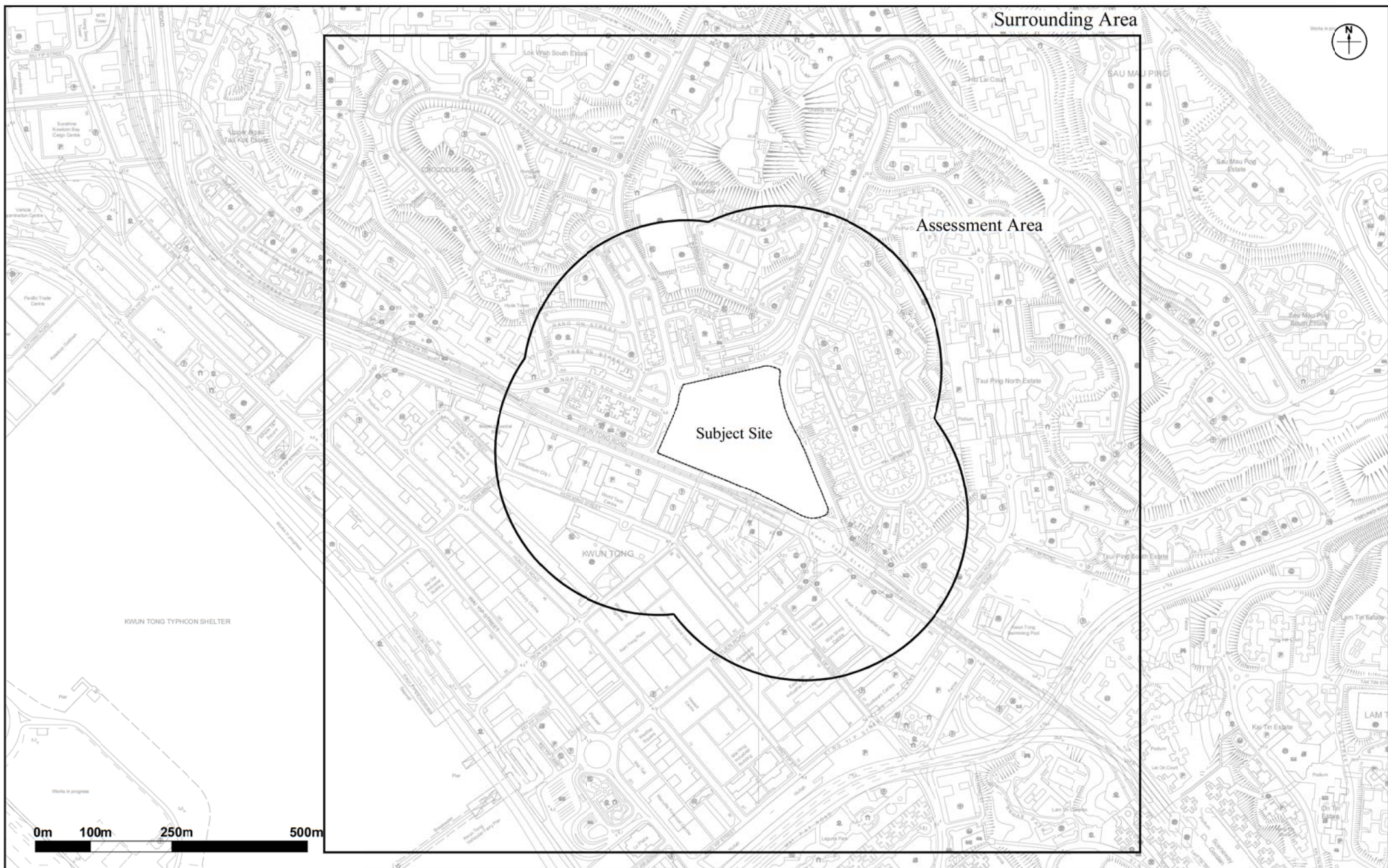
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Checked by: SLo

Rev.: 1.0

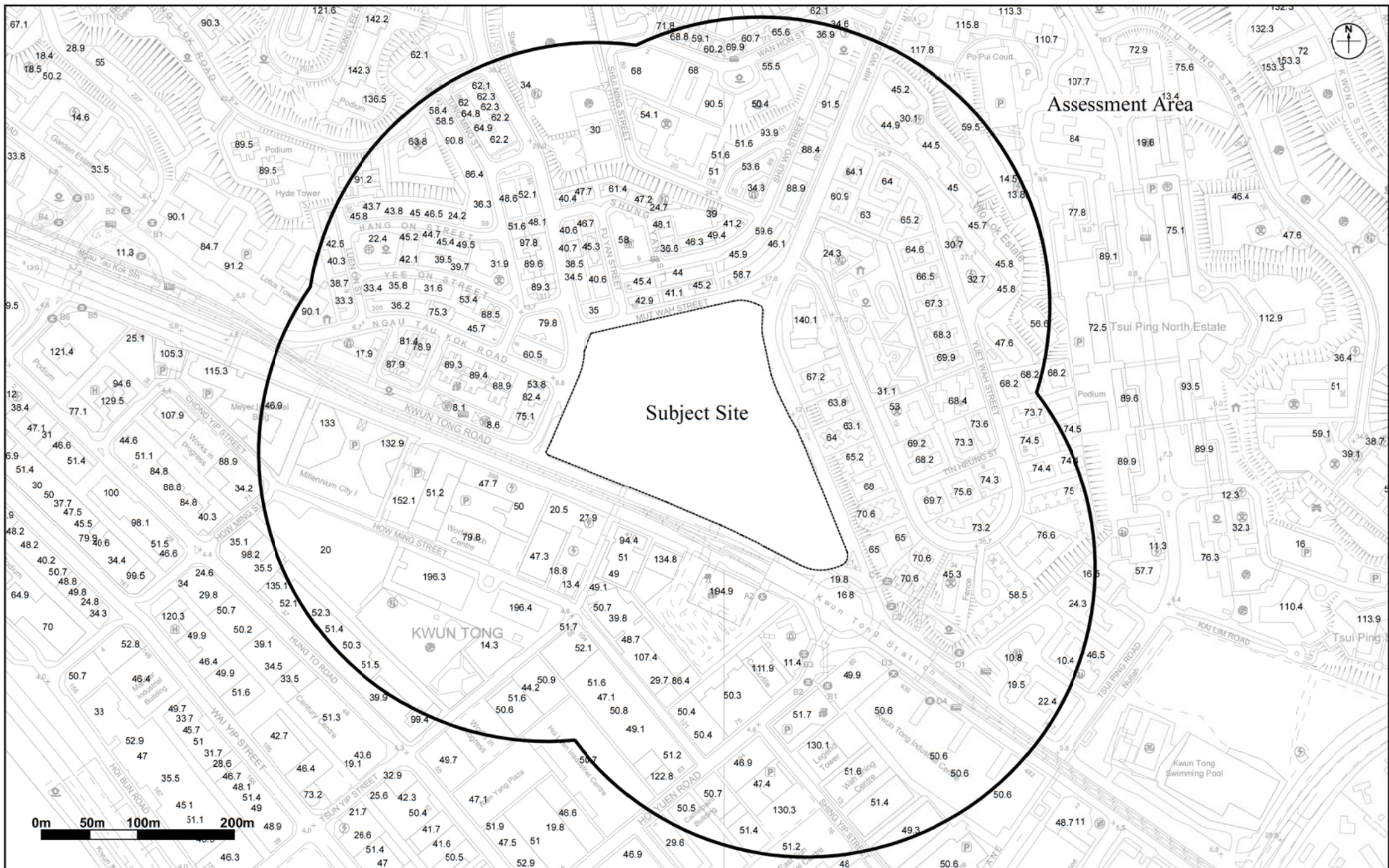
Date: Dec 2017





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|--|---------------------------------|
| <b>Figure:</b> 4   | <b>RAMBOLL</b> ENVIRON          |
| <b>Title:</b> Assessment Area and Surrounding Area for CFD Model Simulation                            | Drawn by: JL<br>Checked by: SLo |
| <b>Project:</b> Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment | Rev.: 1.0<br>Date: Apr 2017     |





|  |                 |
|--|-----------------|
| <b>Figure:</b> 5   | RAMBOLL ENVIRON |
| <b>Title:</b> Building Height of the Surrounding Development   | Drawn by: JL    |
| <b>Project:</b> Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment | Checked by: SLO |
|  | Rev.: 1.0       |
|  | Date: Apr 2017  |



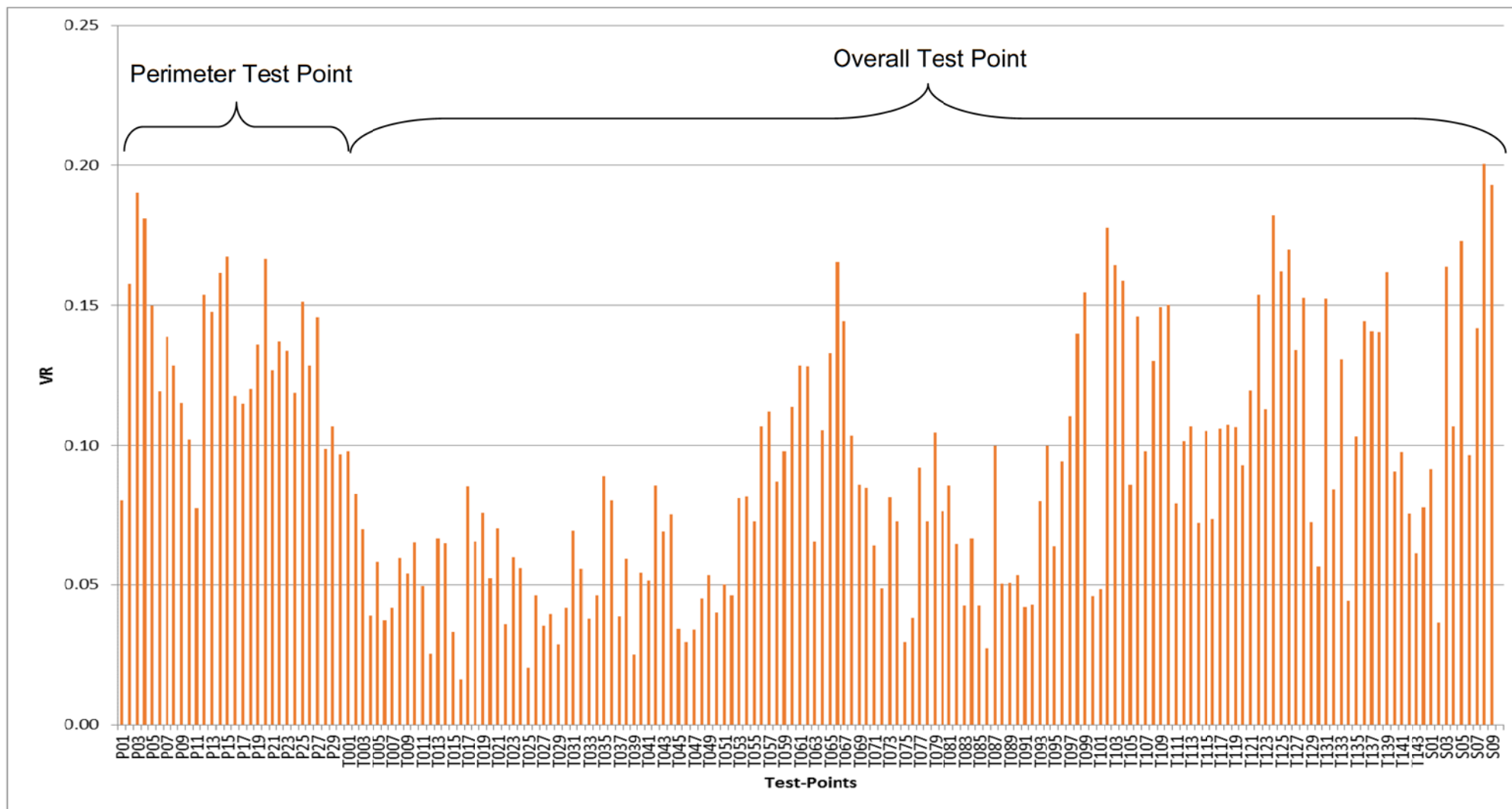


Figure: 6

Title: Wind Velocity Ratios of Individual Test Points for Baseline Scheme (Annual)

Project: Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment

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Date: Dec 2017

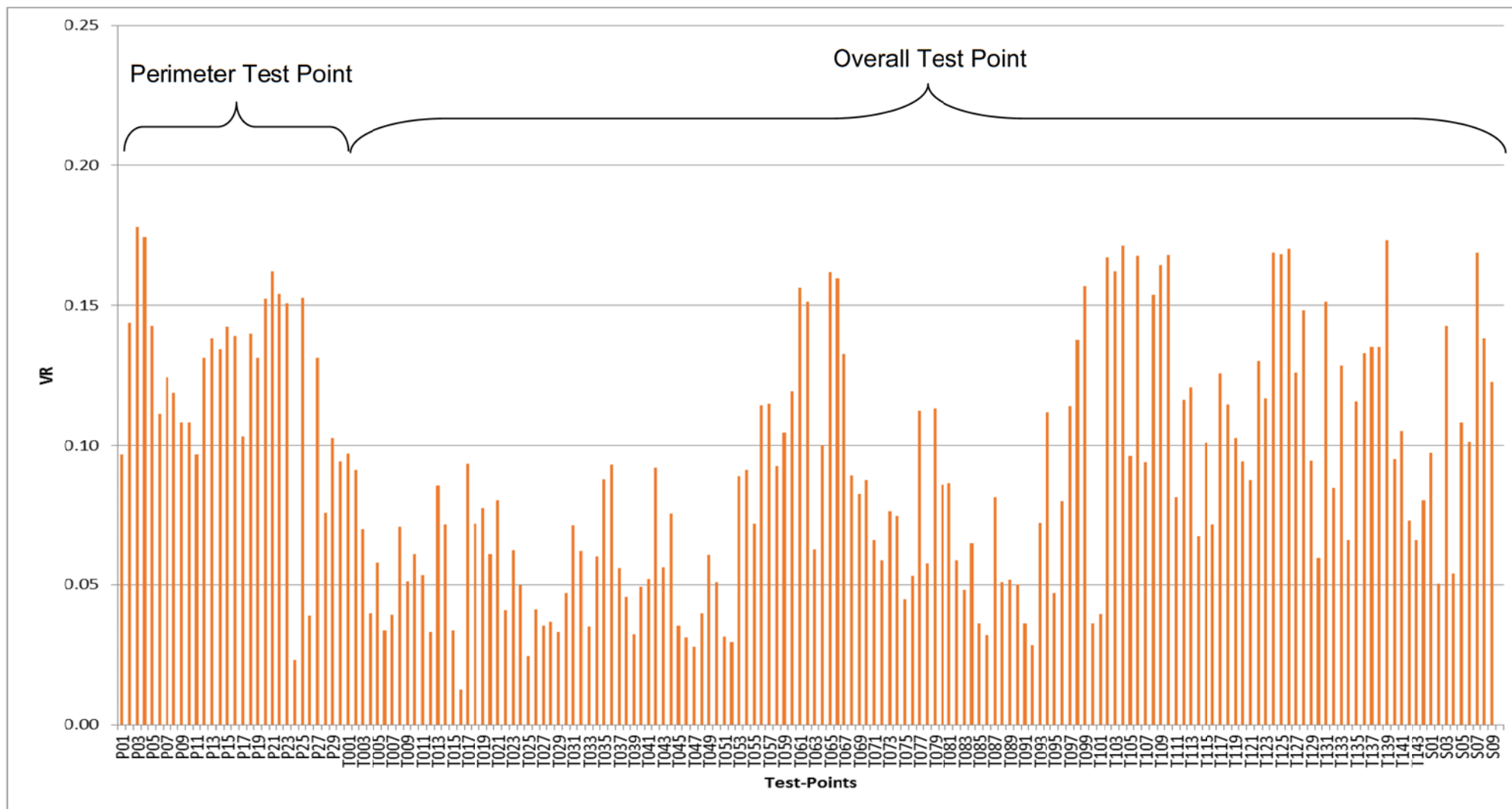


Figure: 7

Title: Wind Velocity Ratios of Individual Test Points for Proposed Scheme (Annual)

Project: Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment

**RAMBOLL** ENVIRON

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Date: Dec 2017



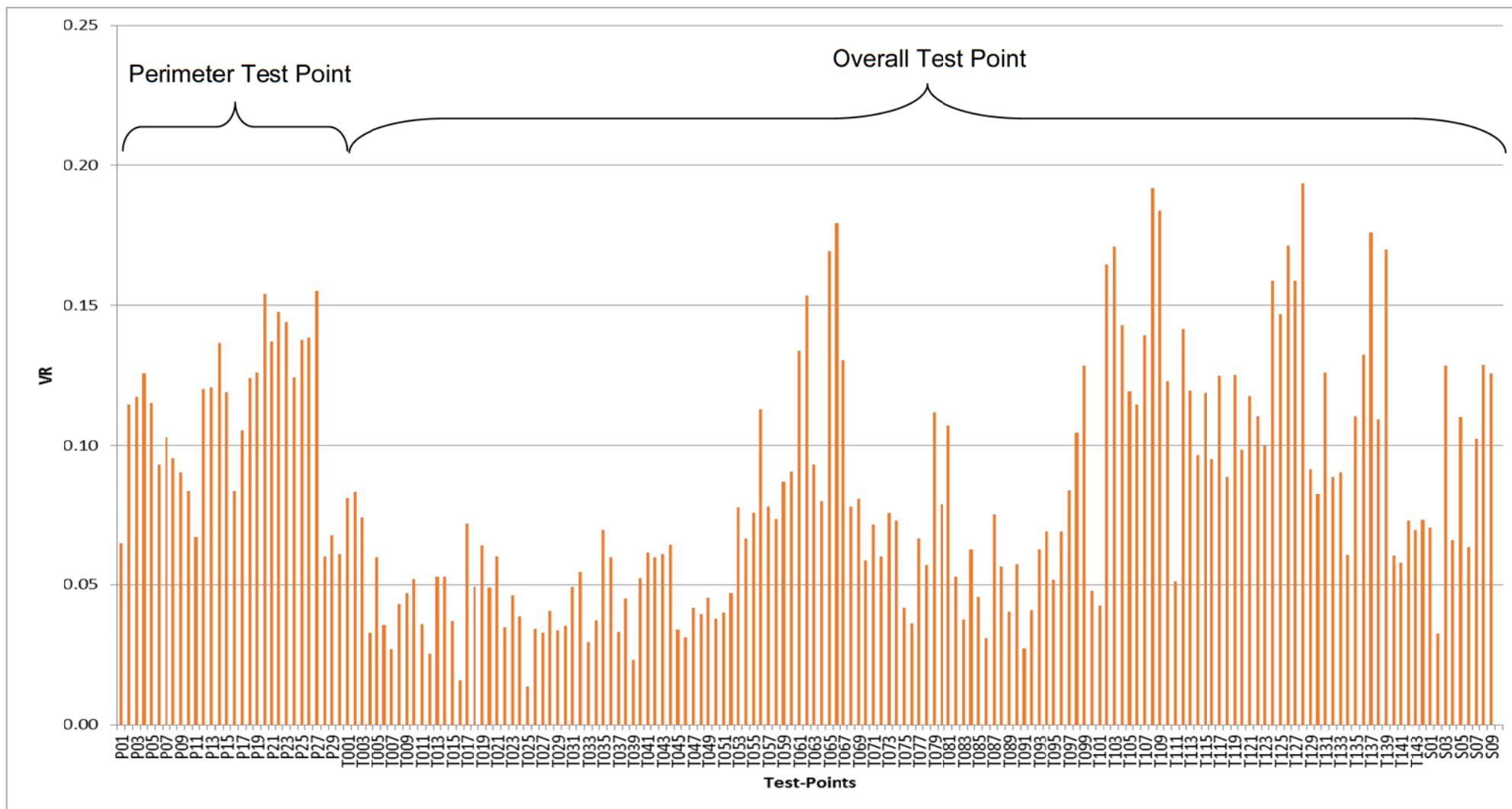


Figure: 8

Title: Wind Velocity Ratios of Individual Test Points for Baseline Scheme (Summer)

Project: Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment

**RAMBOLL** ENVIRON

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Date: Dec 2017

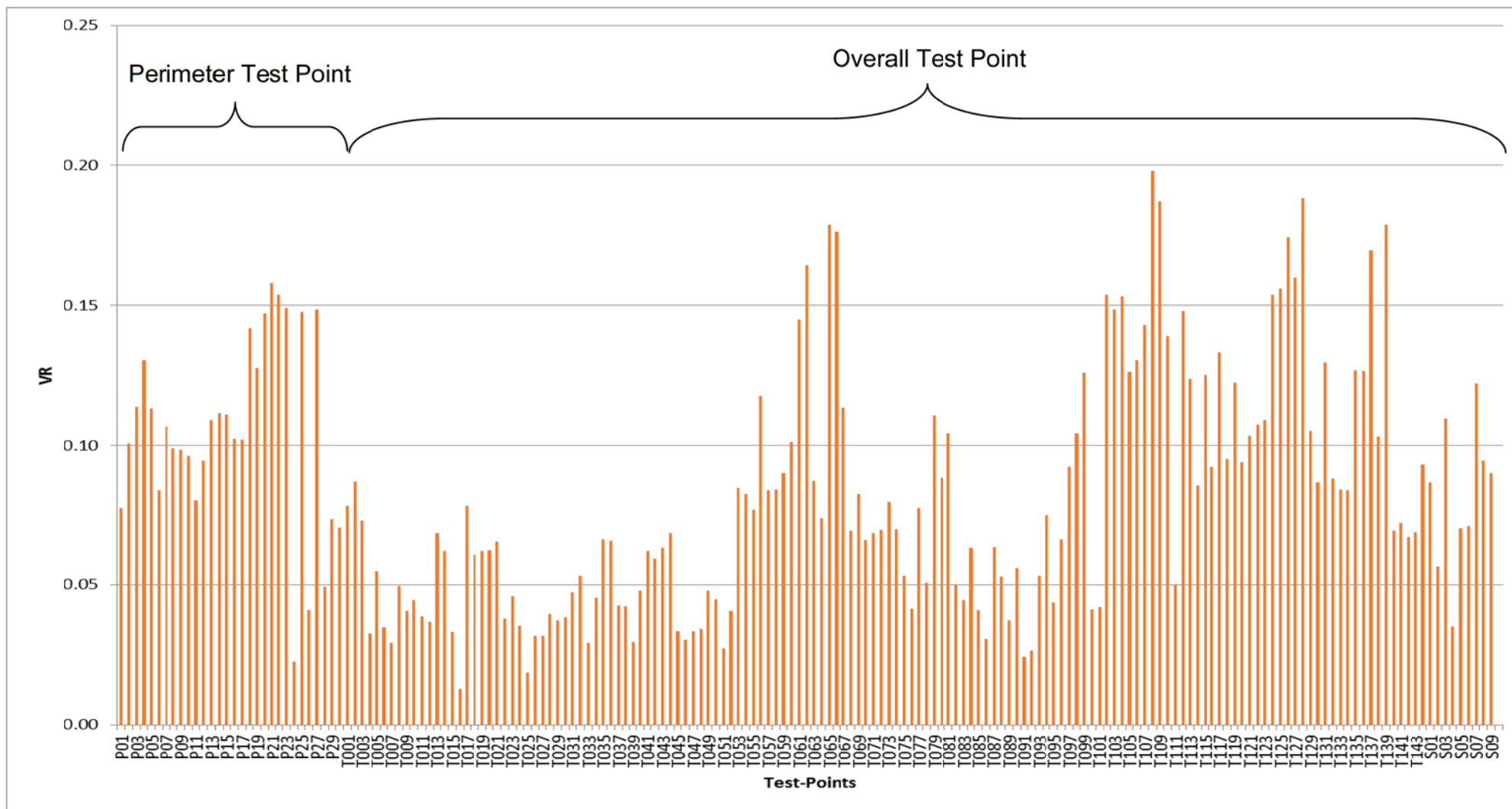


Figure: 9

Title: Wind Velocity Ratios of Individual Test Points for Proposed Scheme (Summer)

Project: Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment

**RAMBOLL** ENVIRON

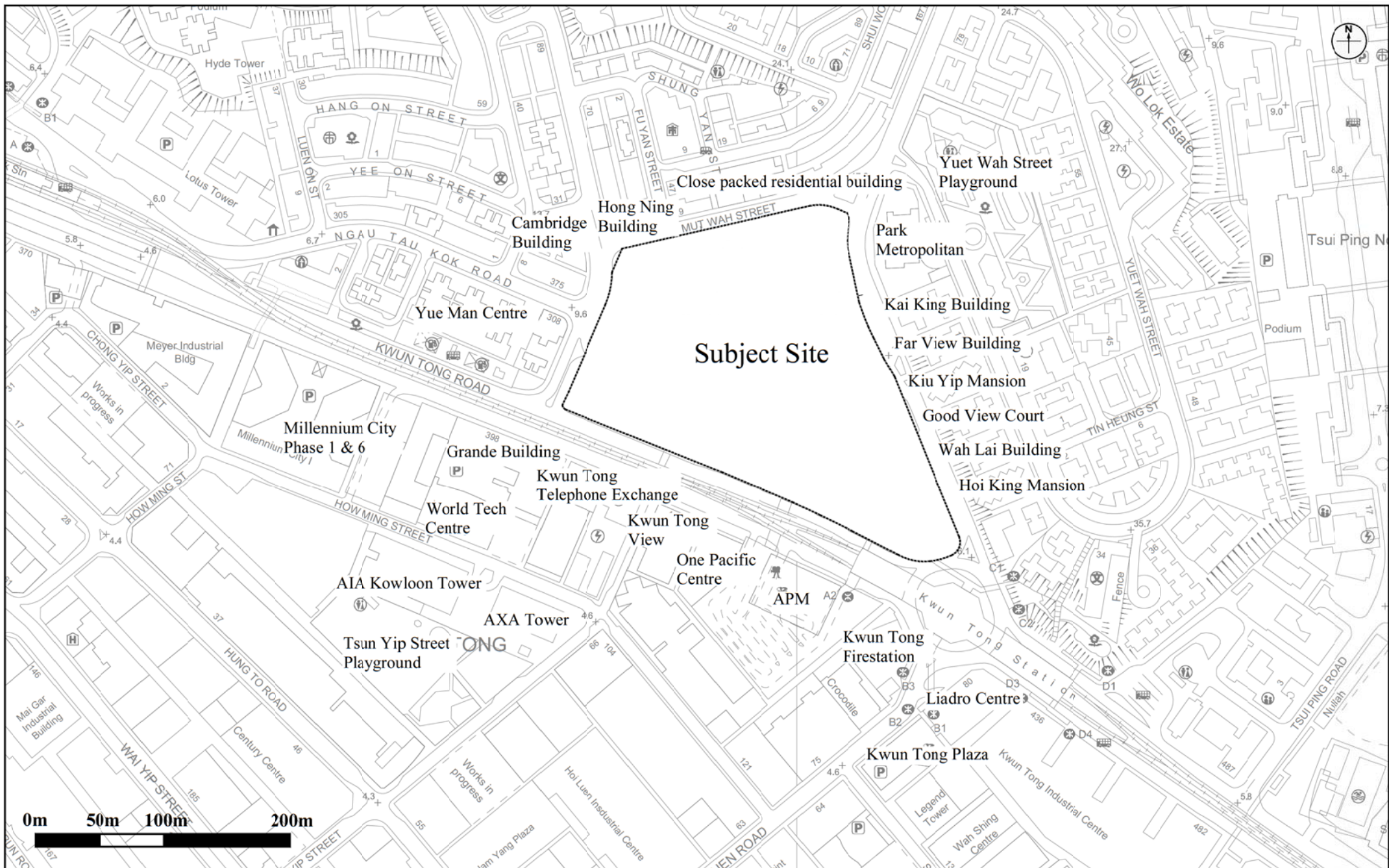
Drawn by: JL

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Rev.: 1.0

Date: Dec 2017





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|--|-----------------|
| <b>Figure:</b> 10  | RAMBOLL ENVIRON |
| <b>Title:</b> Building Name for the Surrounding Developments   | Drawn by: JL    |
| <b>Project:</b> Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment | Checked by: SLo |
|  | Rev.: 1.0       |
|  | Date: Dec 2017  |





**Figure: 11**

**Title:** Master Layout Plan of the Baseline Scheme

**Project:** Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment

|                        |
|------------------------|
| <b>RAMBOLL</b> ENVIRON |
| Drawn by: JL           |
| Checked by: SLo        |
| Rev.: 1.0              |
| Date: Dec 2017         |



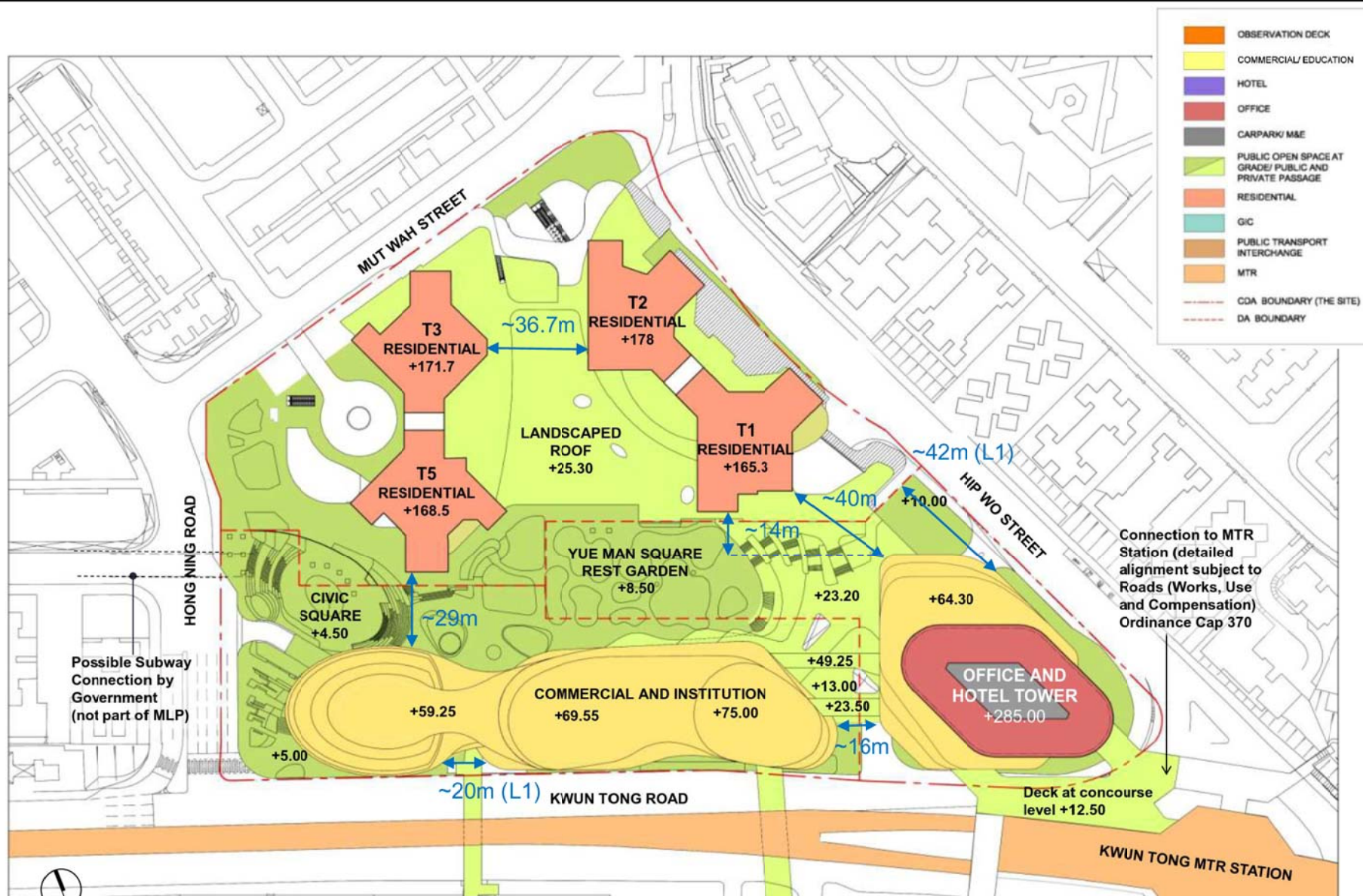


Figure: 12

Title: Master Layout Plan of Proposed Scheme

Project: Kwun Tong Town Centre Development (DA 4 and 5) Quantitative Air Ventilation Assessment

**RAMBOLL** ENVIRON

Drawn by: JL

Checked by: SLo

Rev.: 1.0

Date: Dec 2017

## **APPENDIX A: LAYOUT OF THE BASELINE SCHEME**





L1 Plan [Level +5.0]



L2 Plan [Level +8.5]





L2M Plan [Level +12]

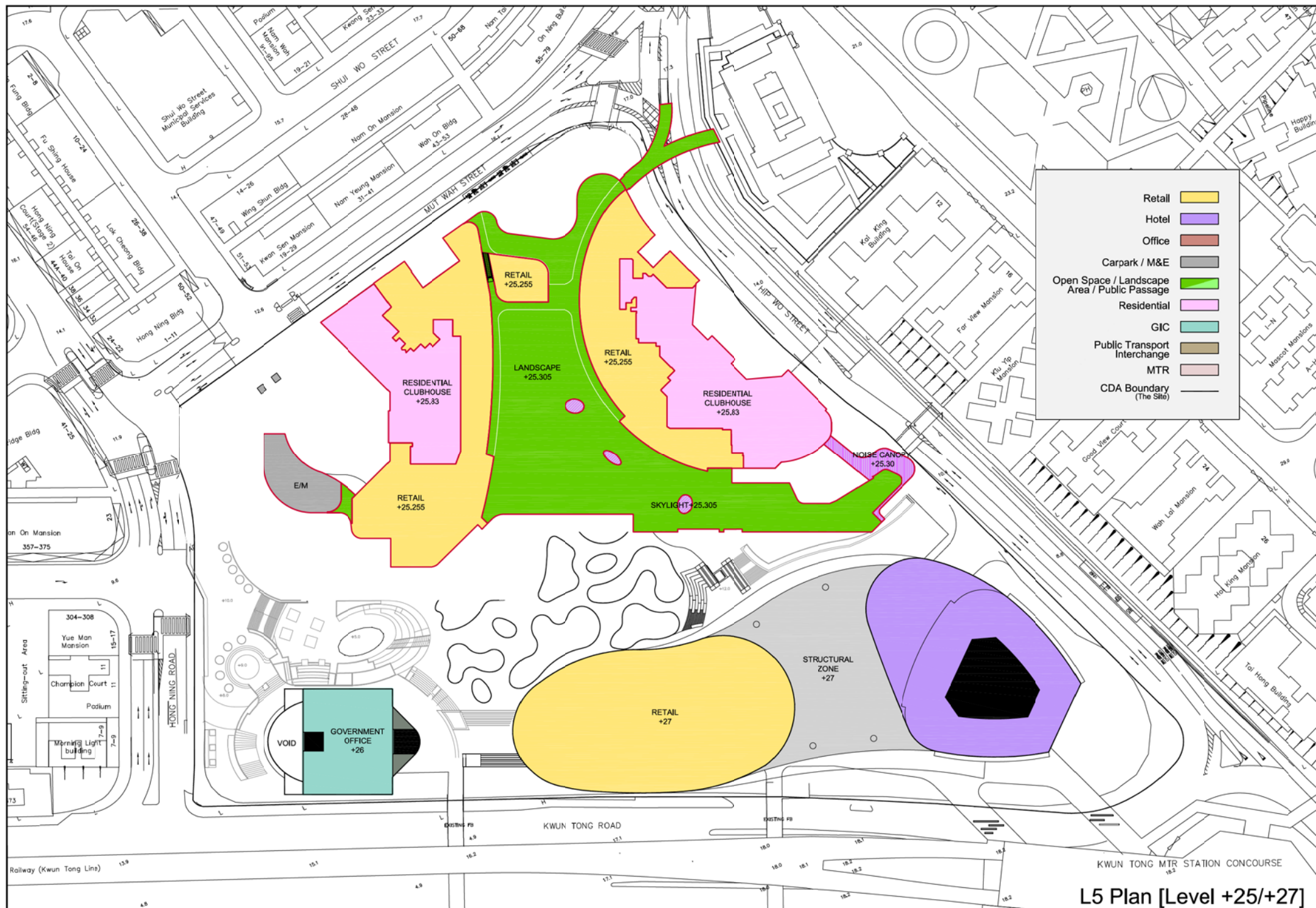


L3 Plan [Level +17]

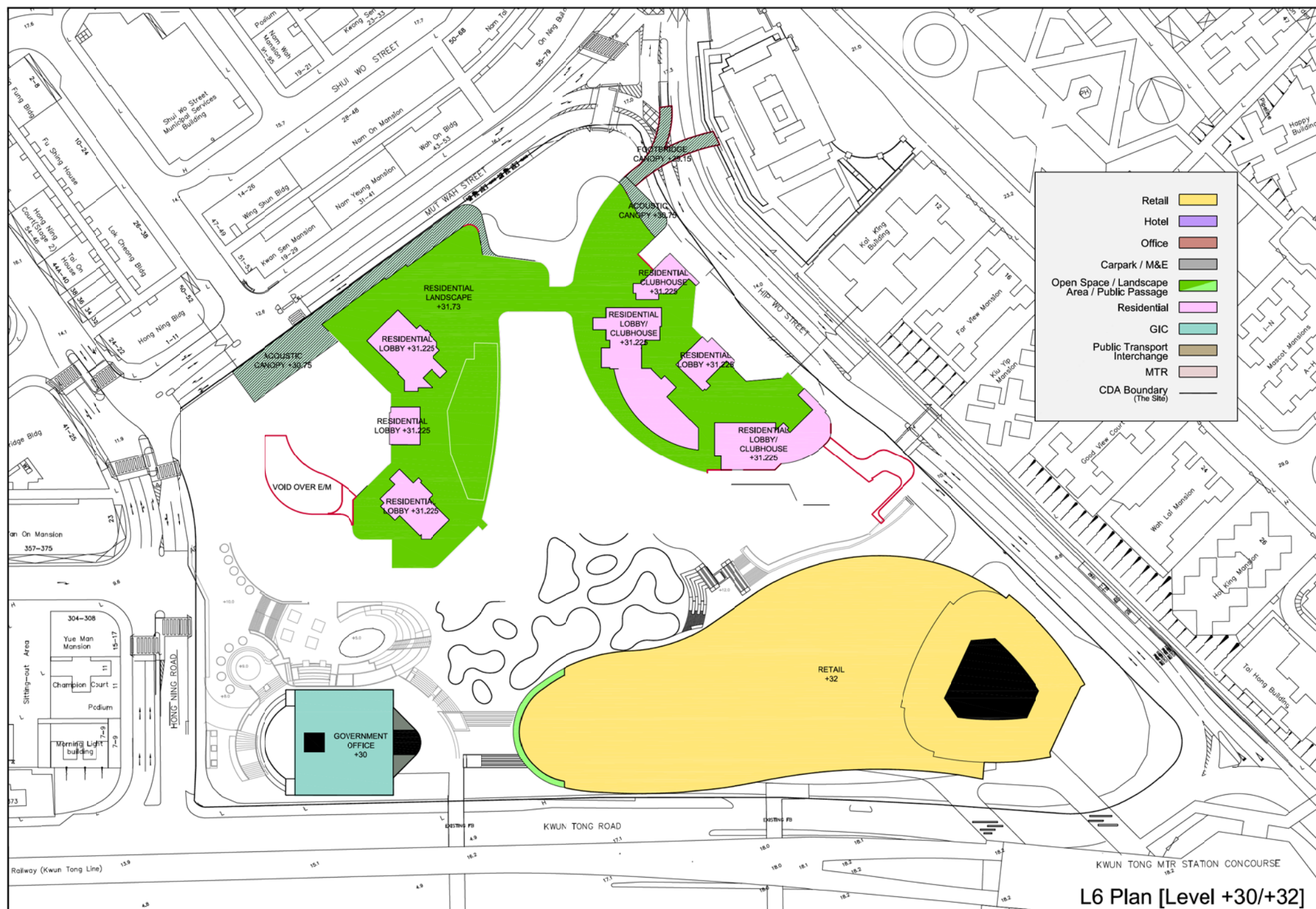




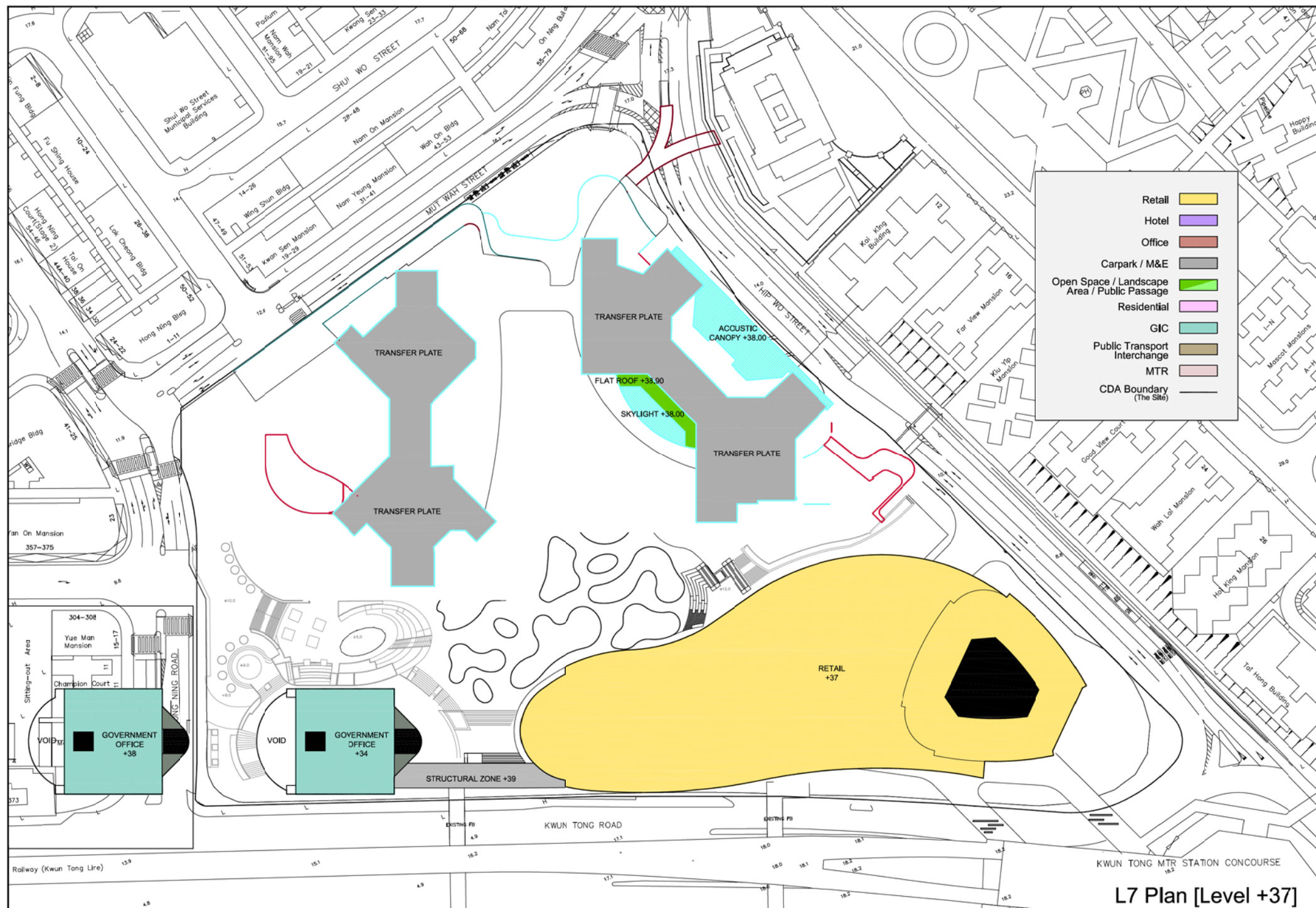
L4 Plan [Level +22]





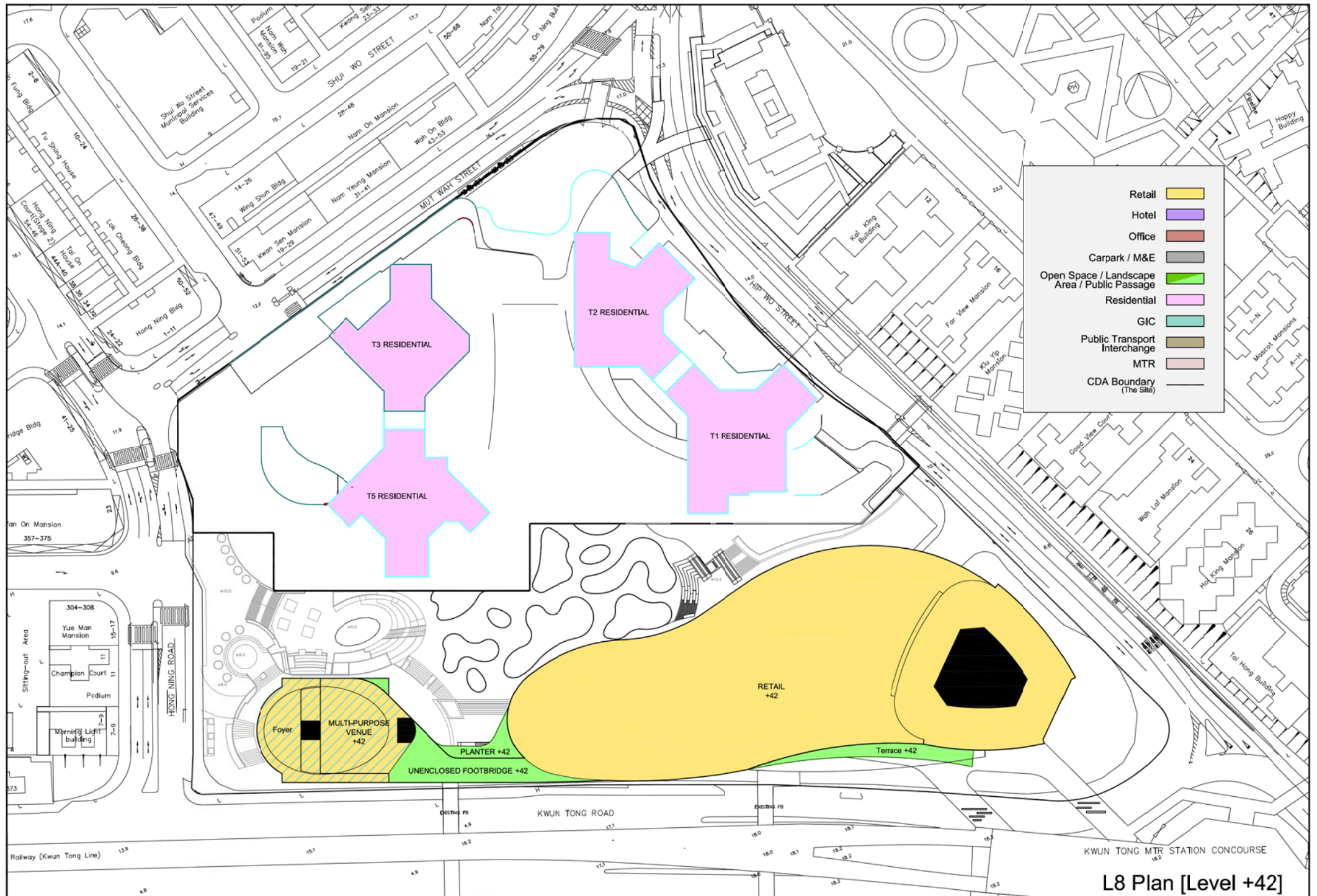


L6 Plan [Level +30/+32]



L7 Plan [Level +37]



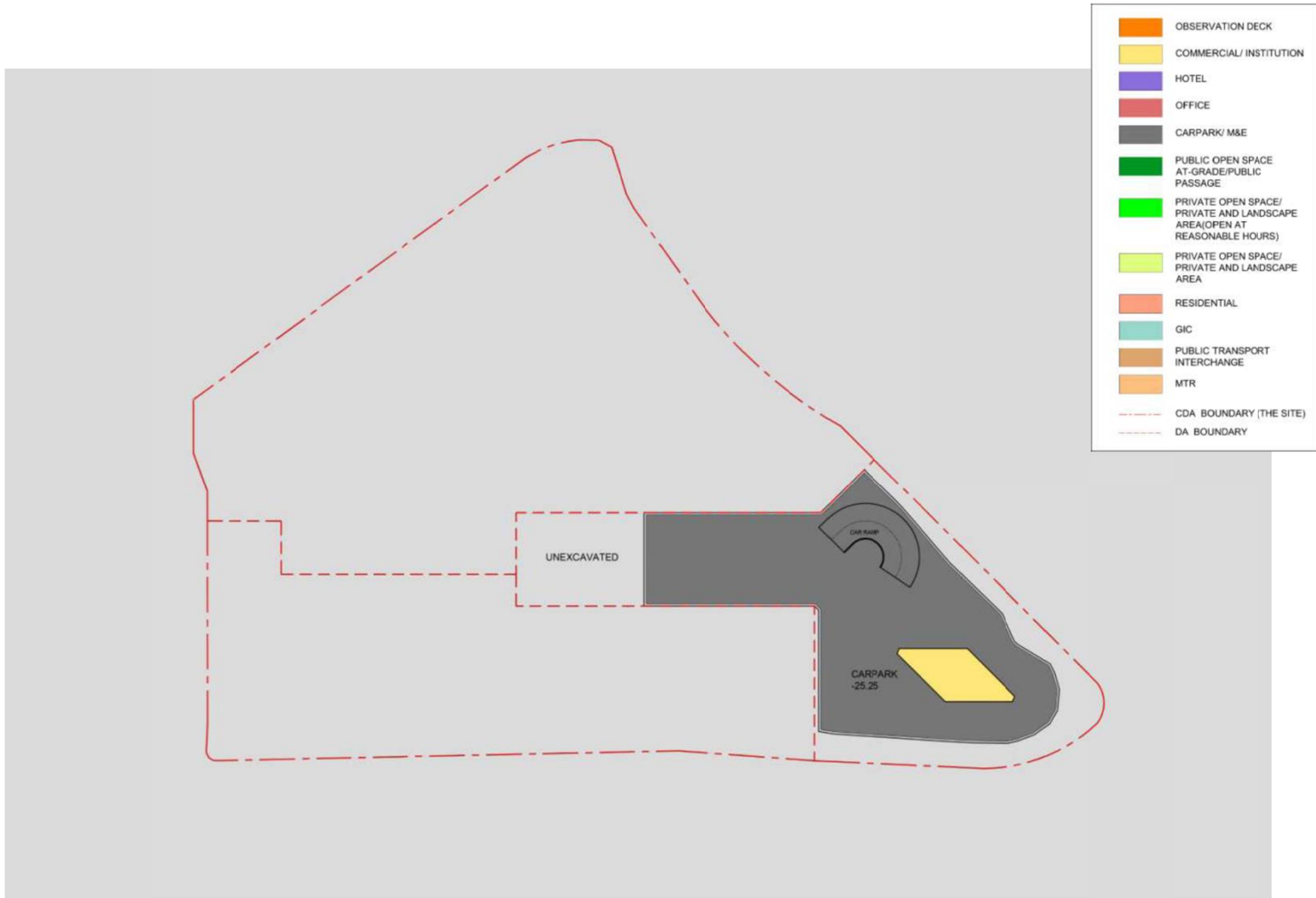


L8 Plan [Level +42]

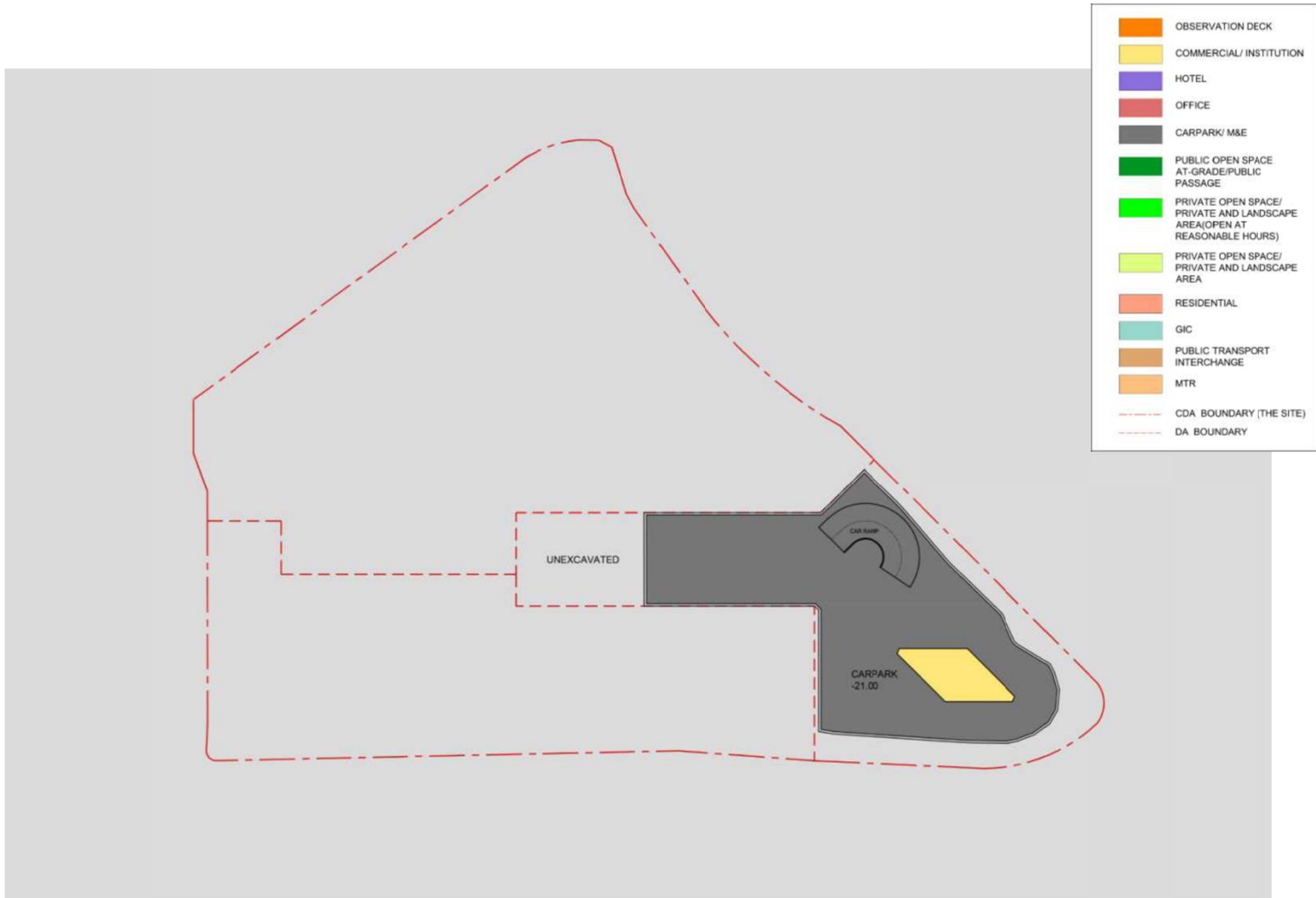
## **APPENDIX B: LAYOUT OF THE PROPOSED SCHEME**

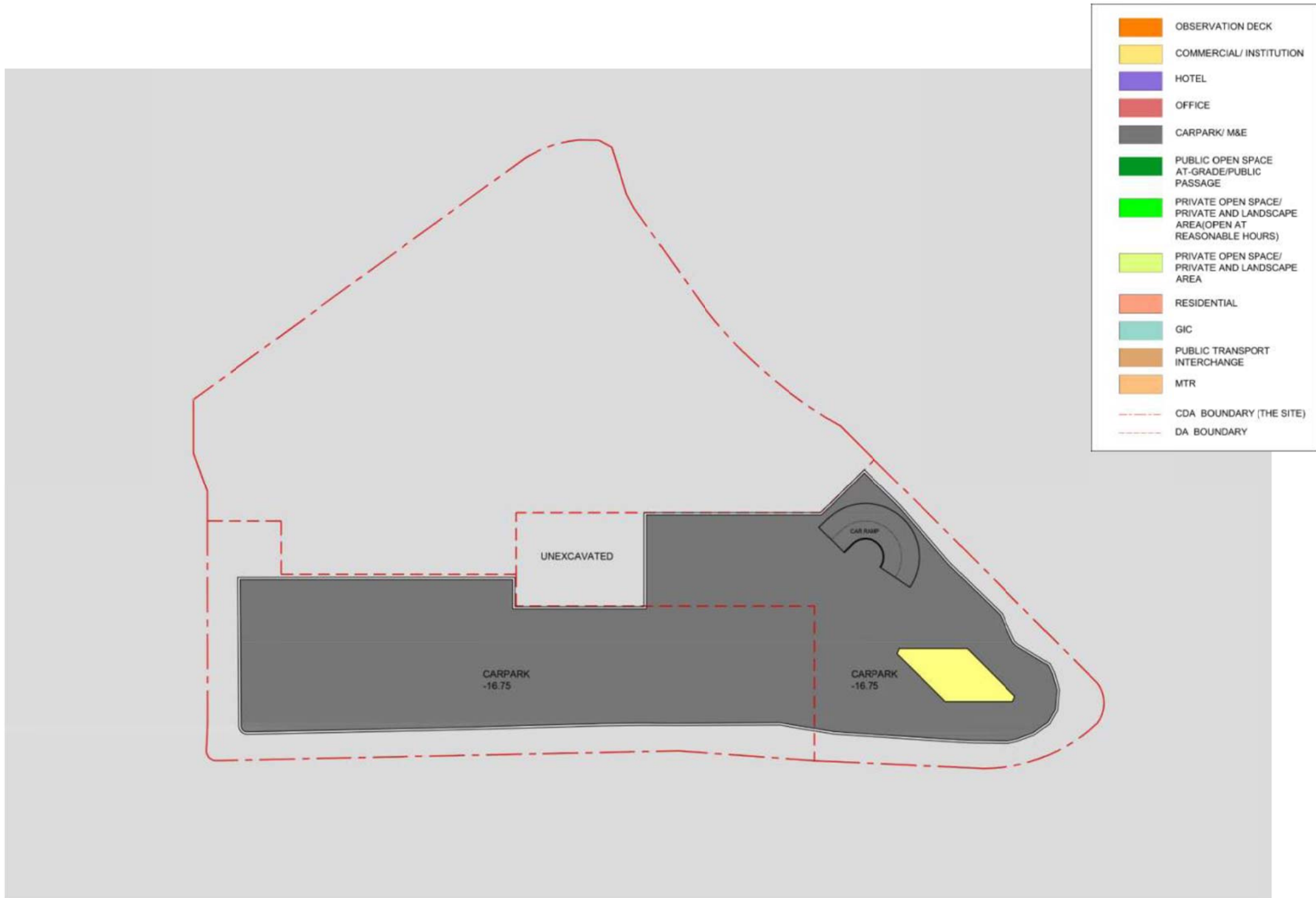




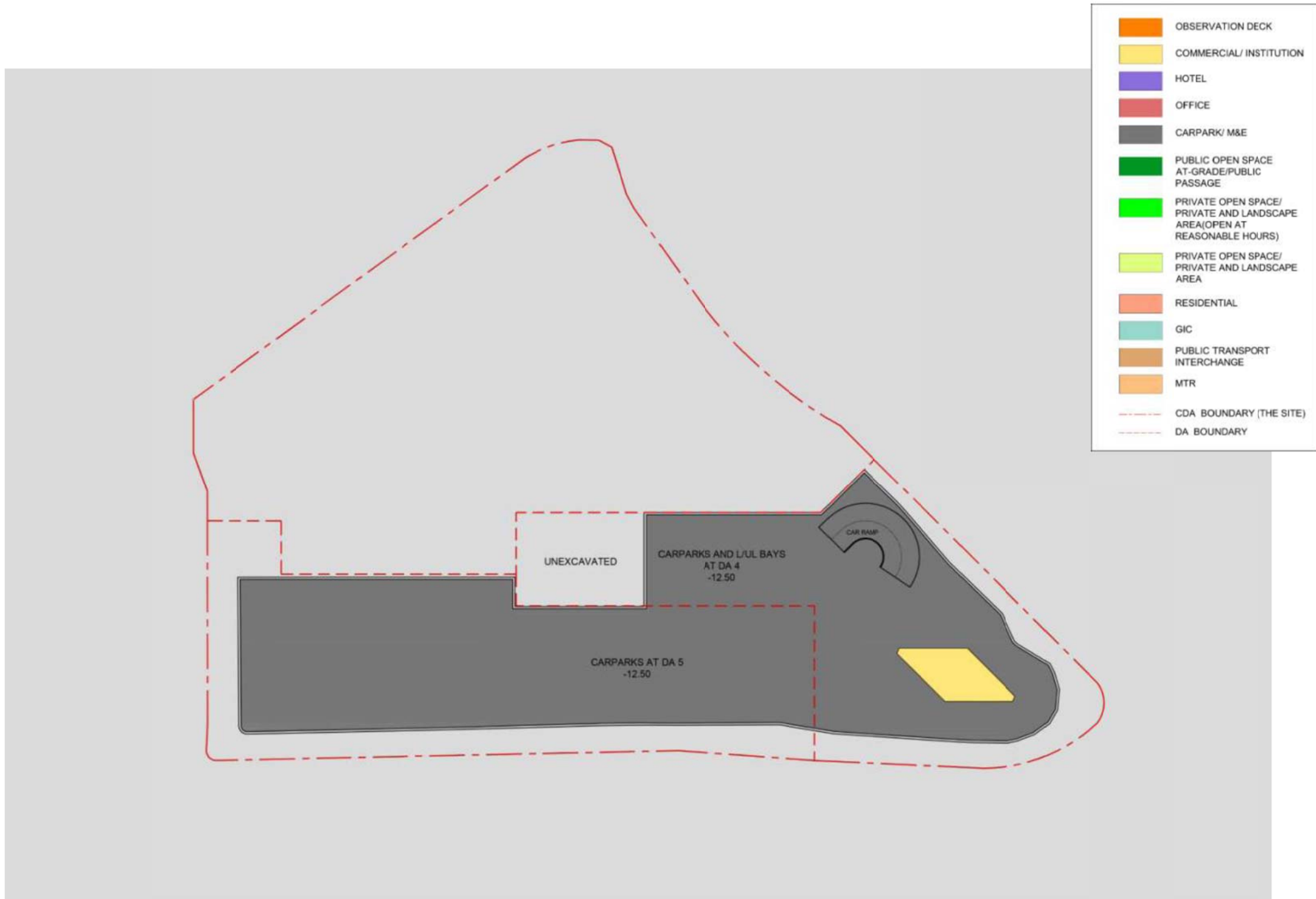


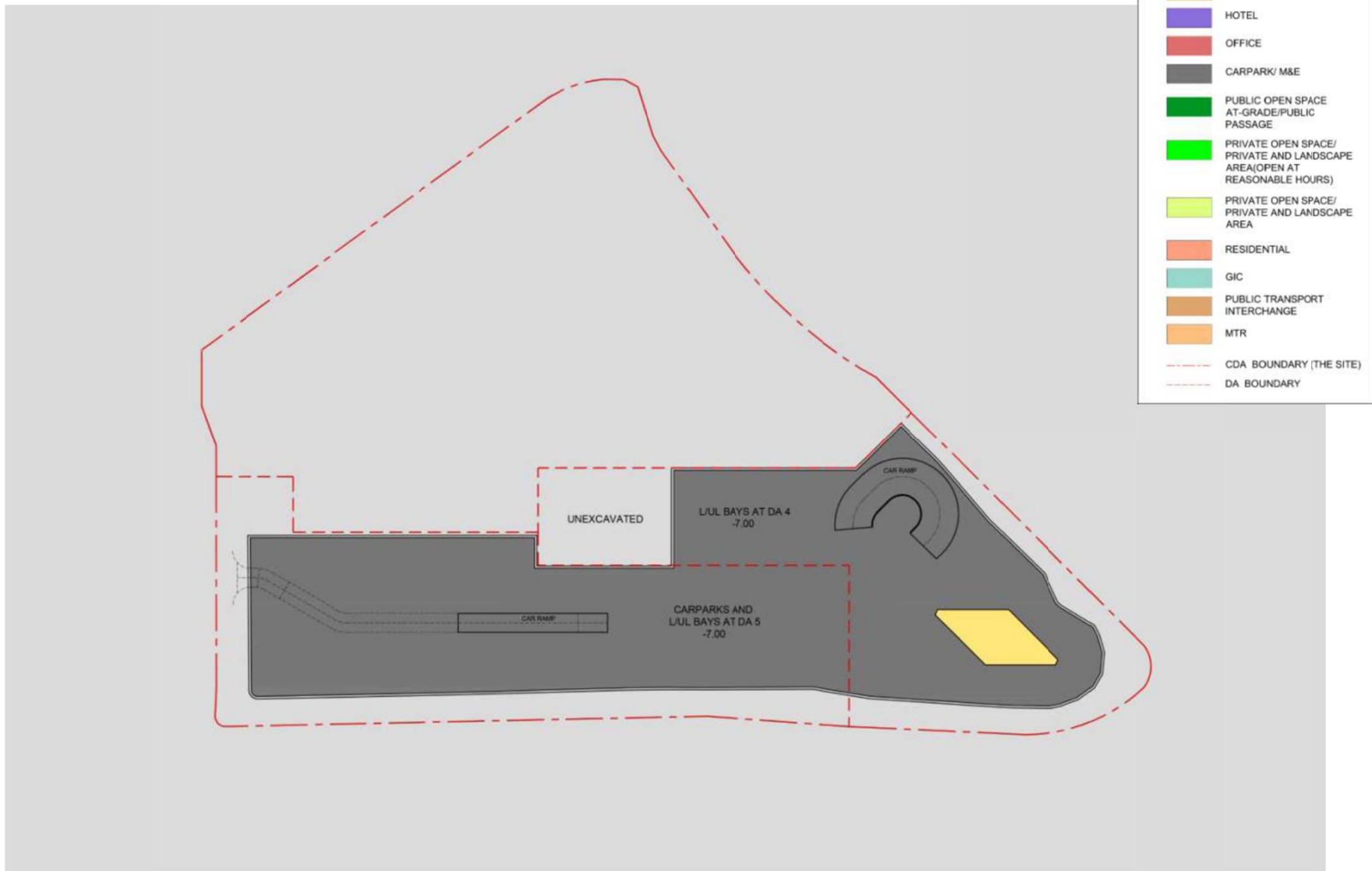




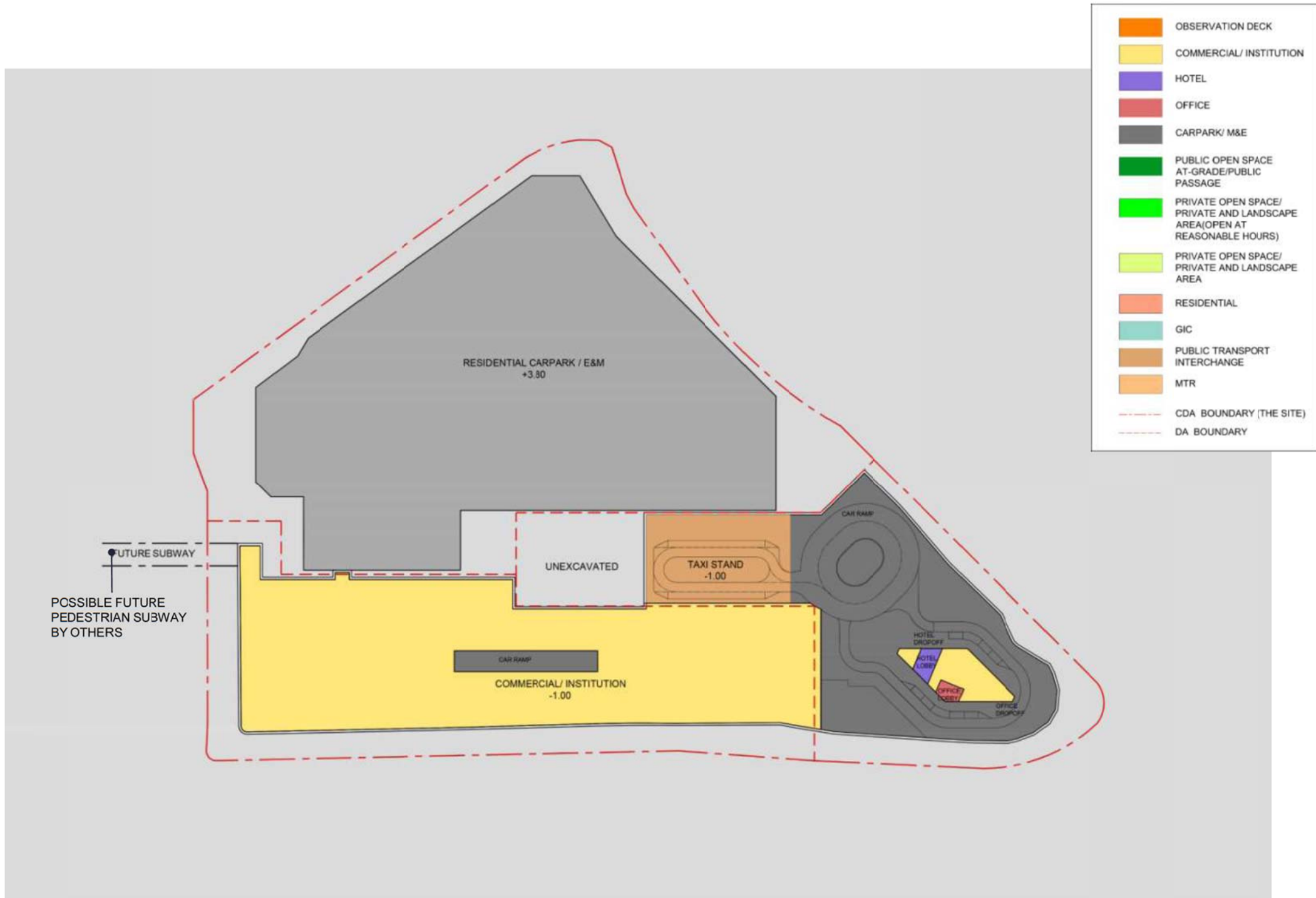






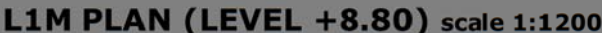


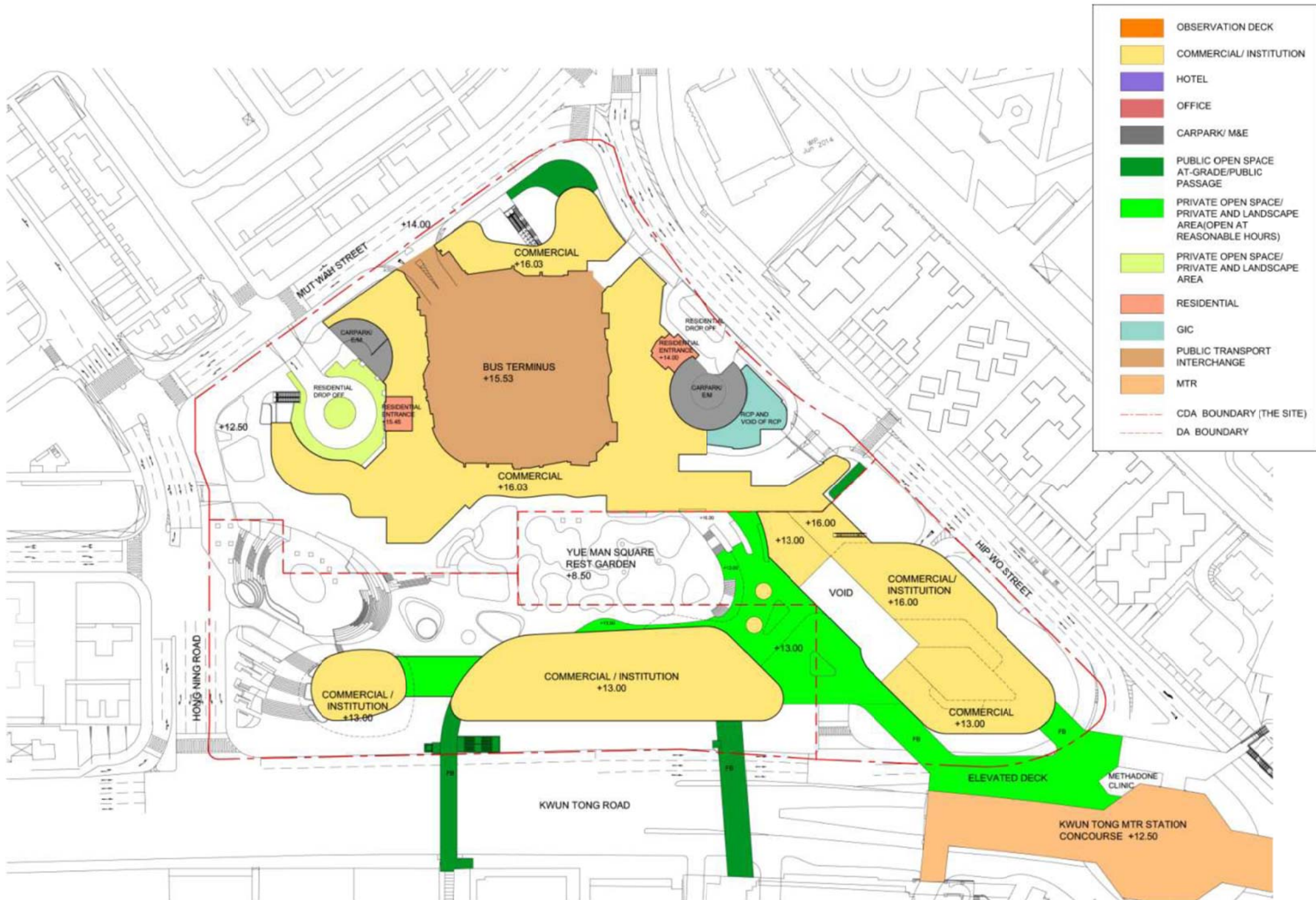




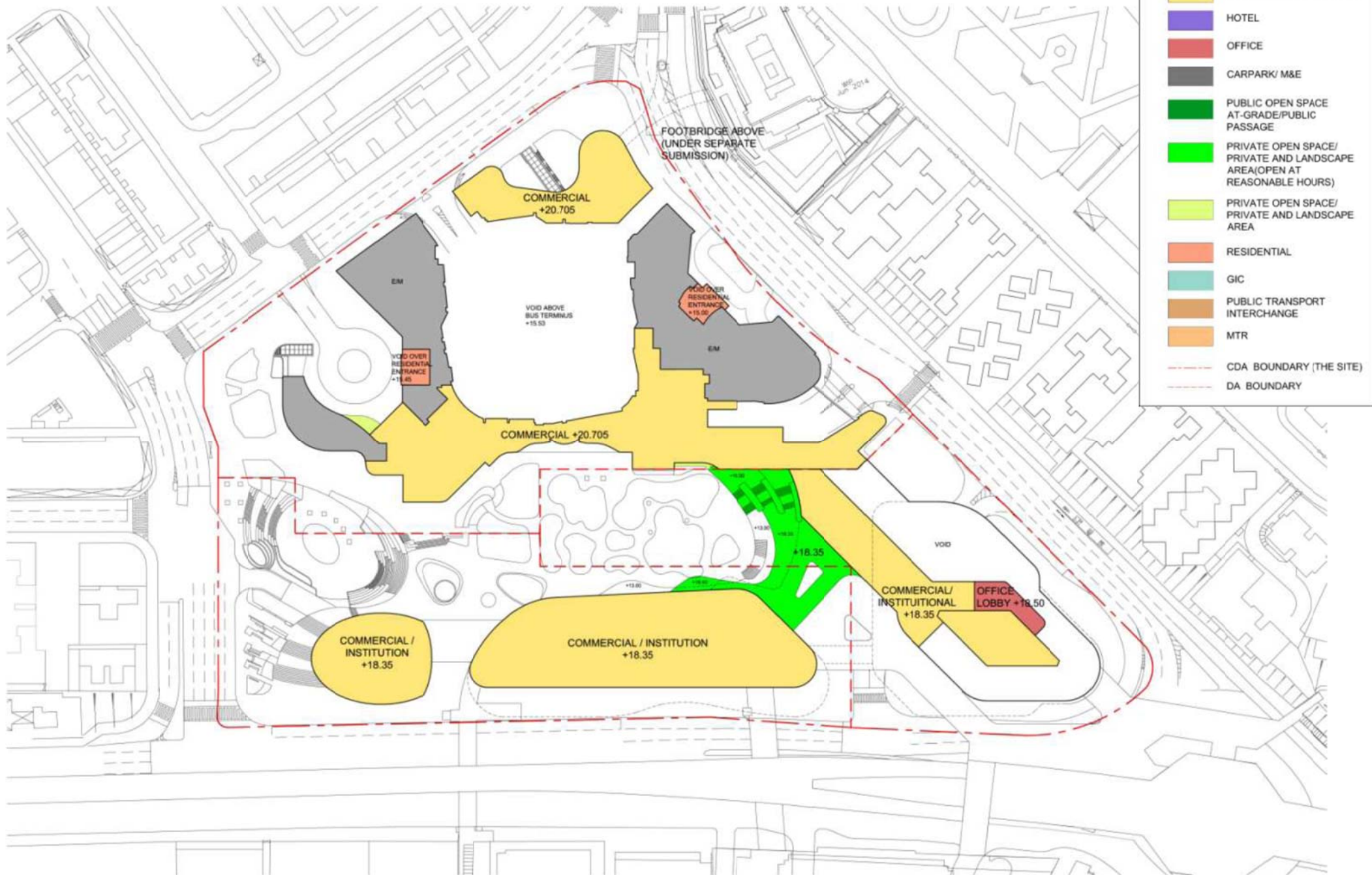
















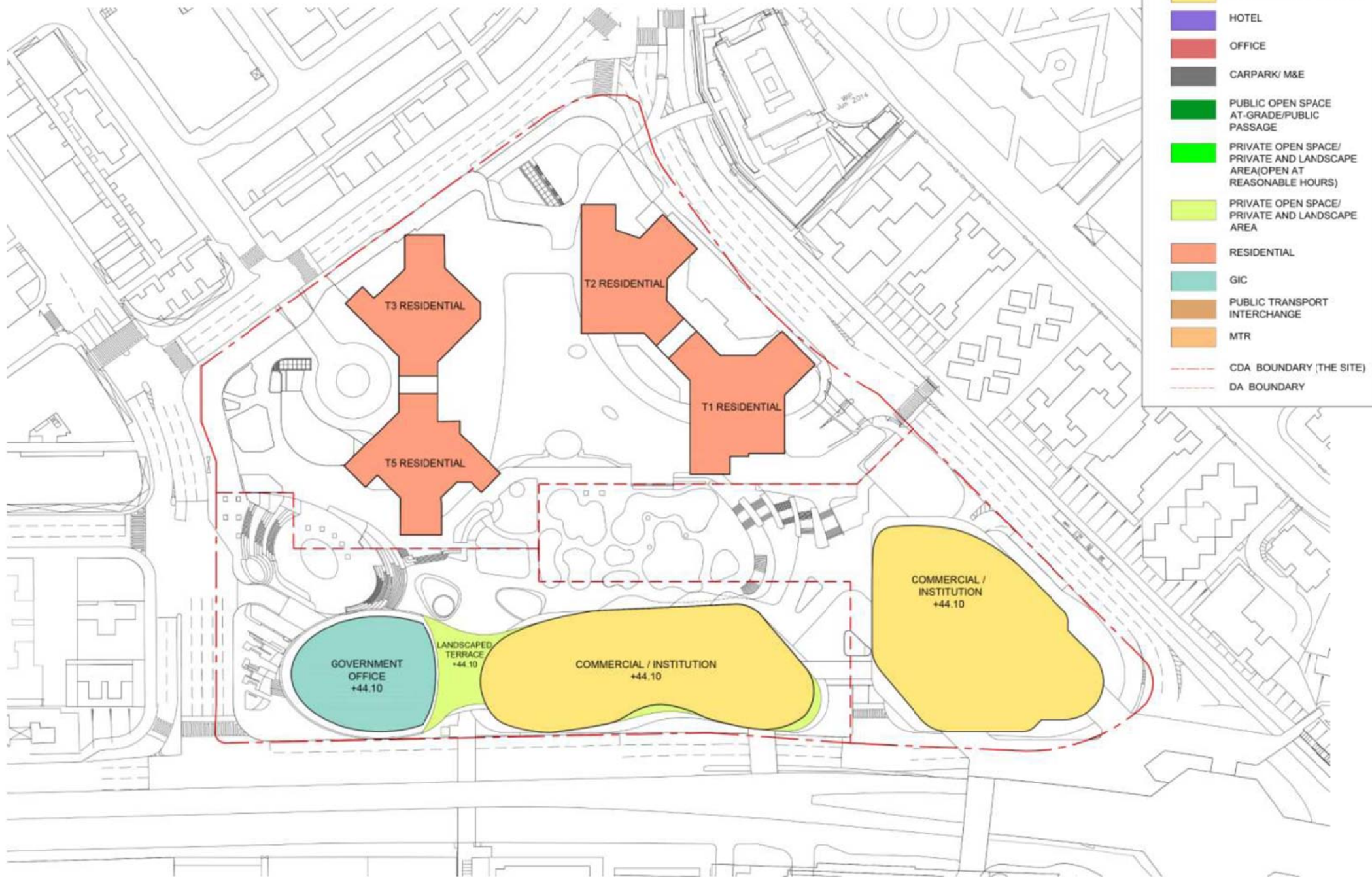




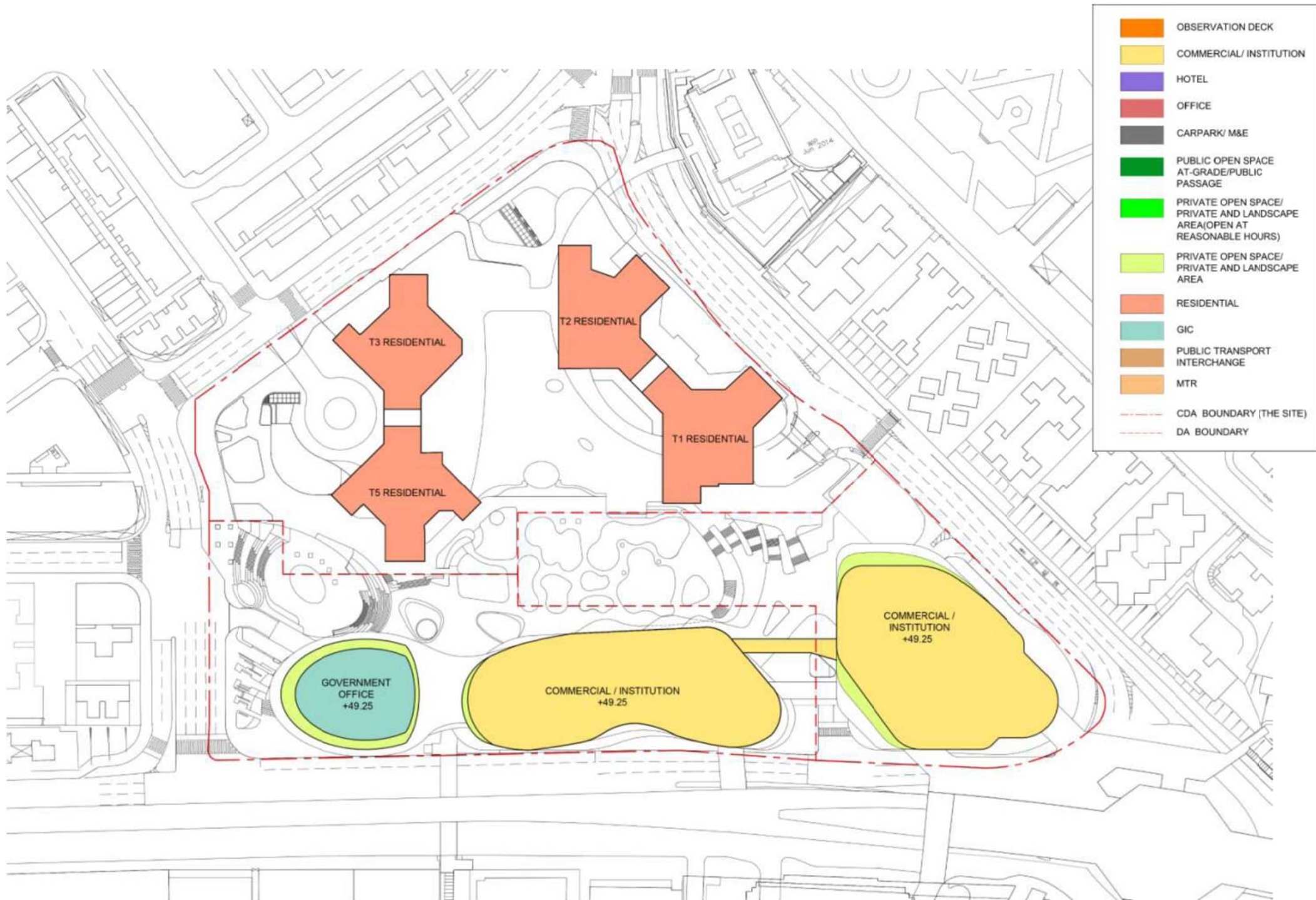


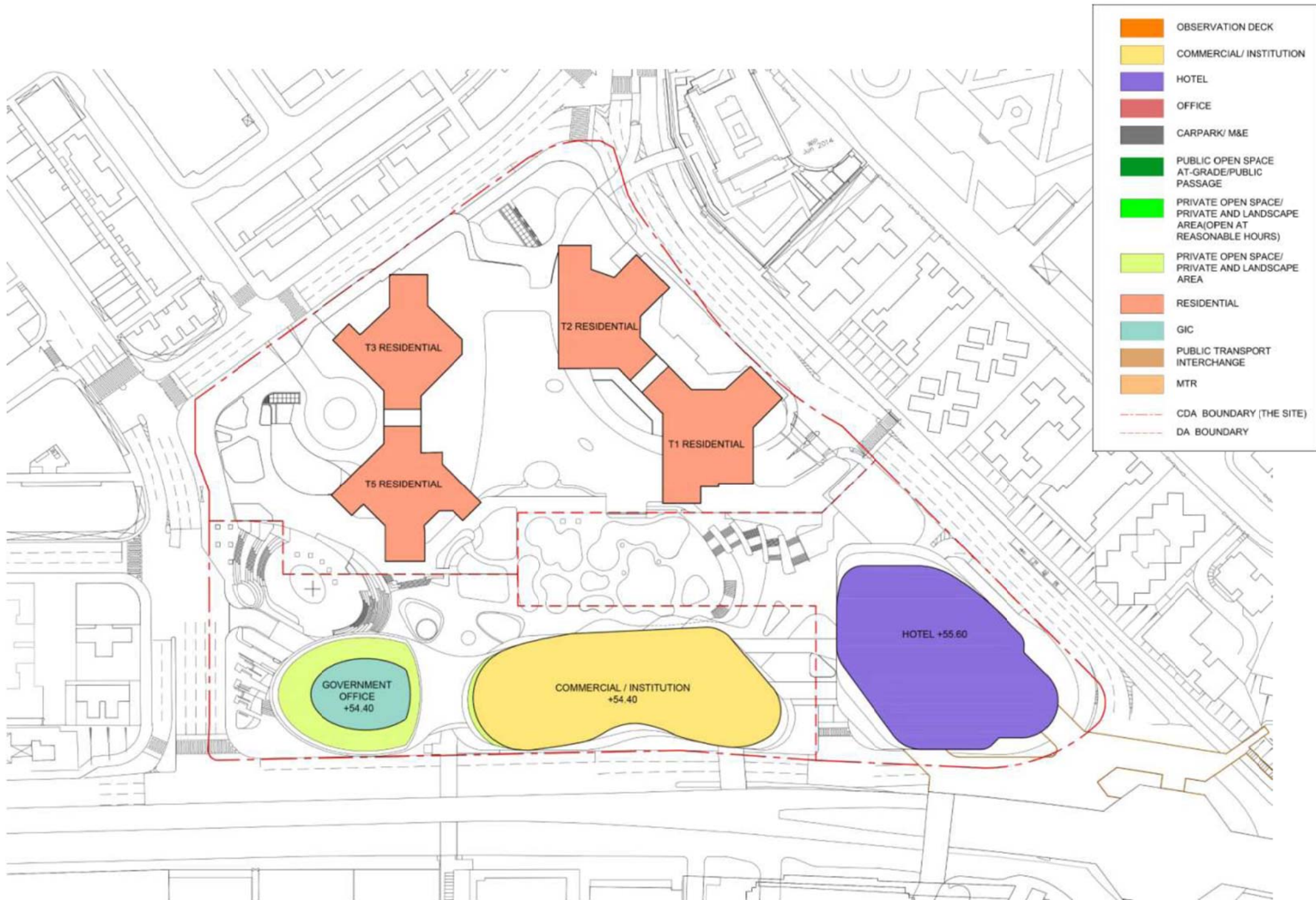




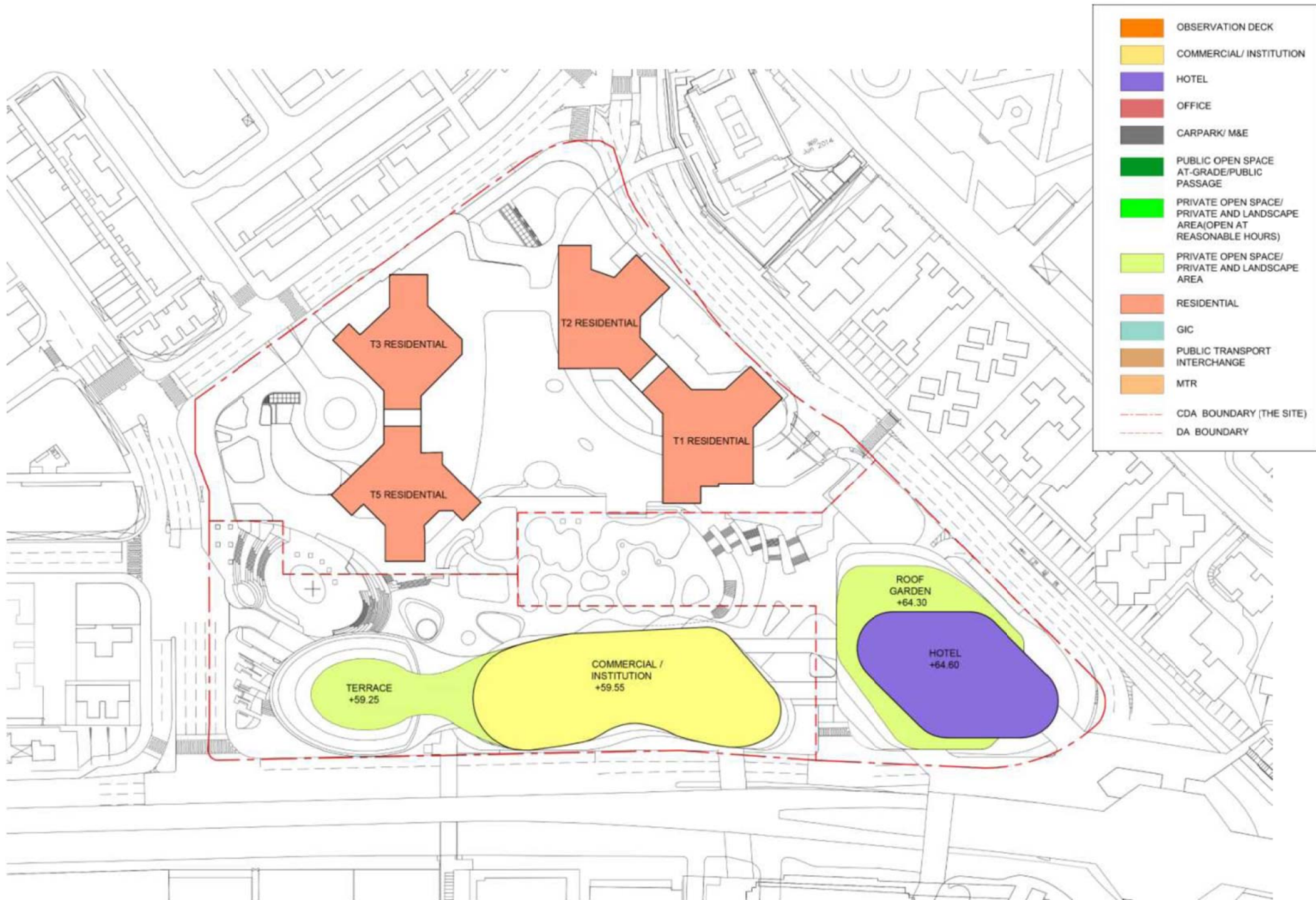


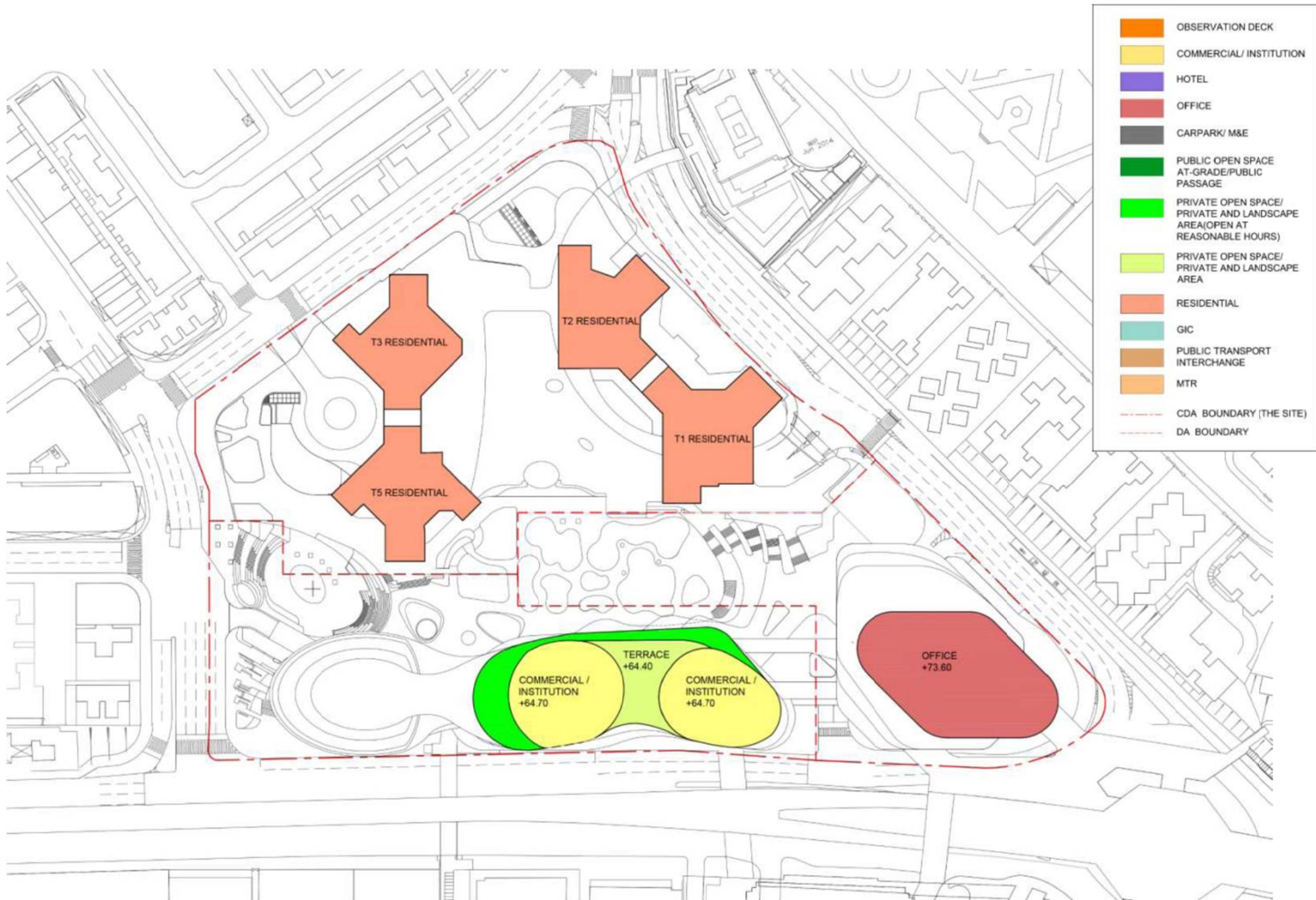




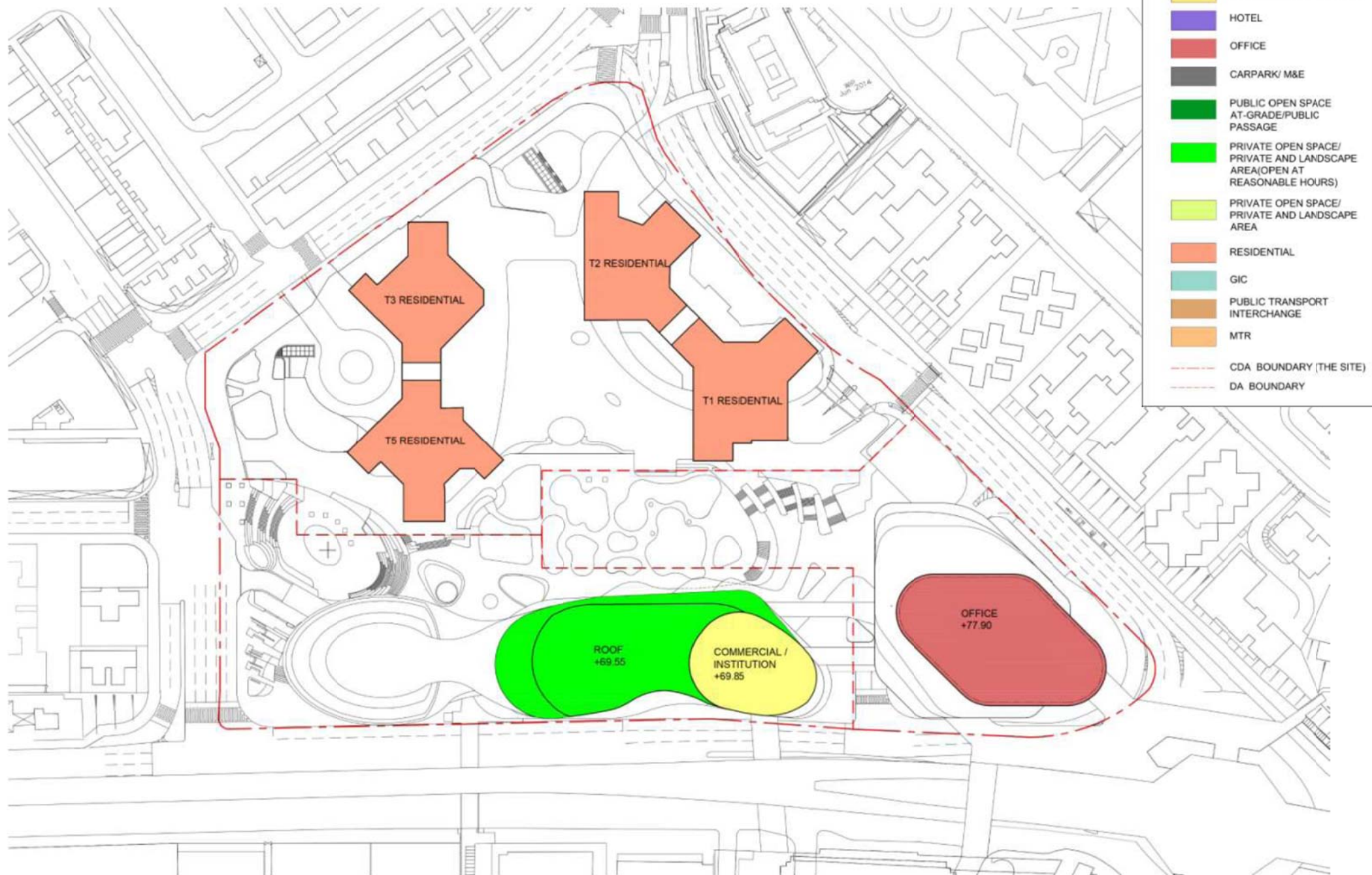


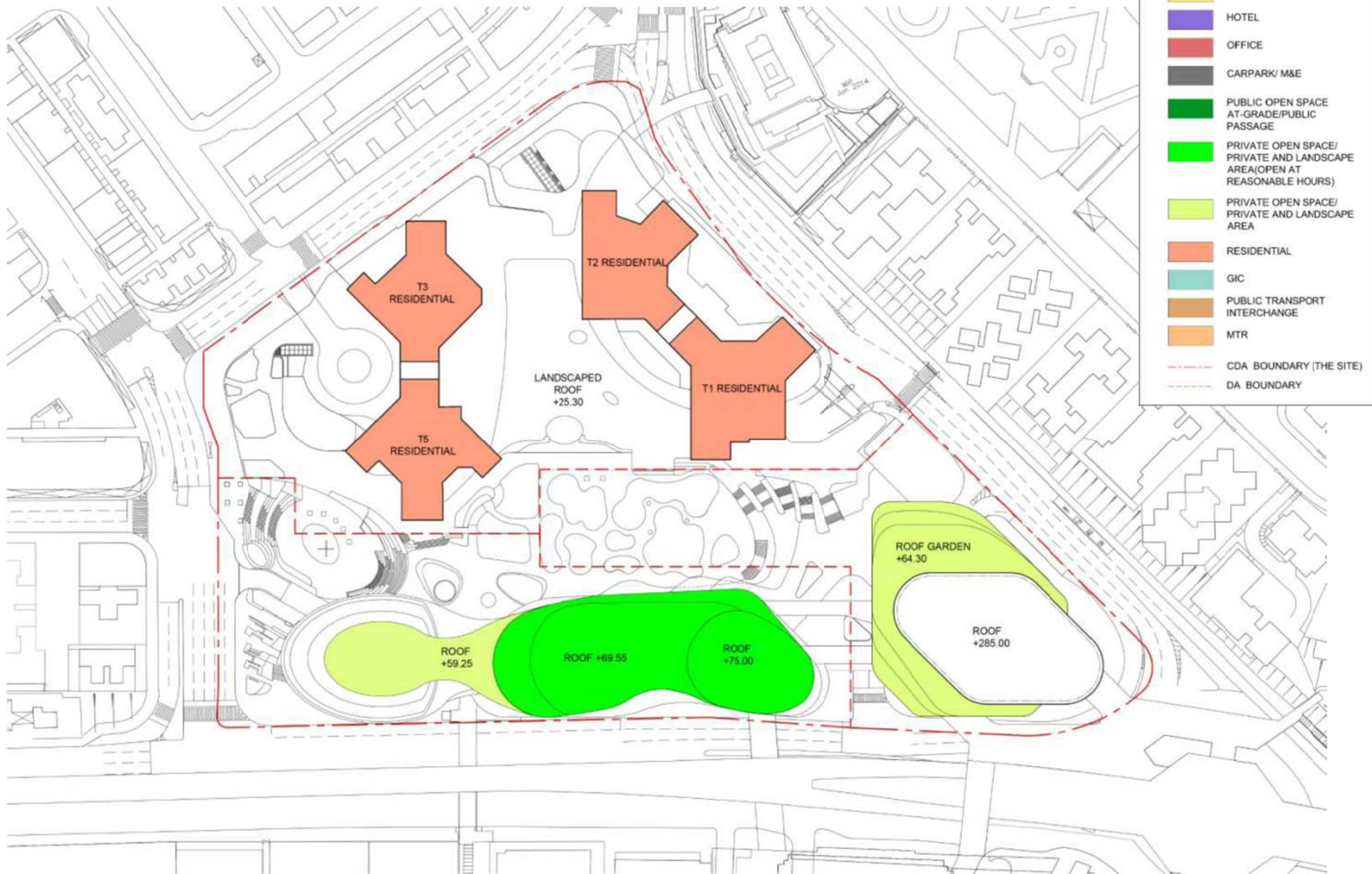




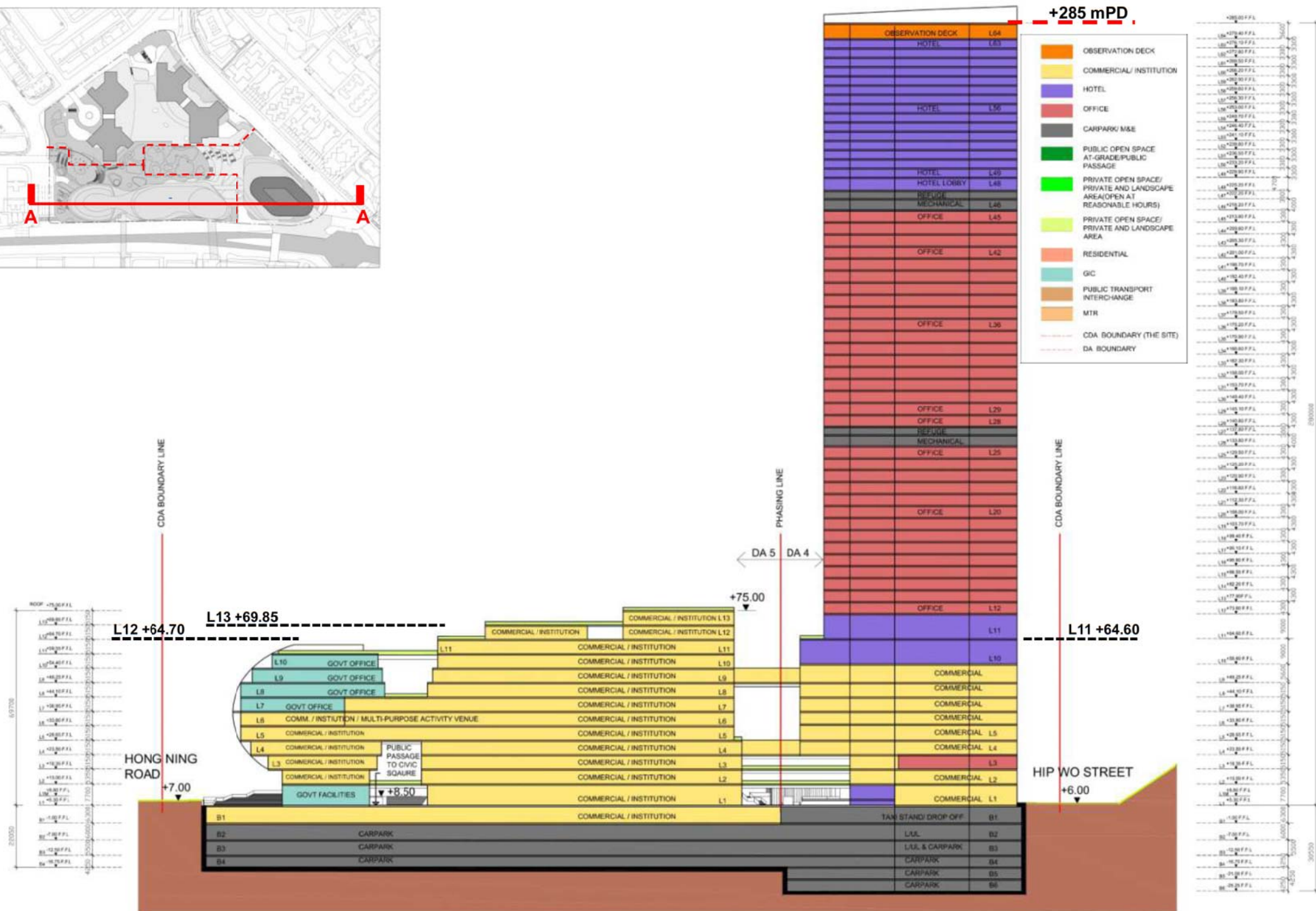


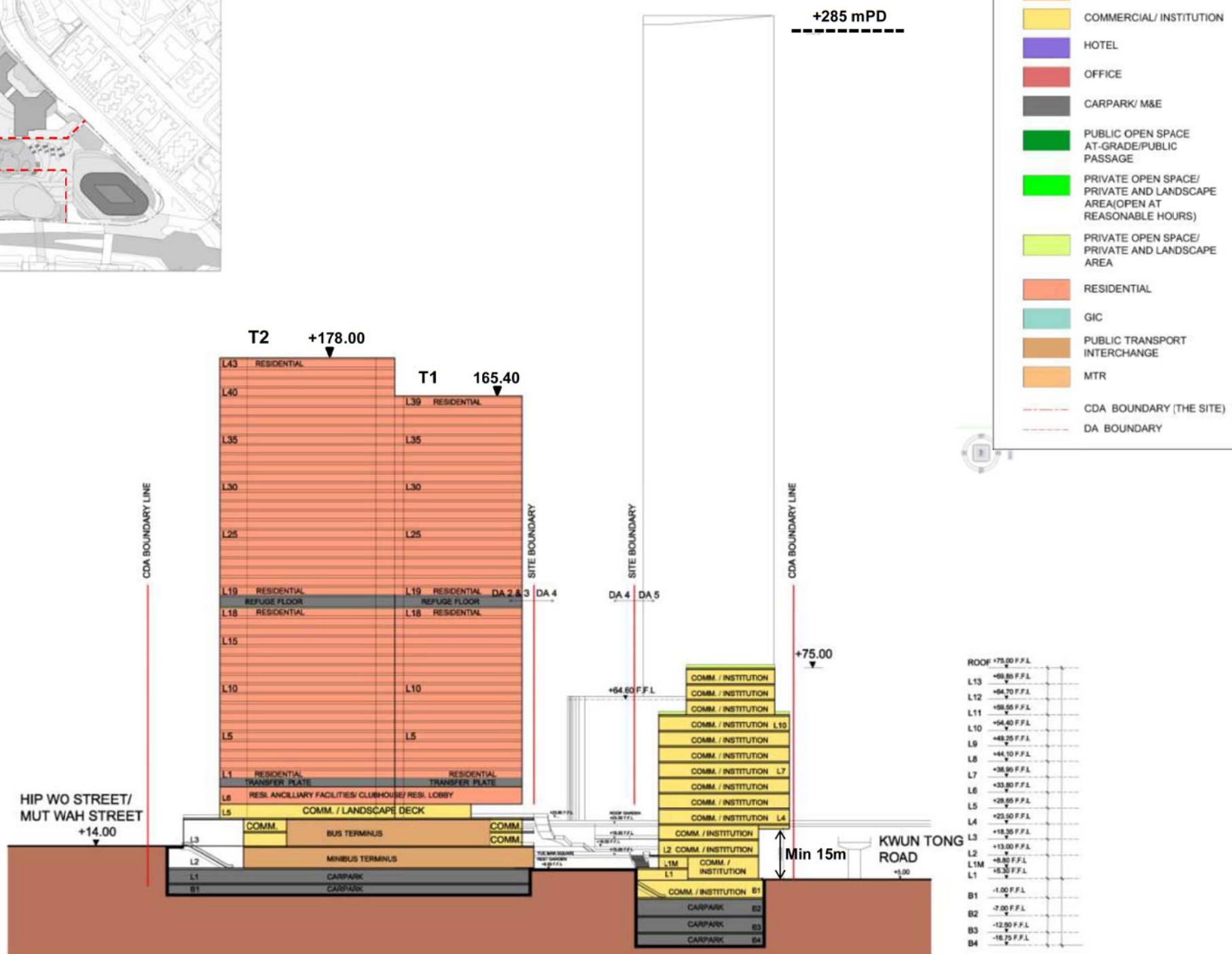
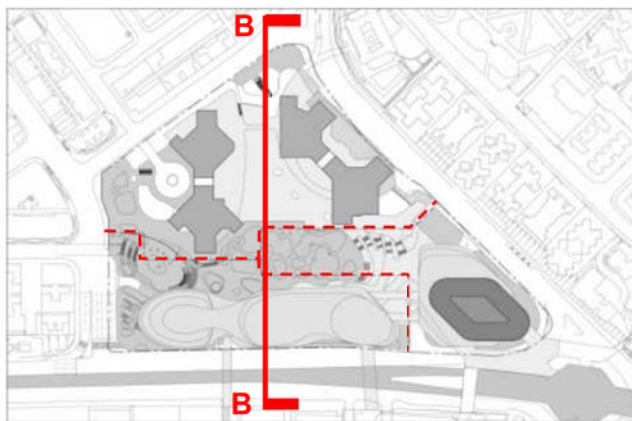




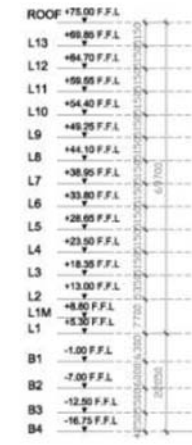
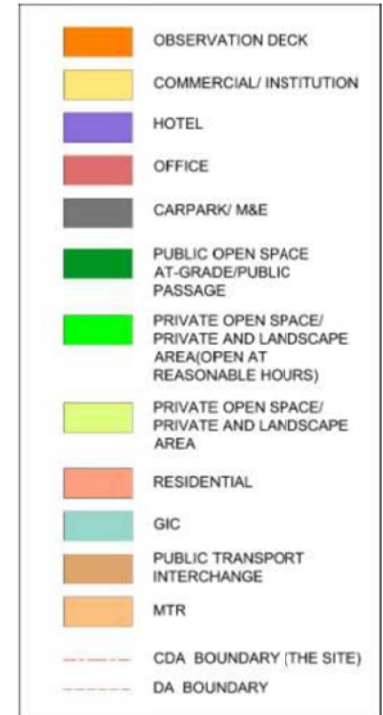
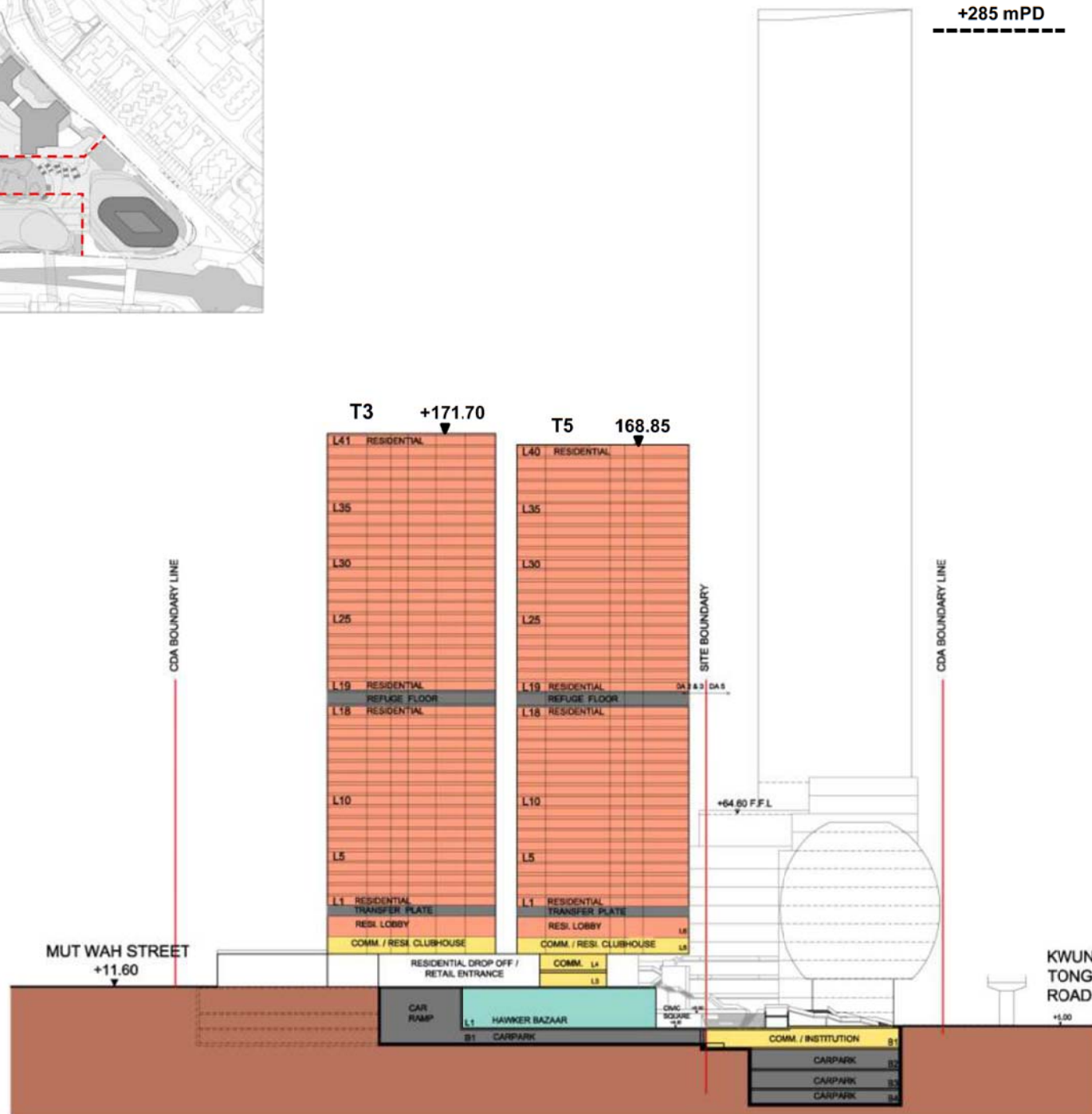
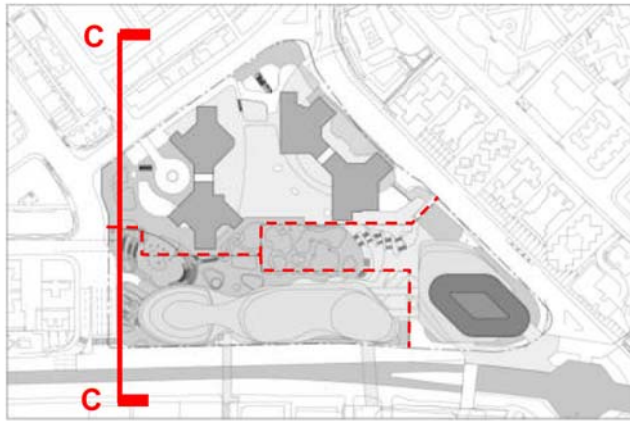






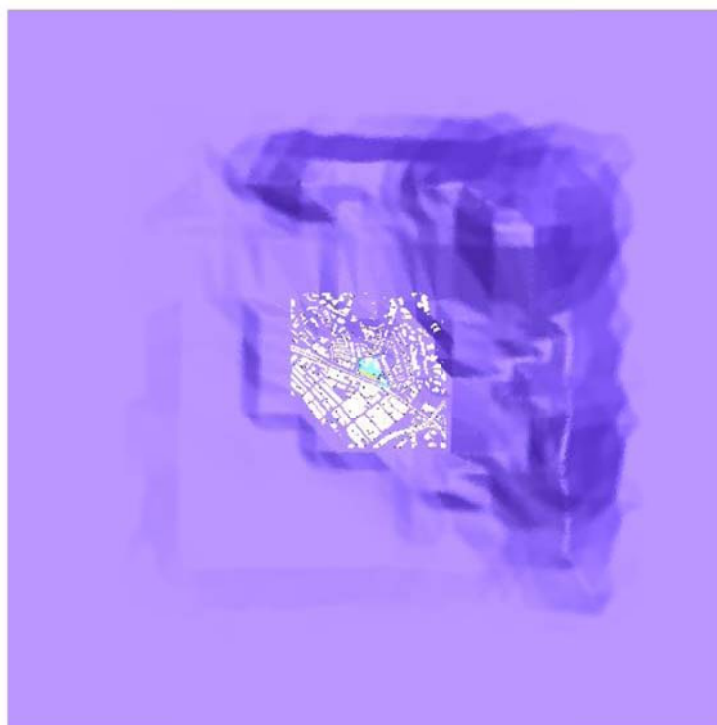






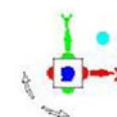
## **APPENDIX C: DOMAIN SIZE, CFD MODEL IN DIFFERENT VIEWS, CONTOUR PLOTS OF SIMULATION RESULTS**

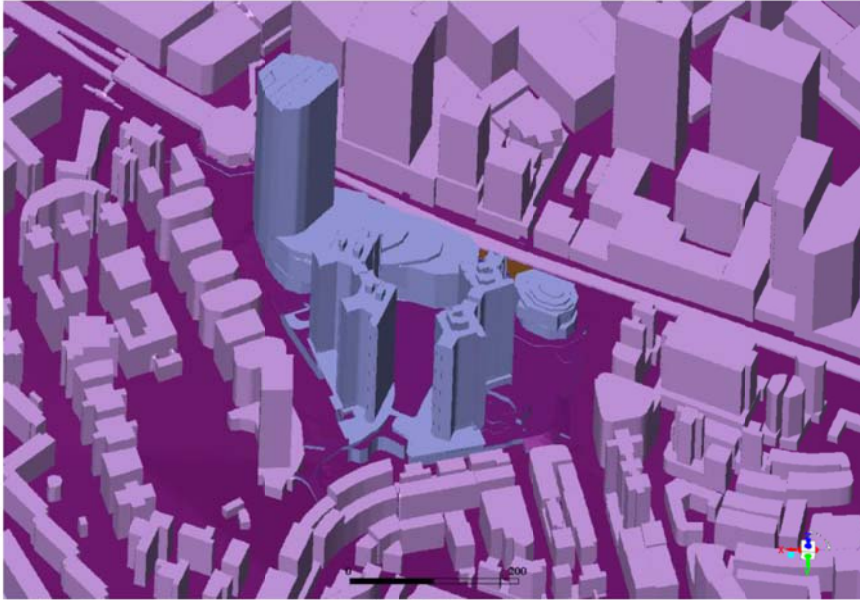




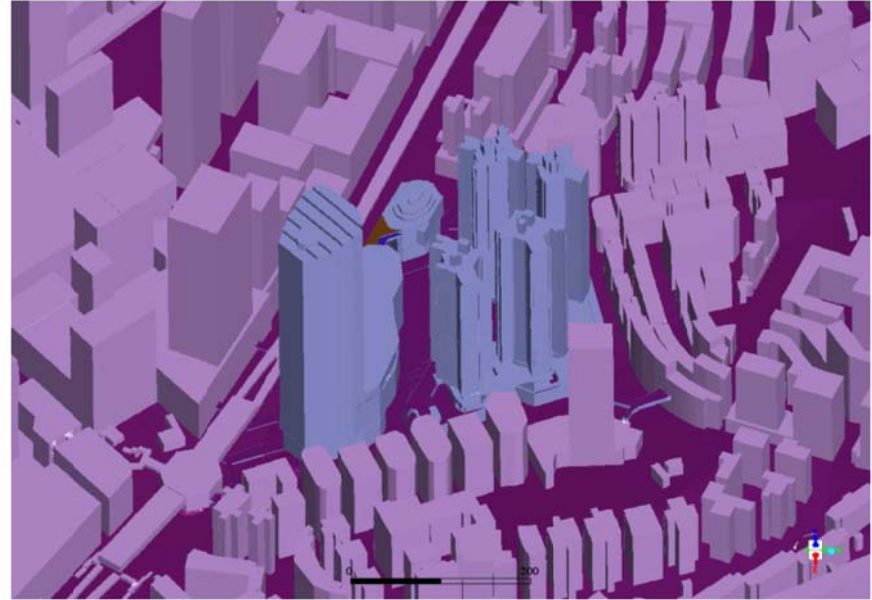
0 5000

Domain





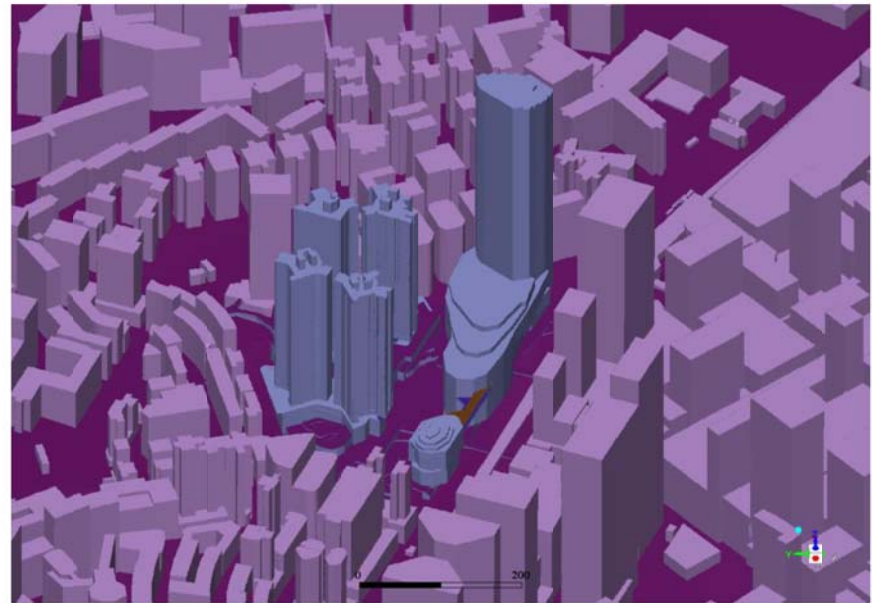
Baseline Scheme - N



Baseline Scheme - E

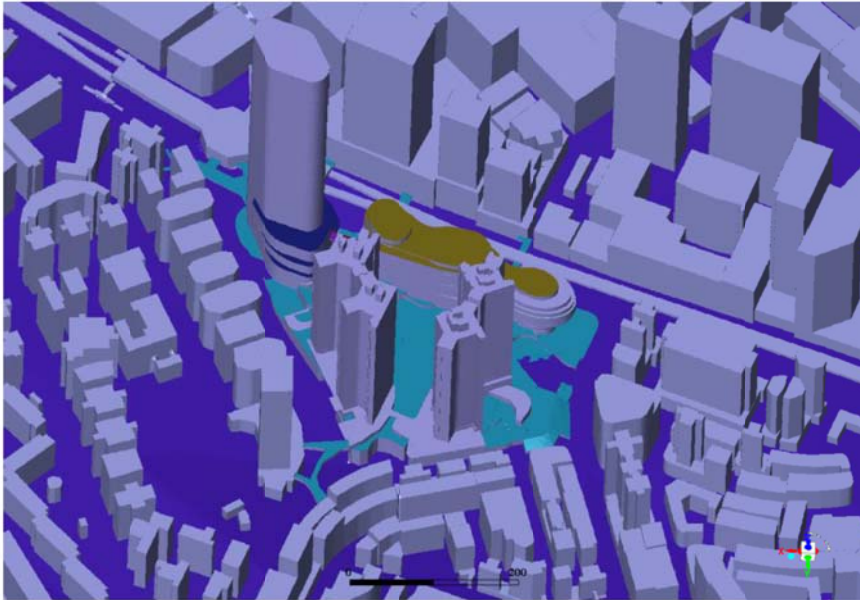


Baseline Scheme - S

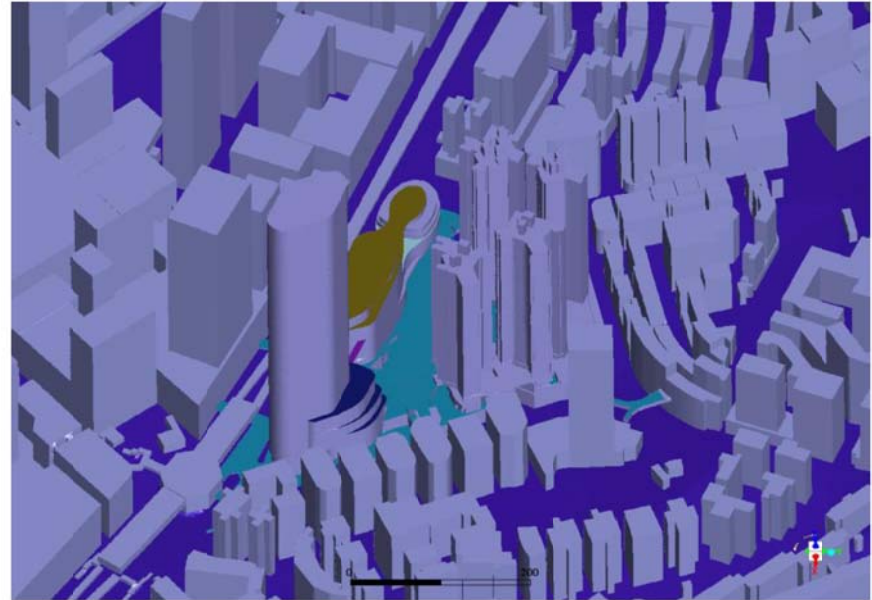


Baseline Scheme - W

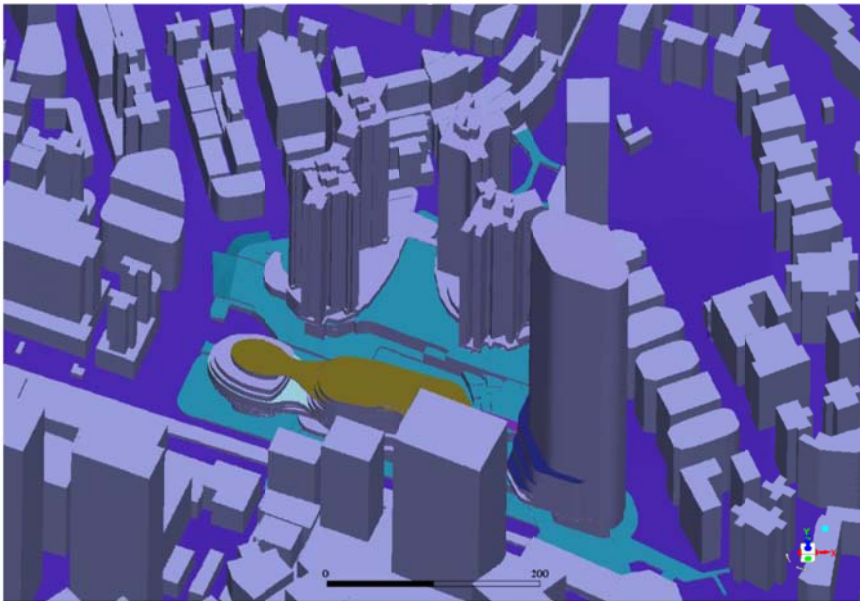




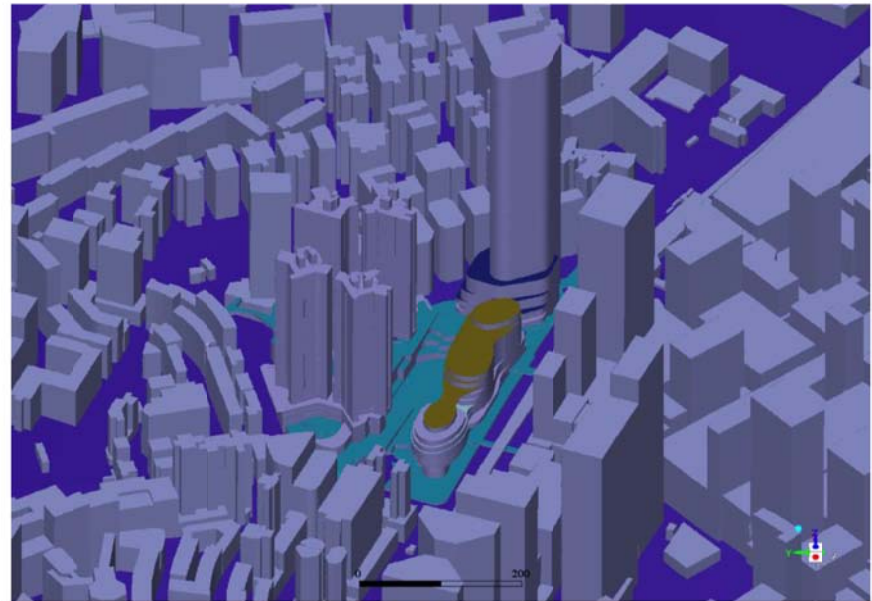
Proposed Scheme - N



Proposed Scheme - E

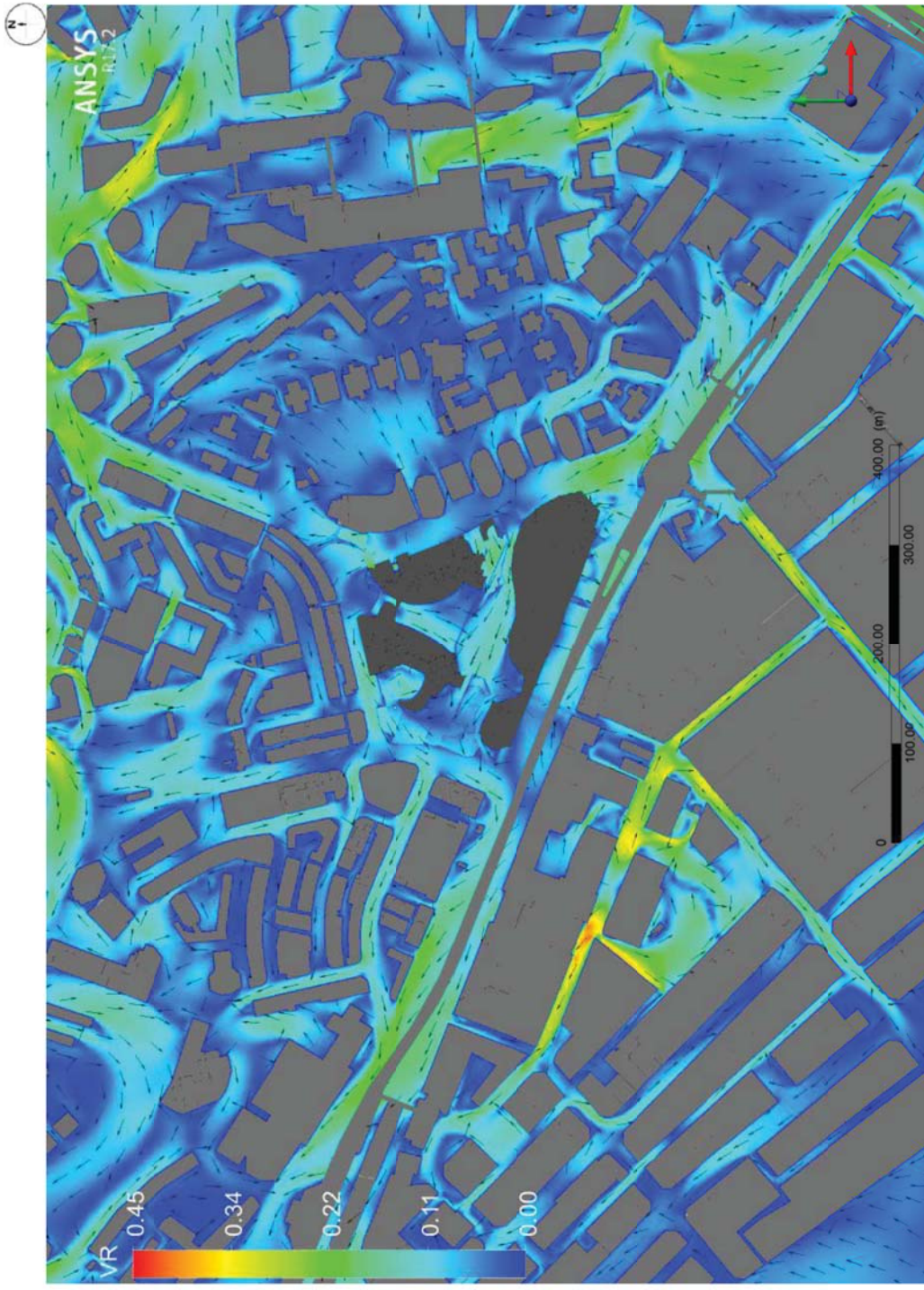


Proposed Scheme - S

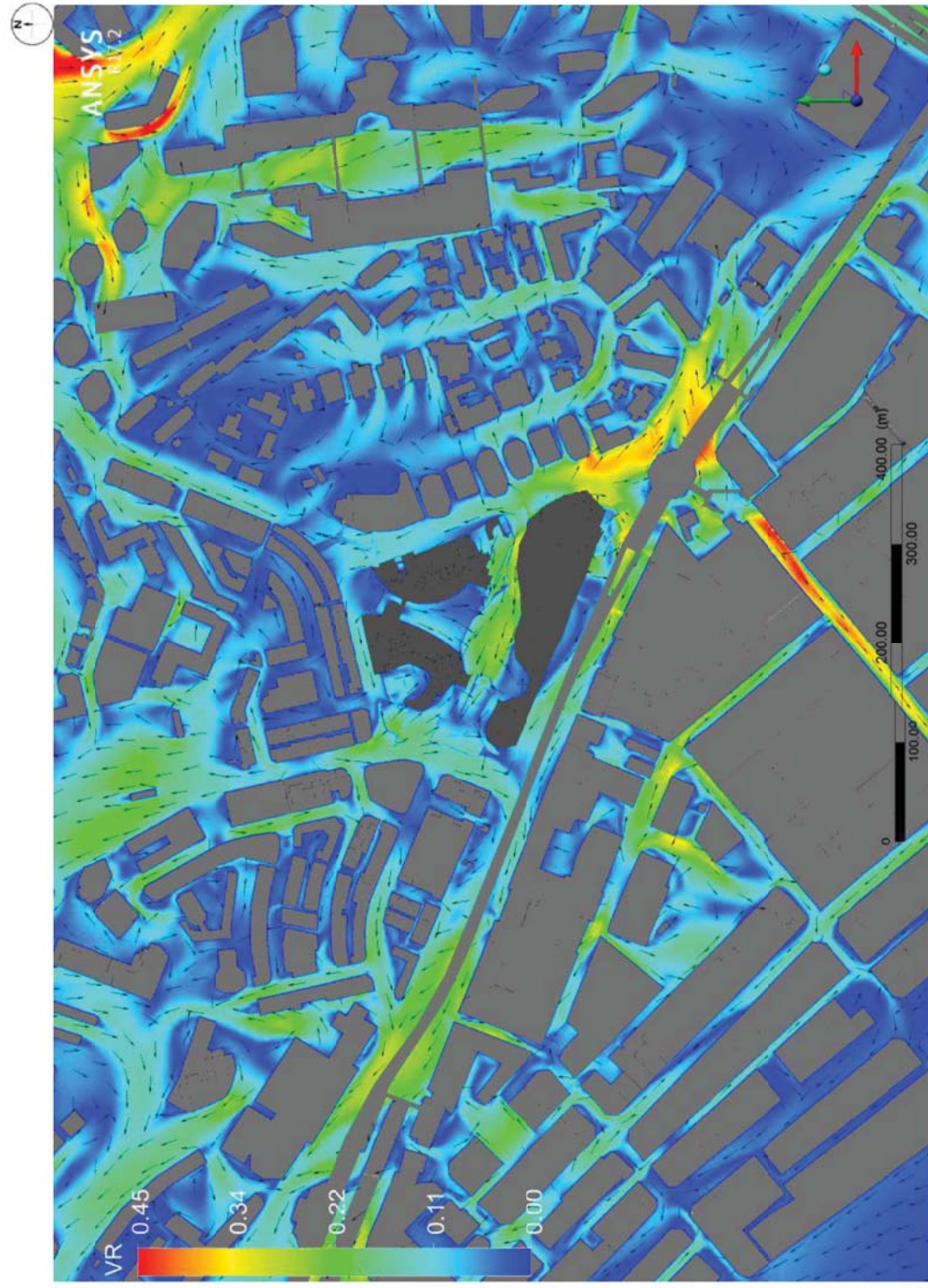


Proposed Scheme - W



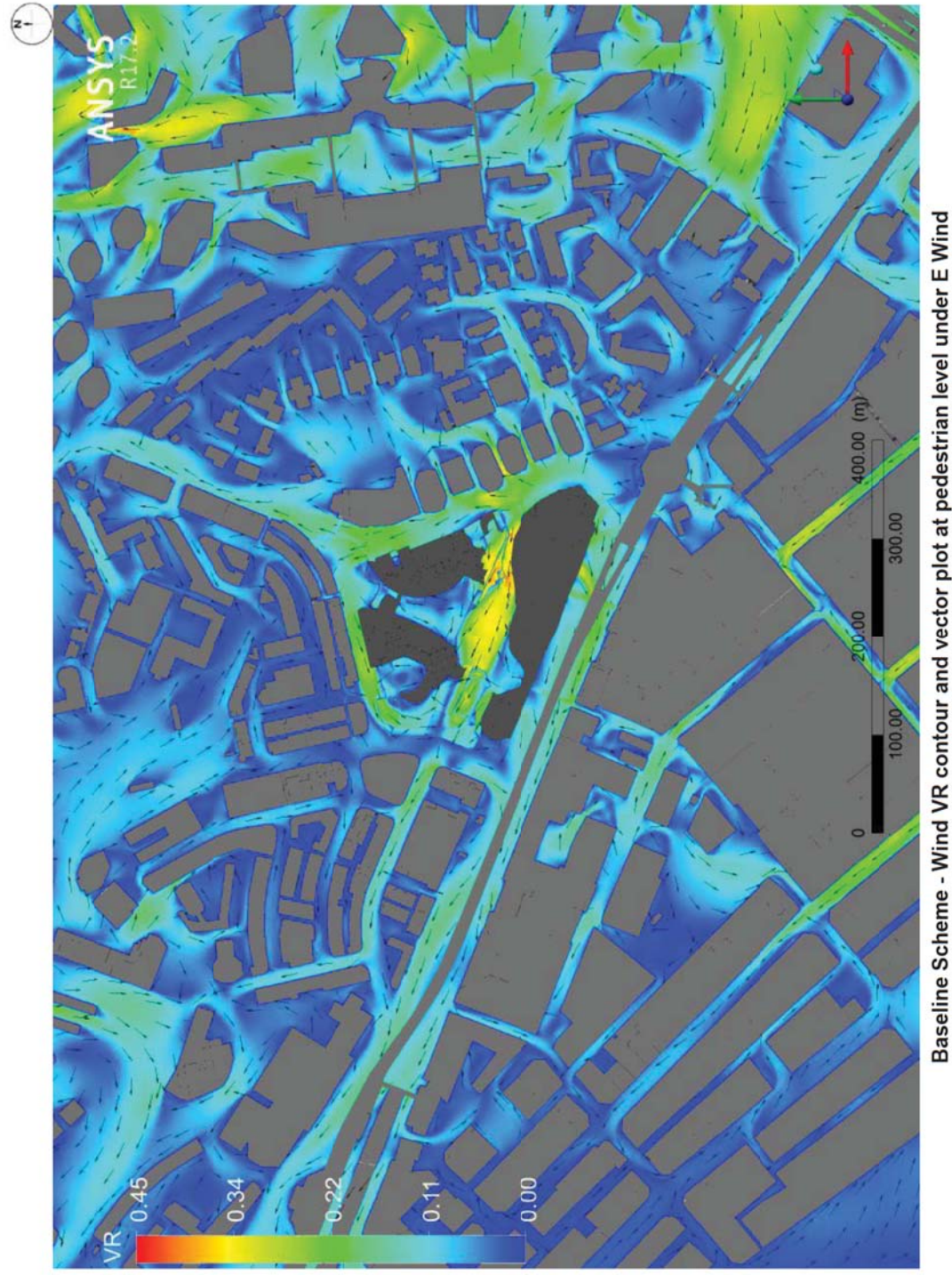
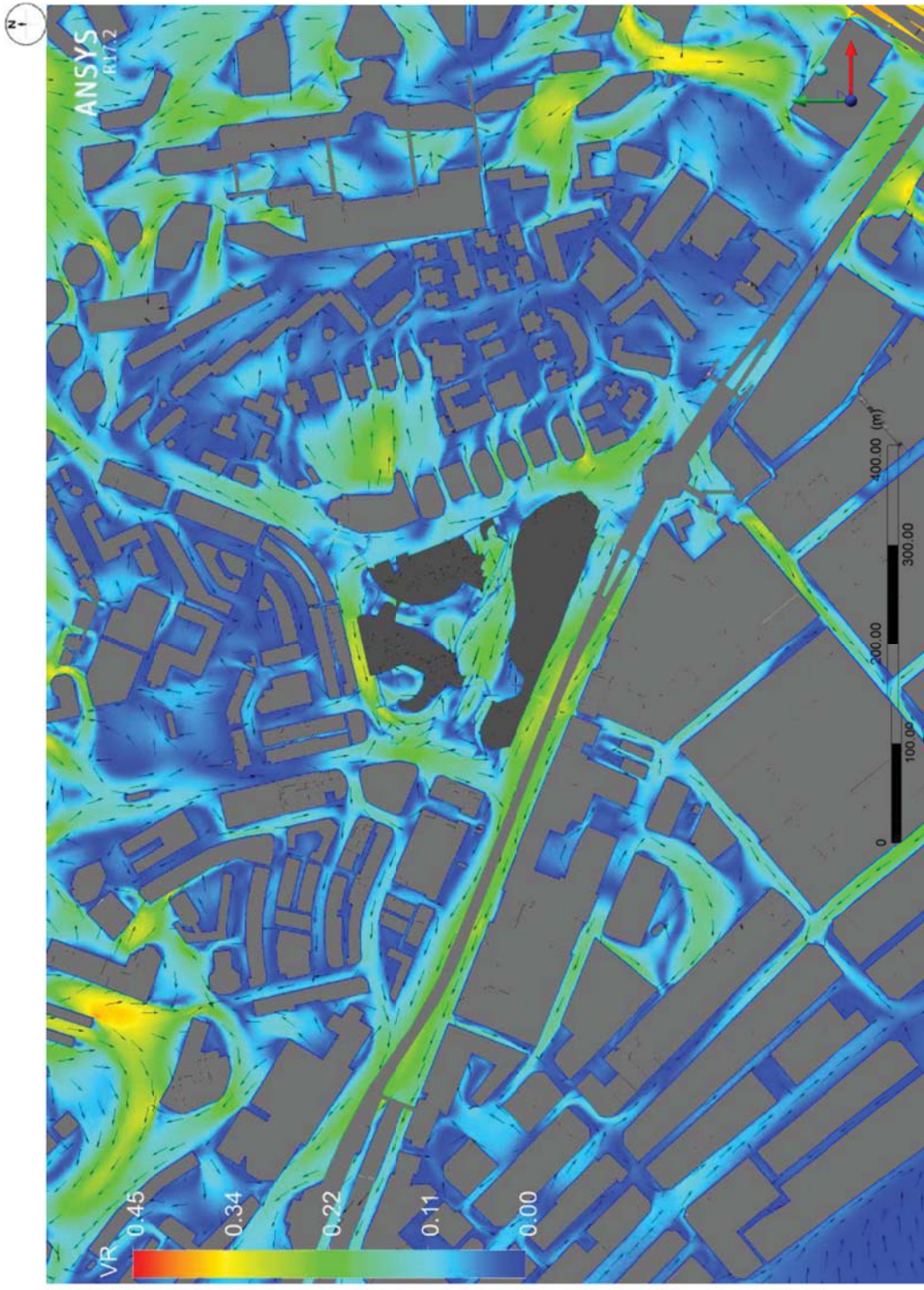


Baseline Scheme - Wind VR contour and vector plot at pedestrian level under NNE Wind

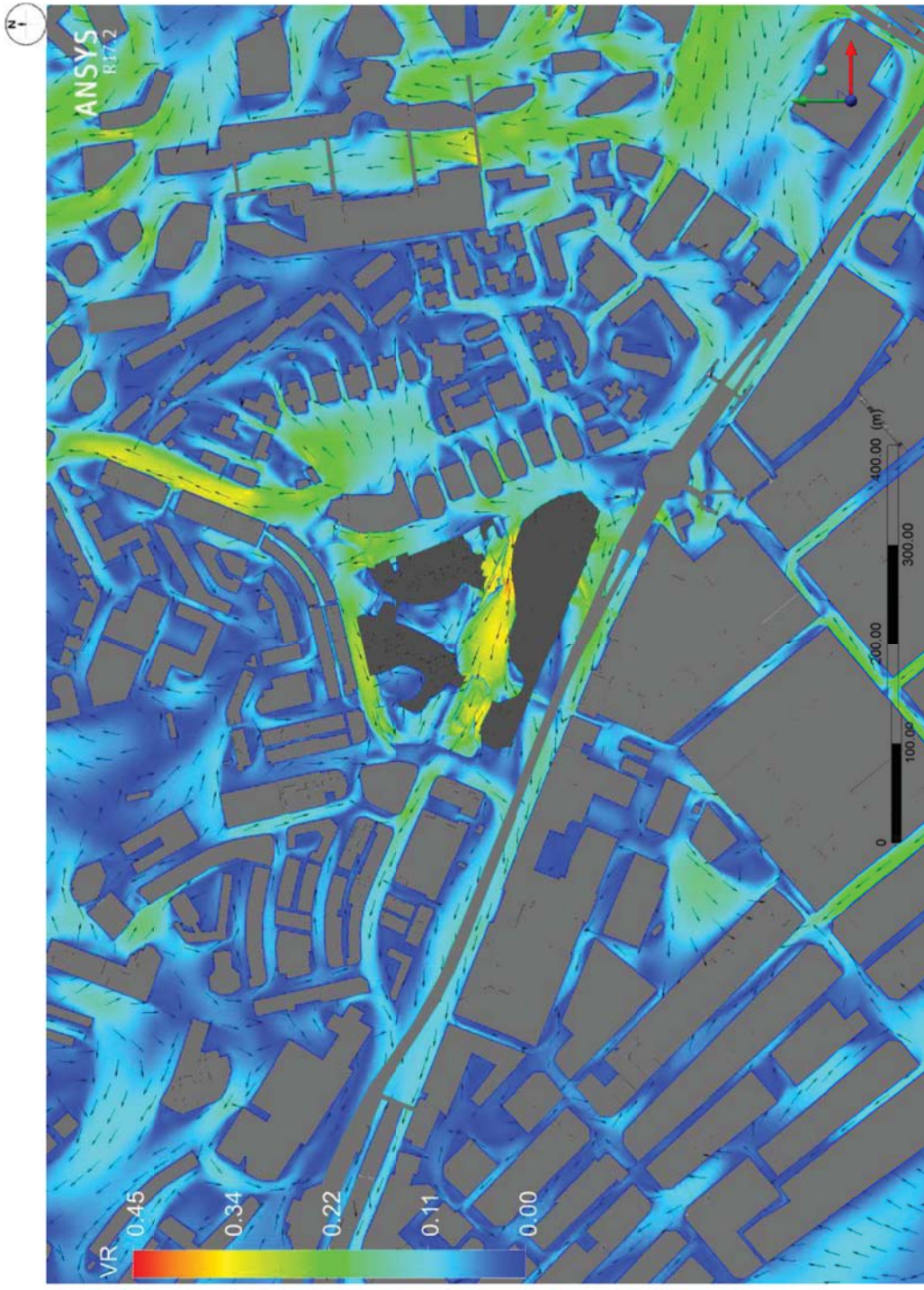


Baseline Scheme - Wind VR contour and vector plot at pedestrian level under NE Wind

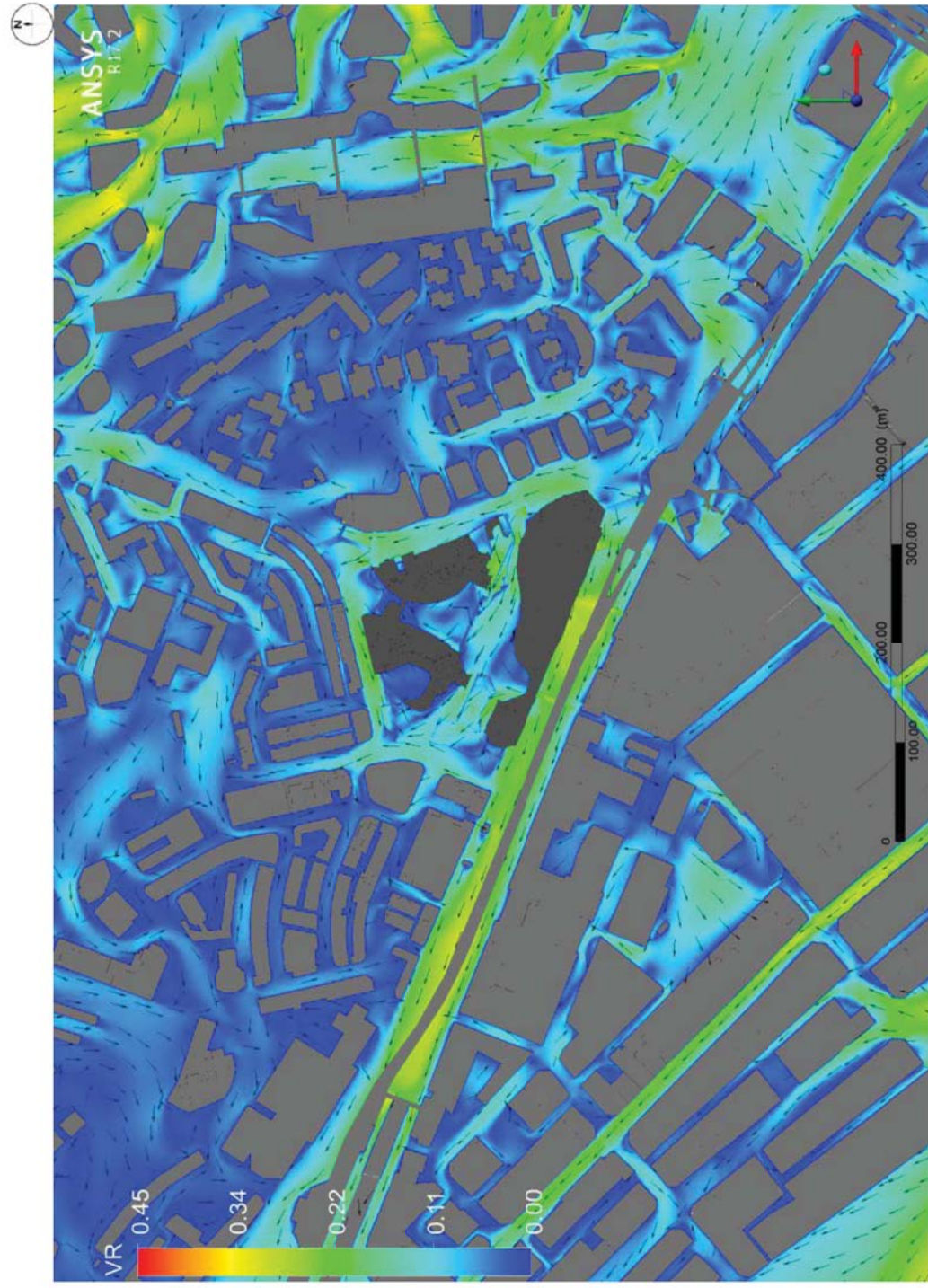






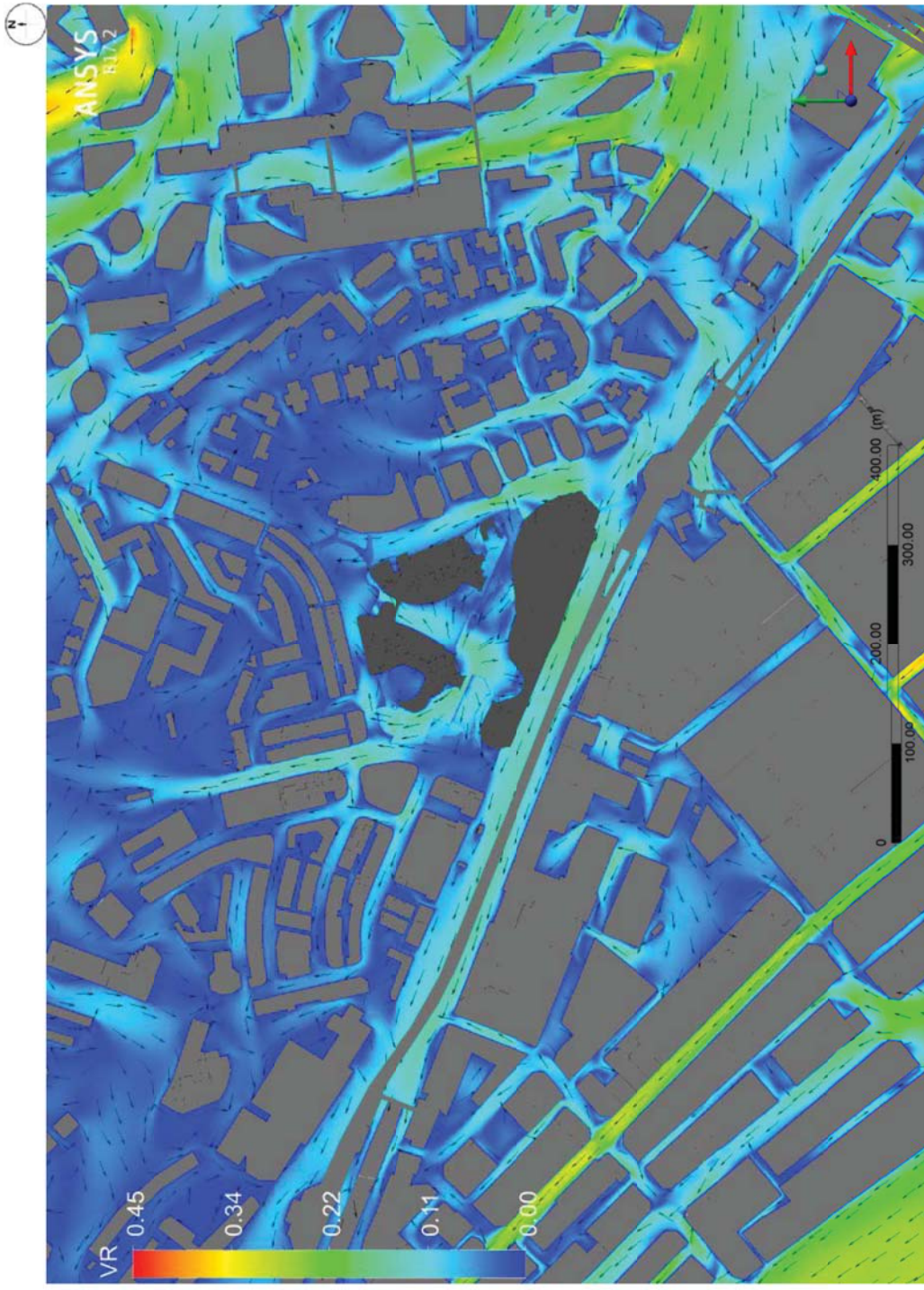


Baseline Scheme - Wind VR contour and vector plot at pedestrian level under ESE Wind

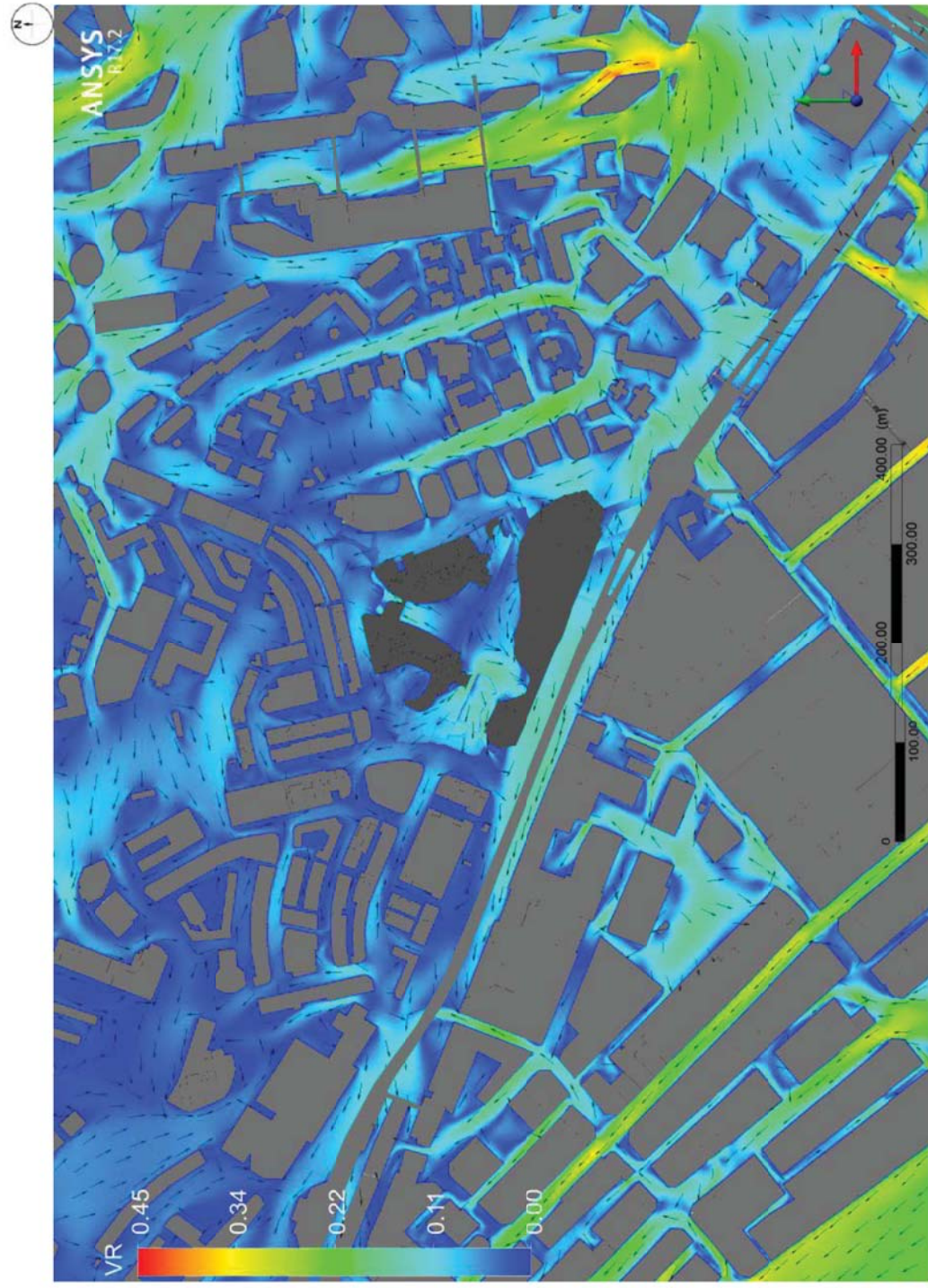


Baseline Scheme - Wind VR contour and vector plot at pedestrian level under SE Wind



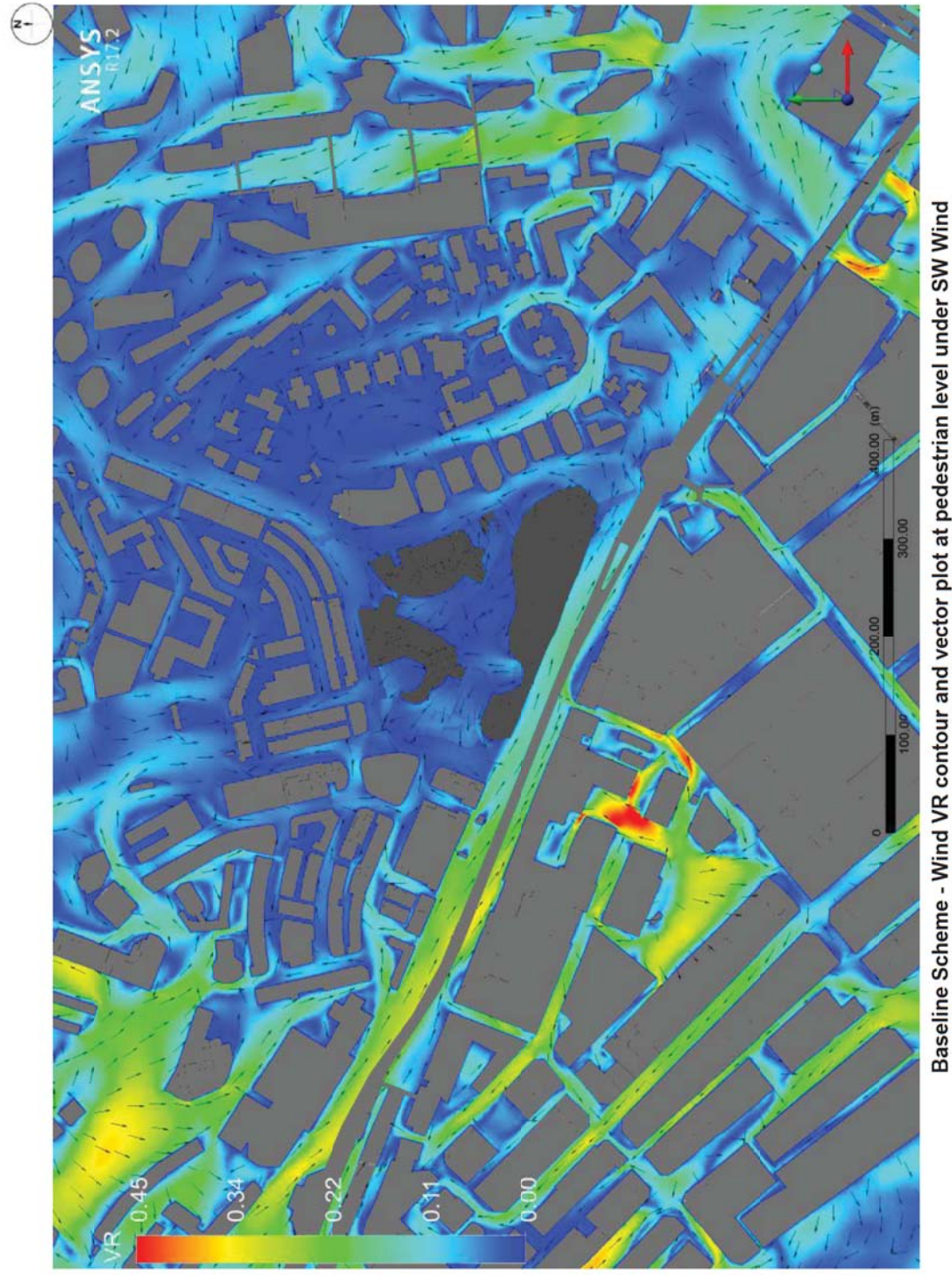
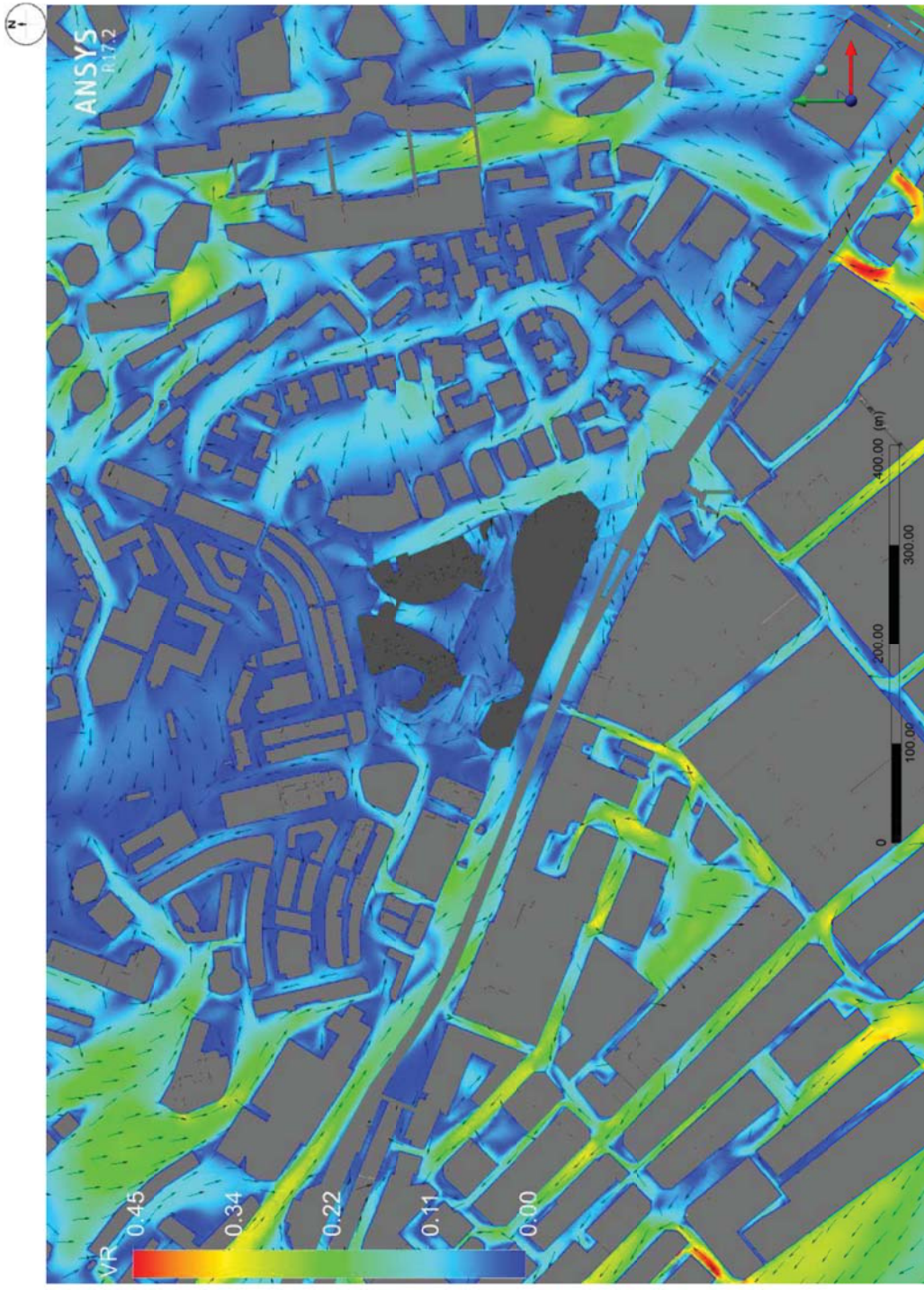


Baseline Scheme - Wind VR contour and vector plot at pedestrian level under SSE Wind

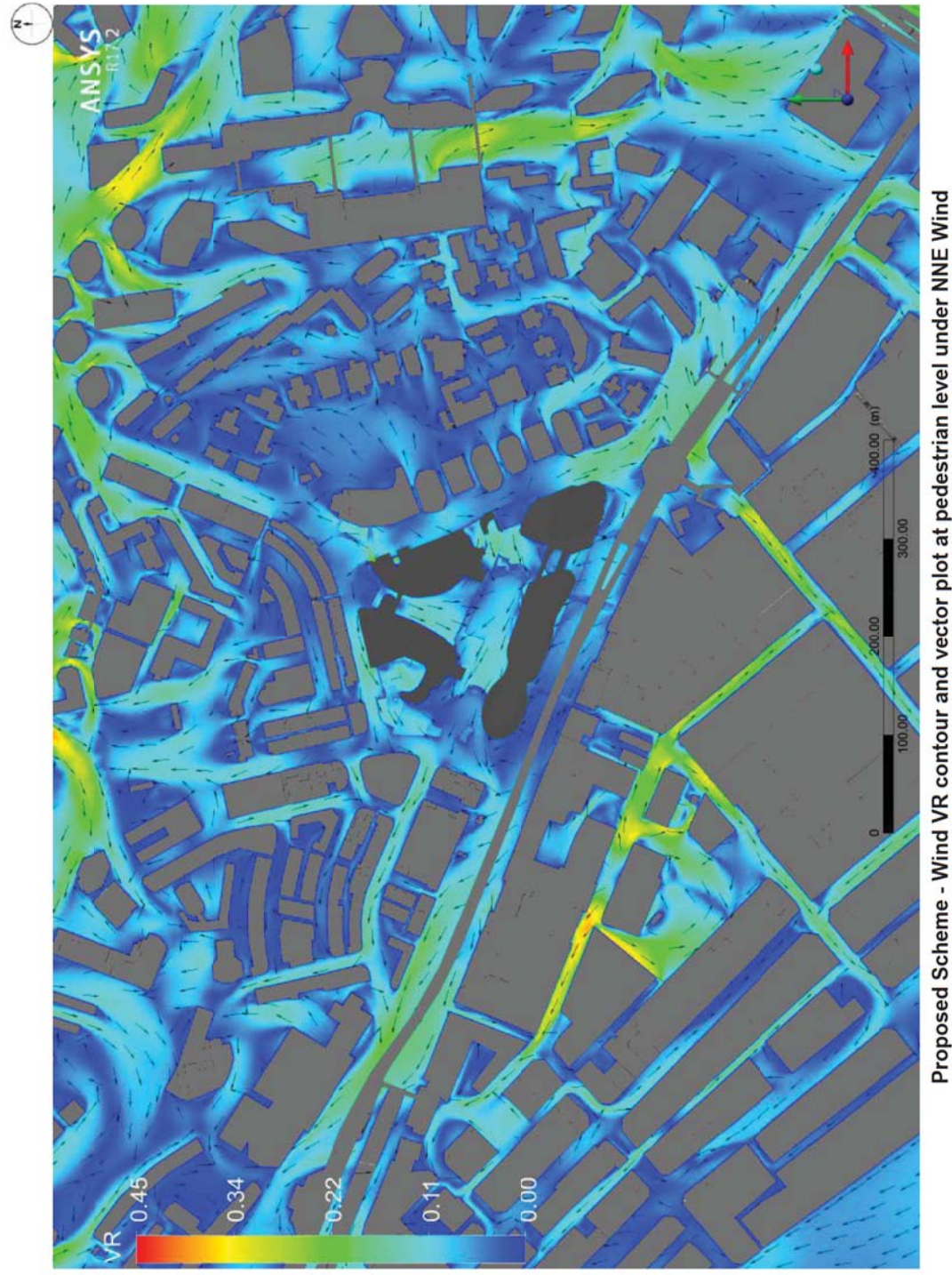
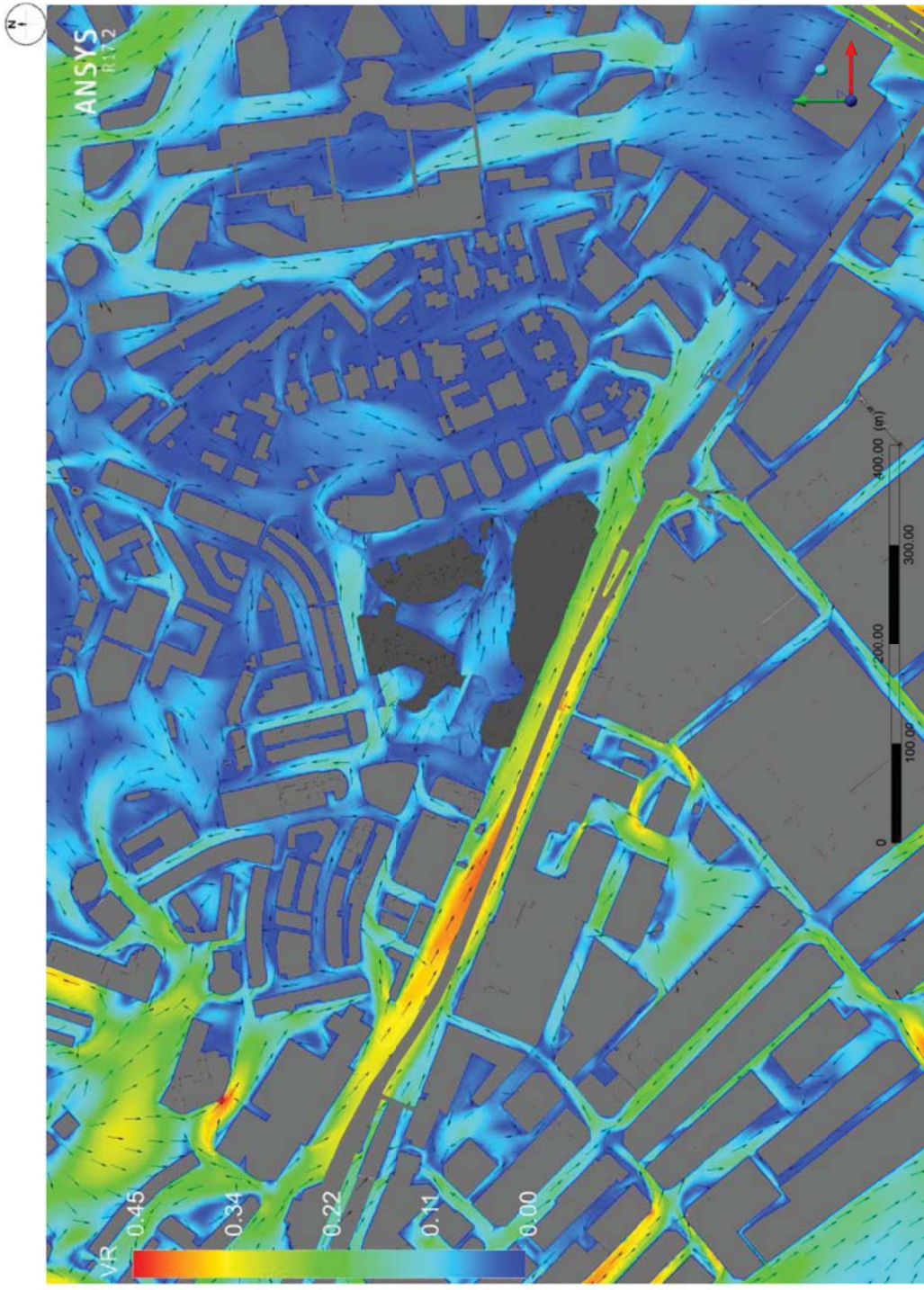


Baseline Scheme - Wind VR contour and vector plot at pedestrian level under S Wind

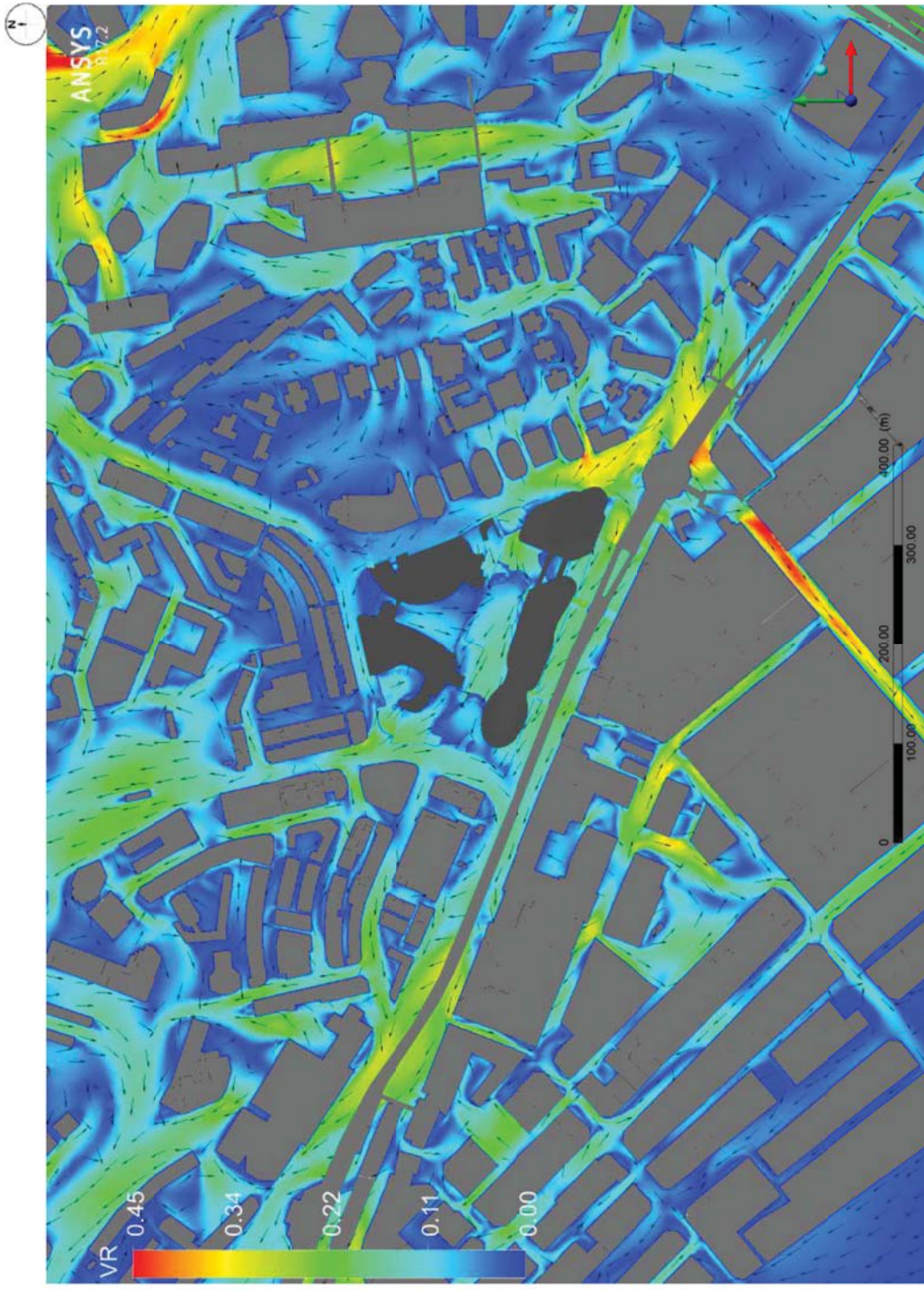




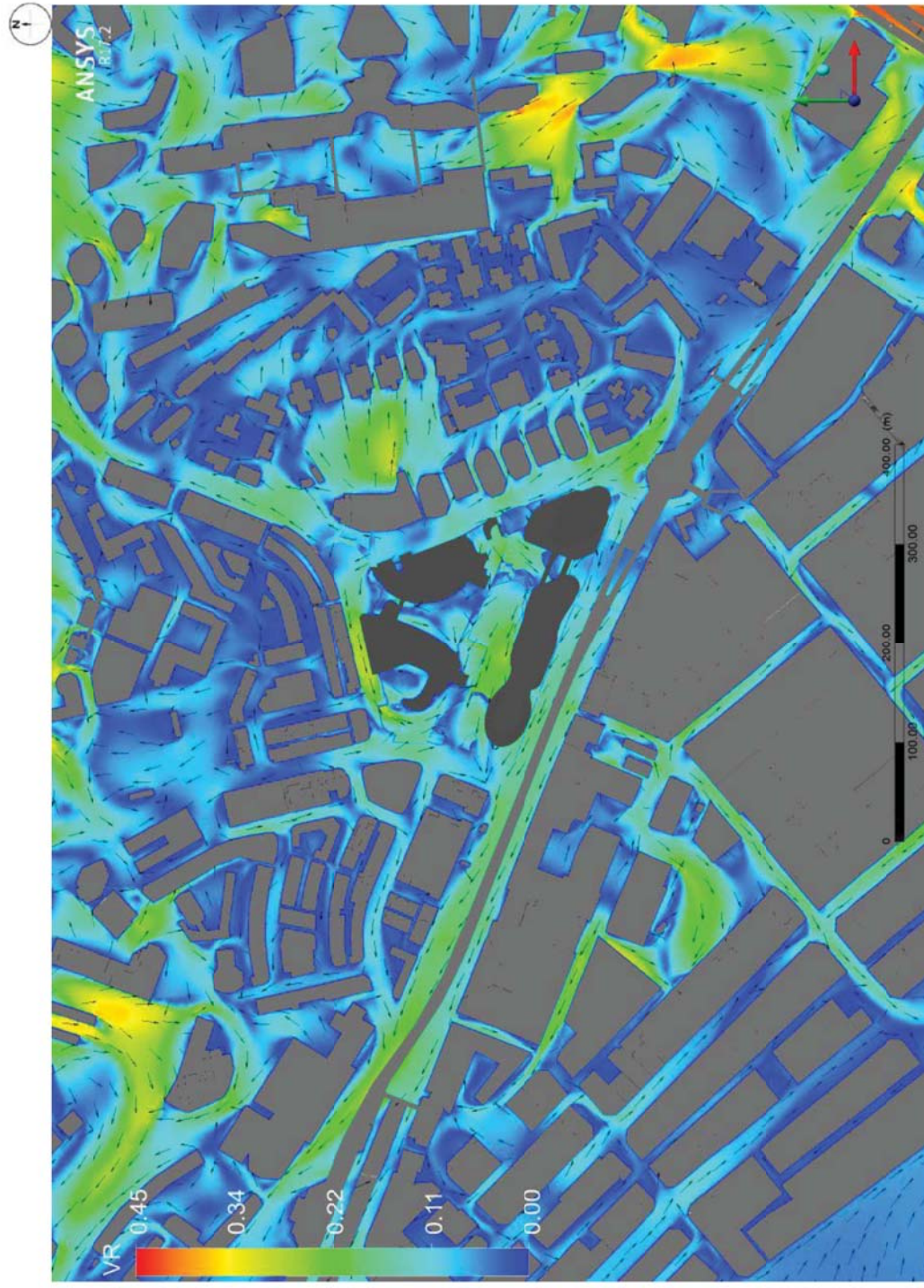






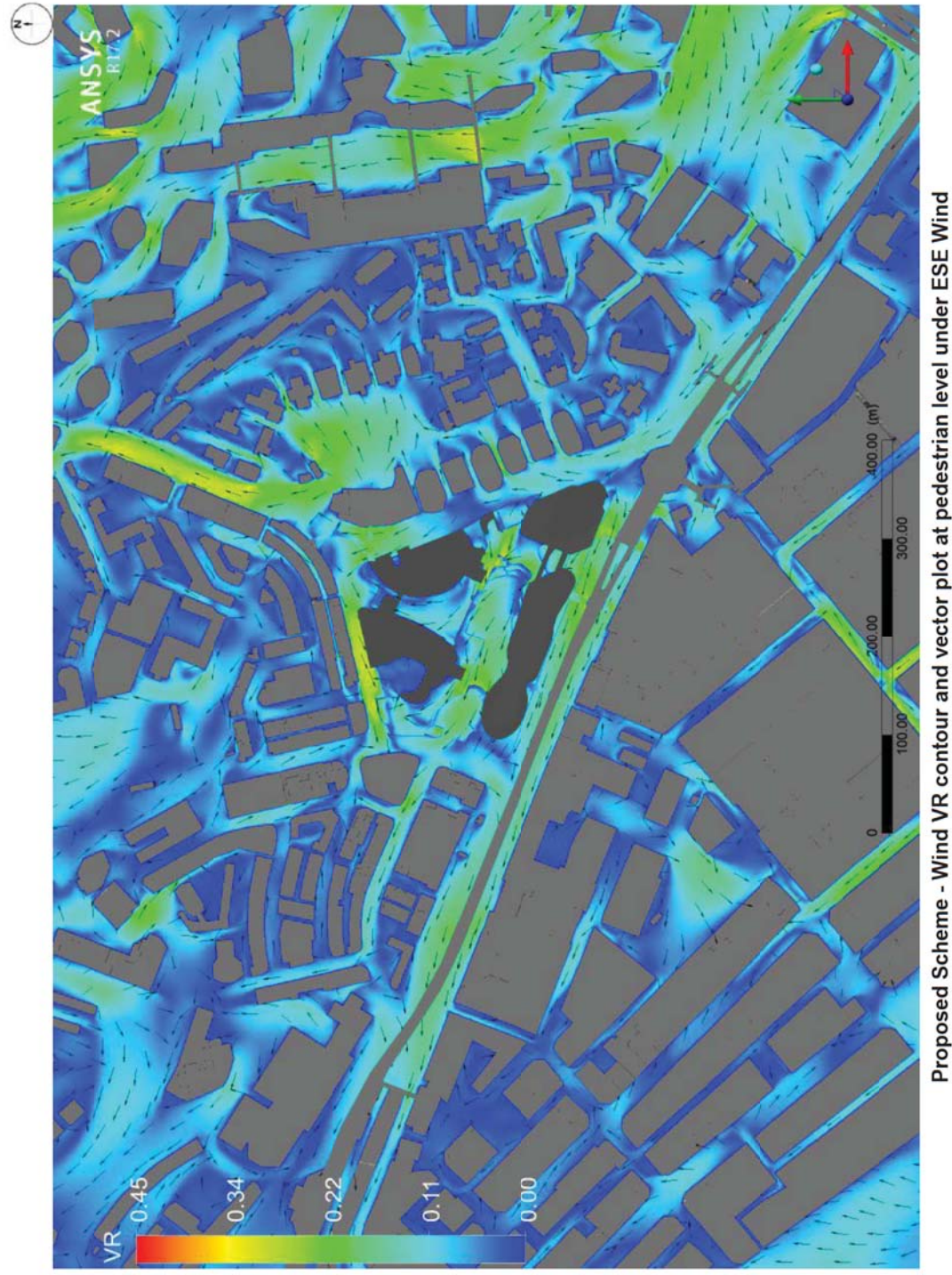
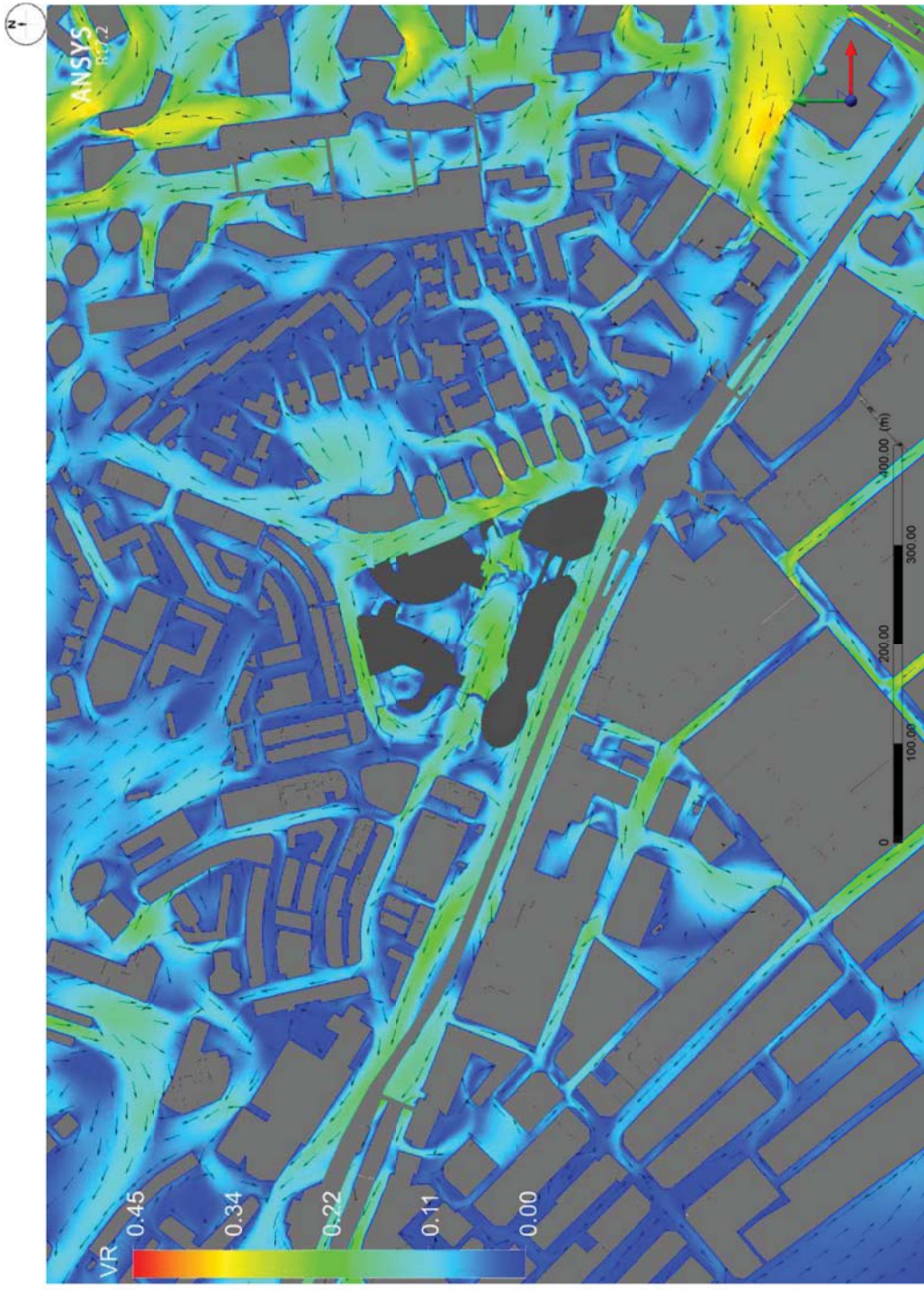


Proposed Scheme - Wind VR contour and vector plot at pedestrian level under NE Wind

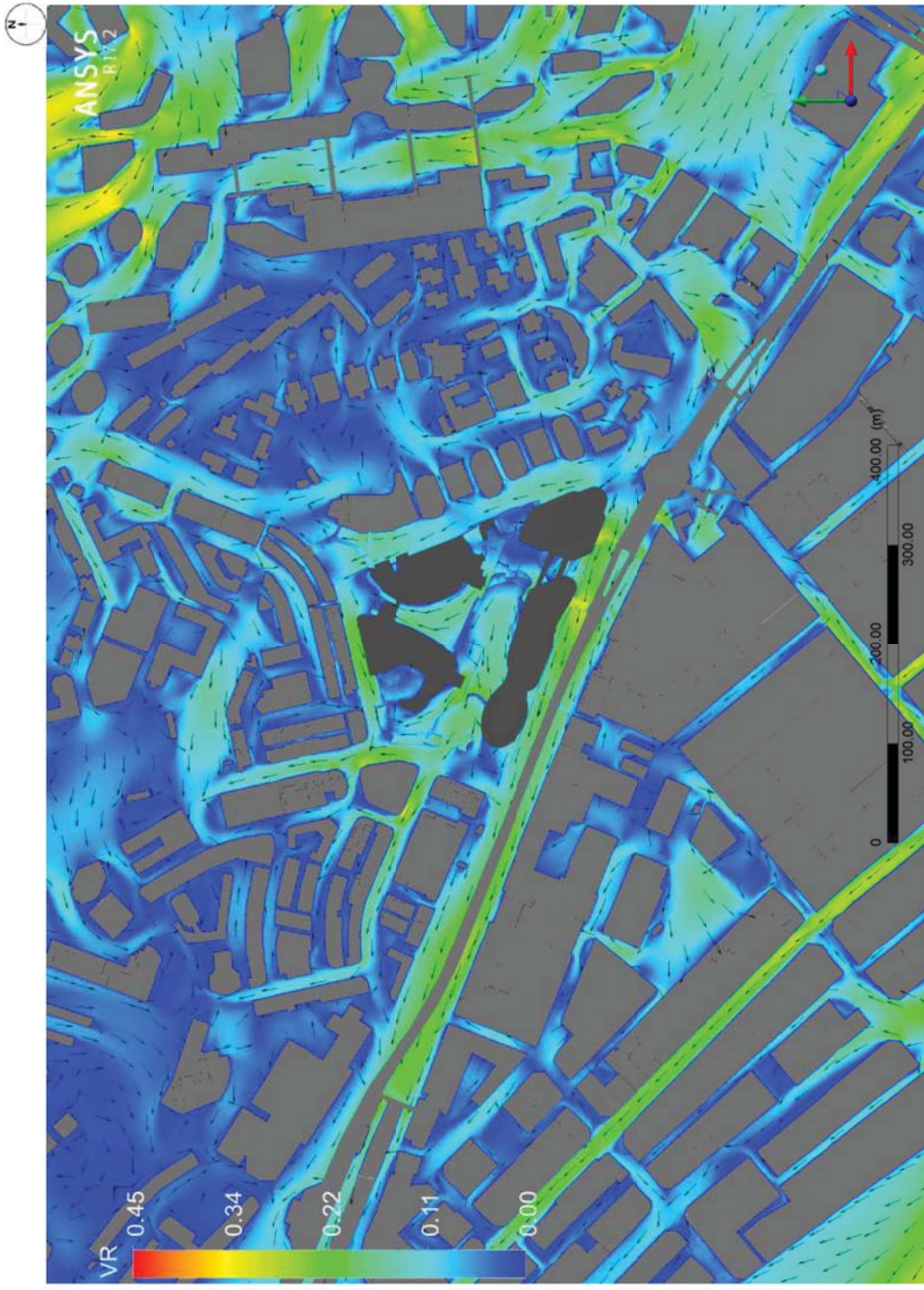


Proposed Scheme - Wind VR contour and vector plot at pedestrian level under ENE Wind

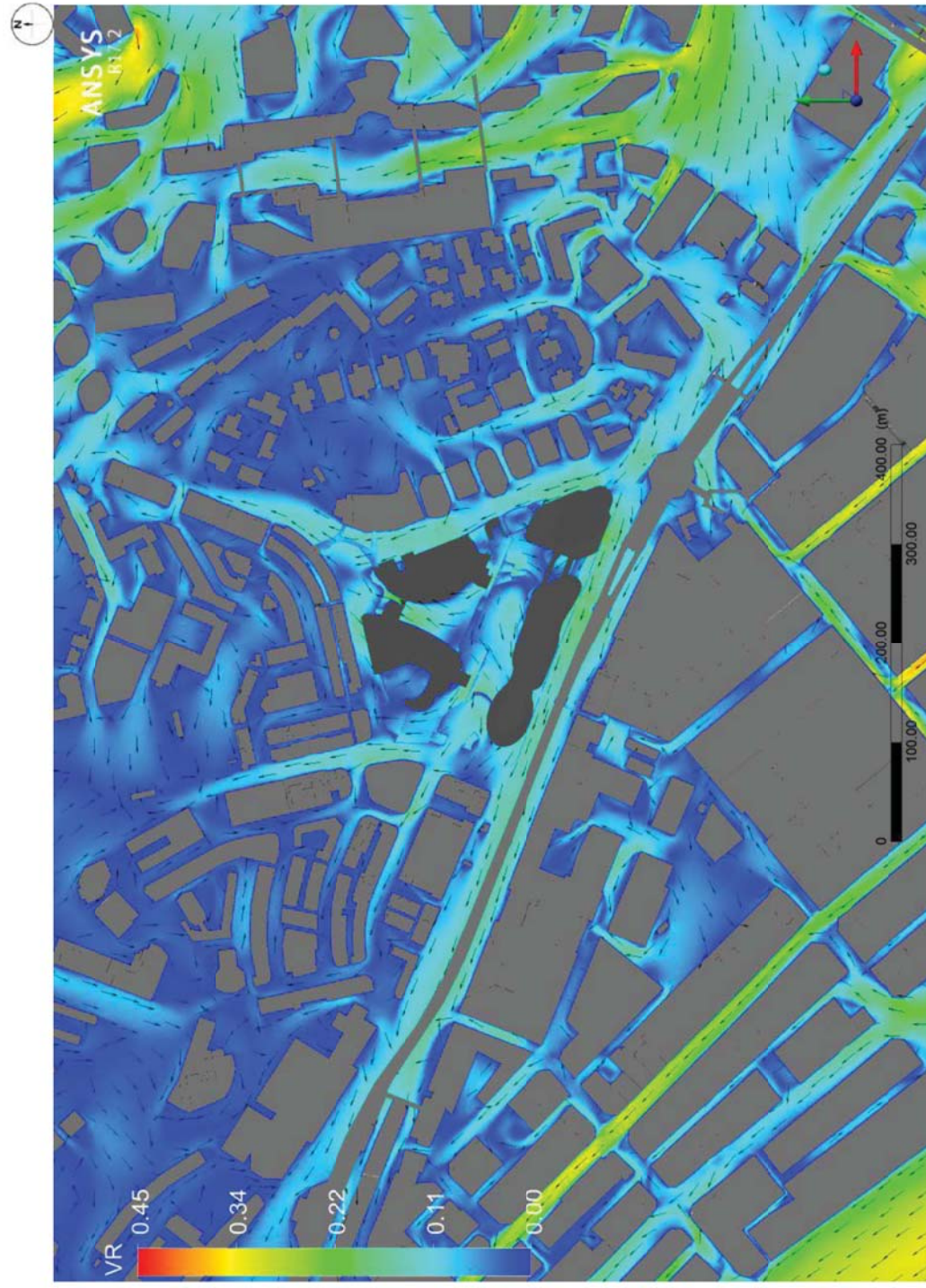






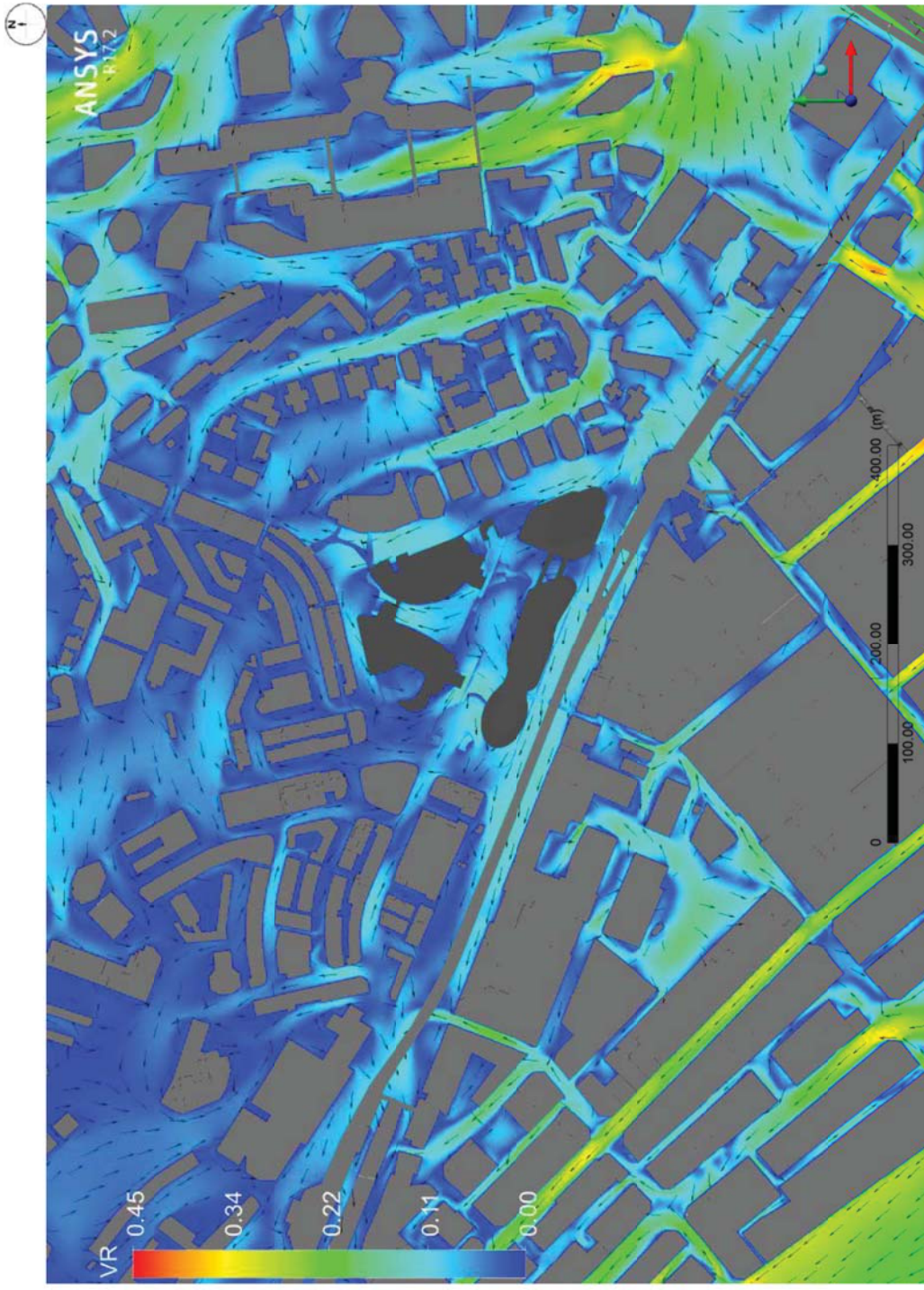


Proposed Scheme - Wind VR contour and vector plot at pedestrian level under SE Wind

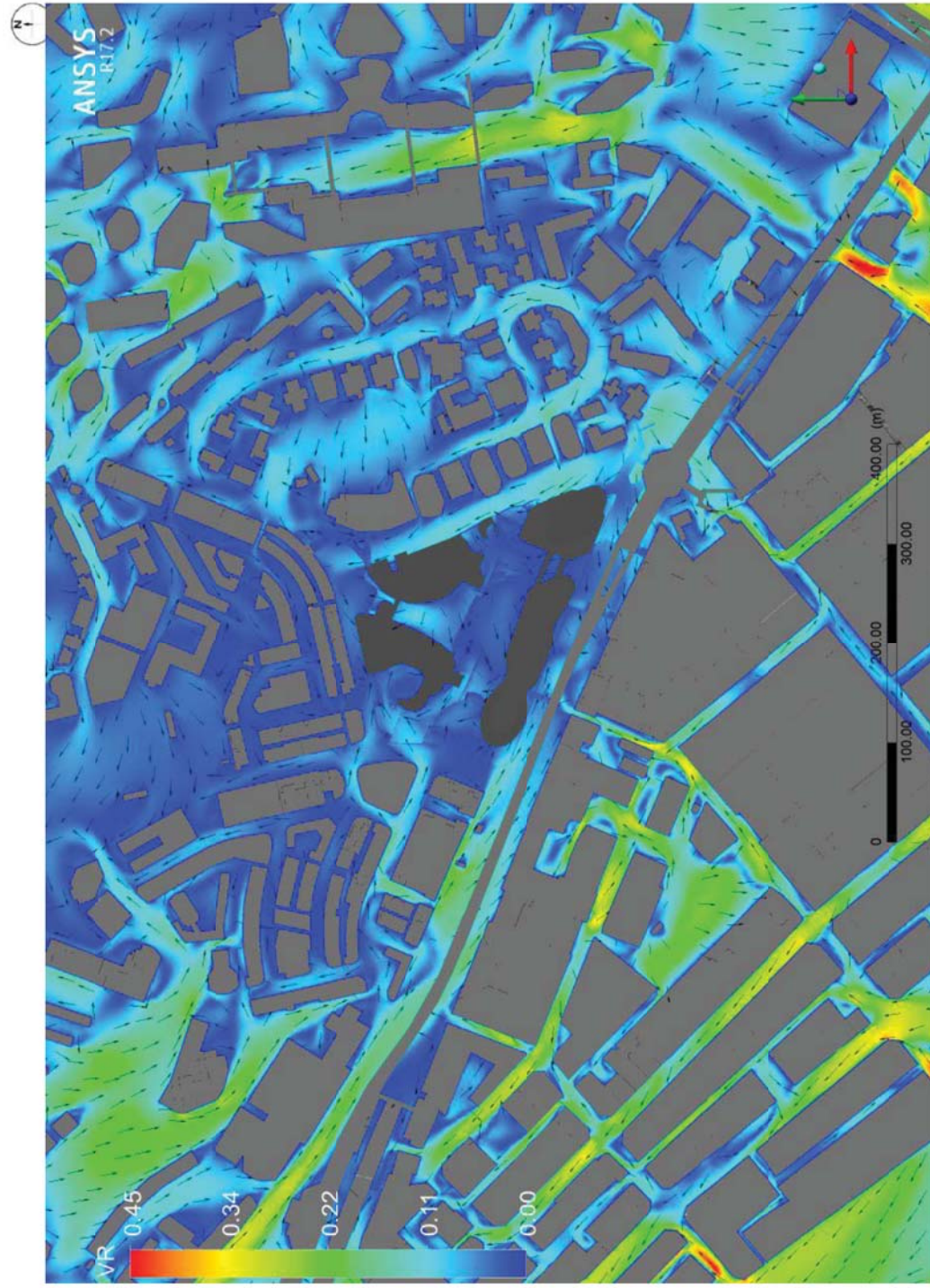


Proposed Scheme - Wind VR contour and vector plot at pedestrian level under SSE Wind



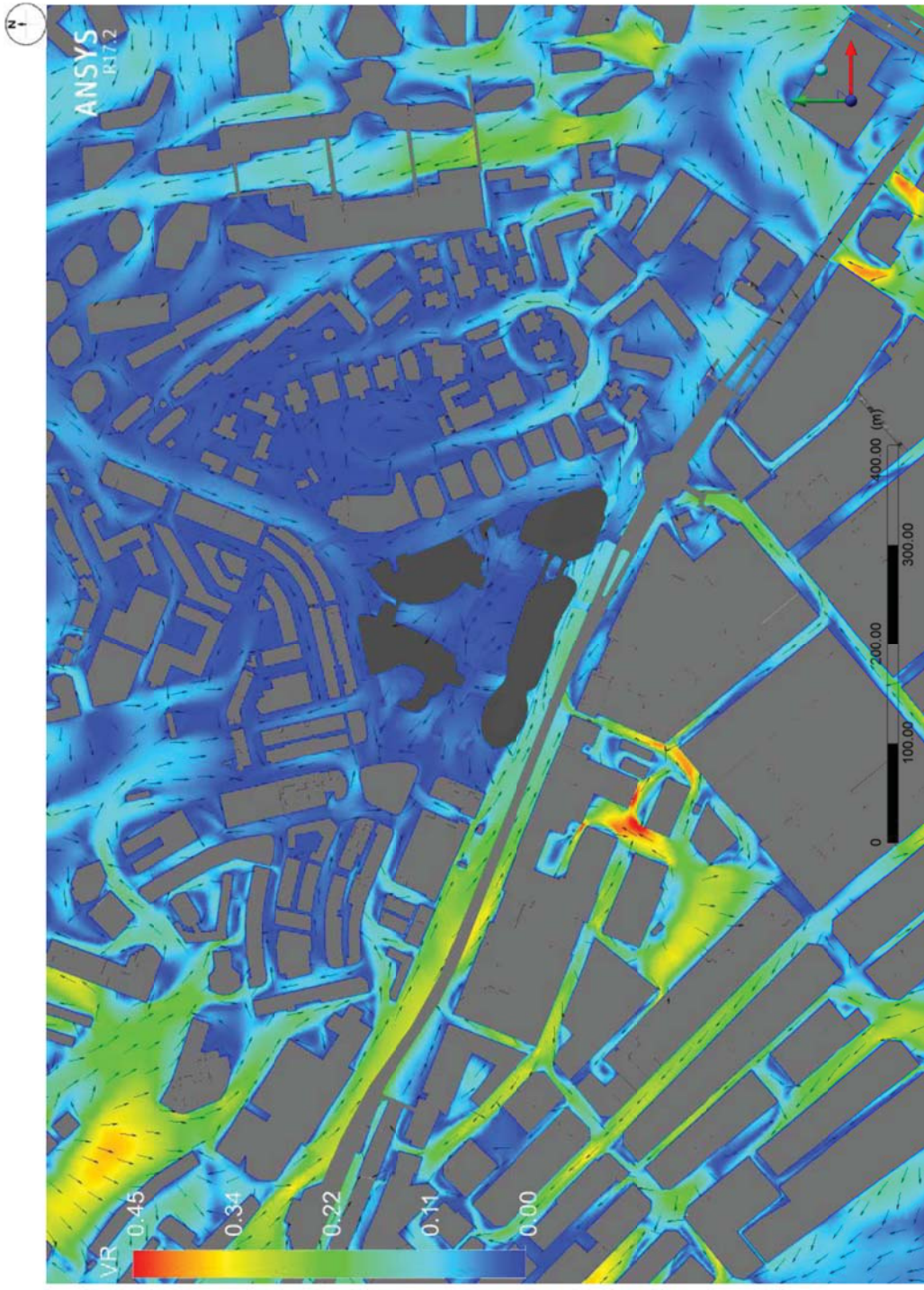


Proposed Scheme - Wind VR contour and vector plot at pedestrian level under S Wind

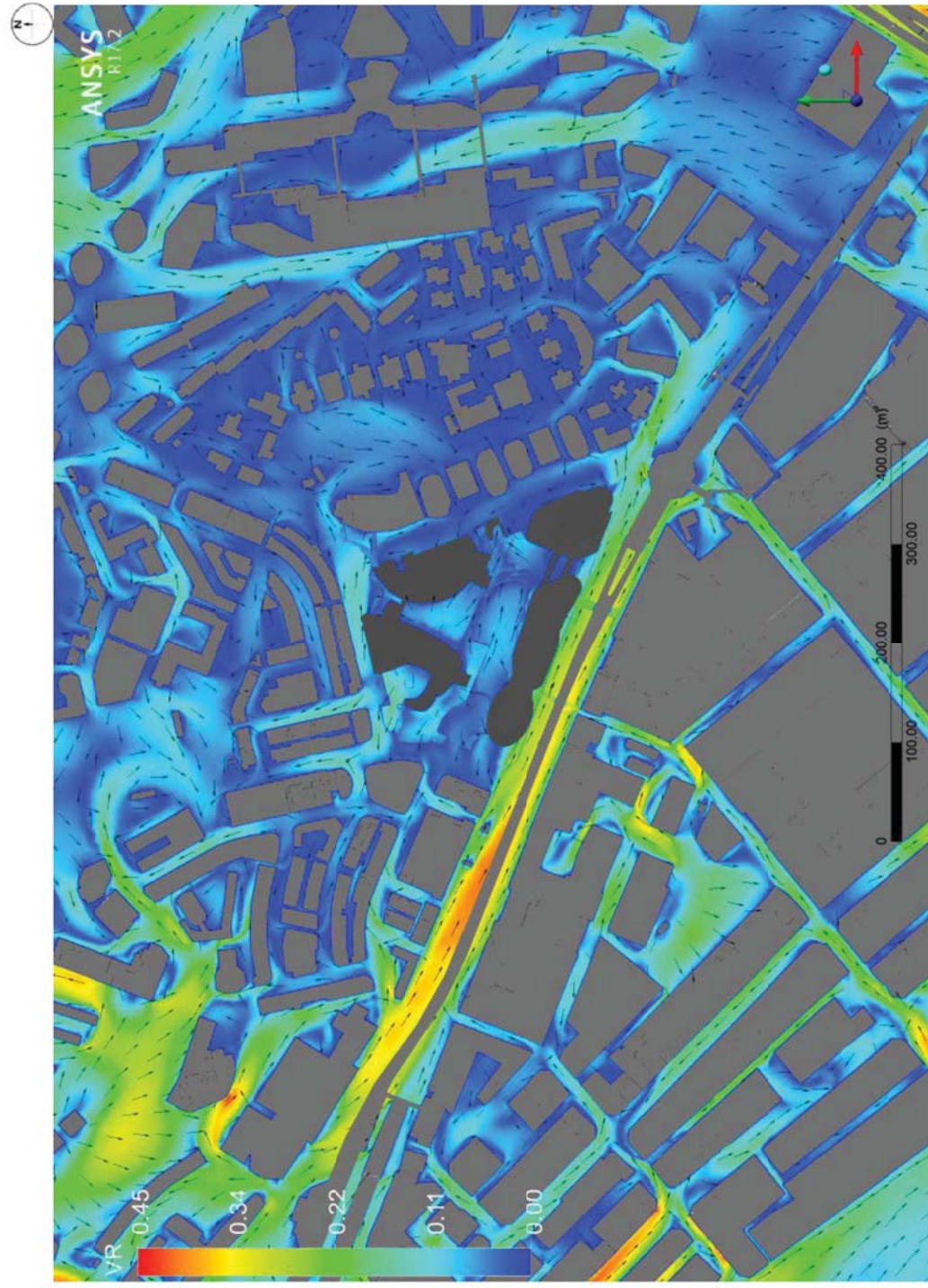


Proposed Scheme - Wind VR contour and vector plot at pedestrian level under SSW Wind



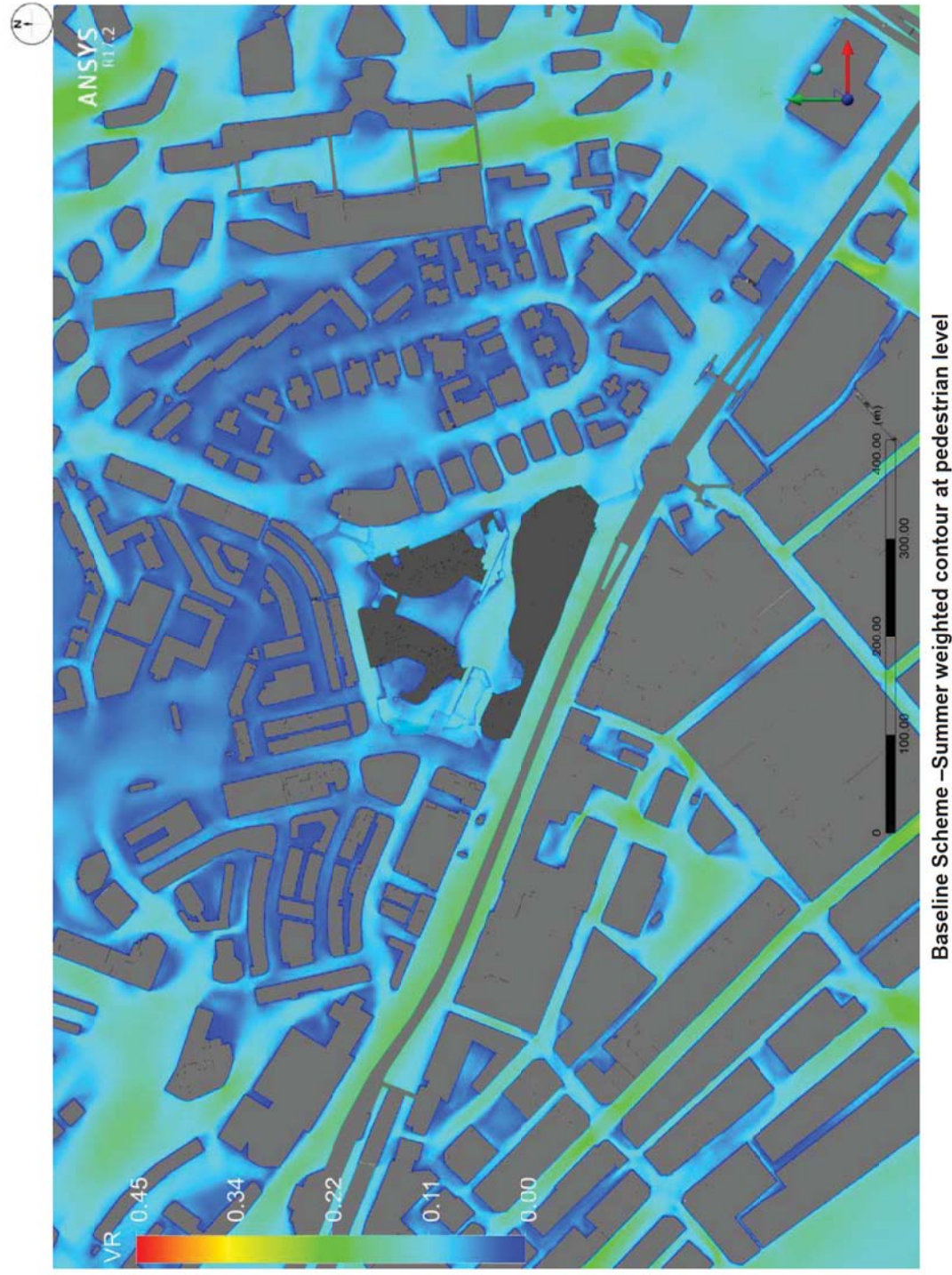
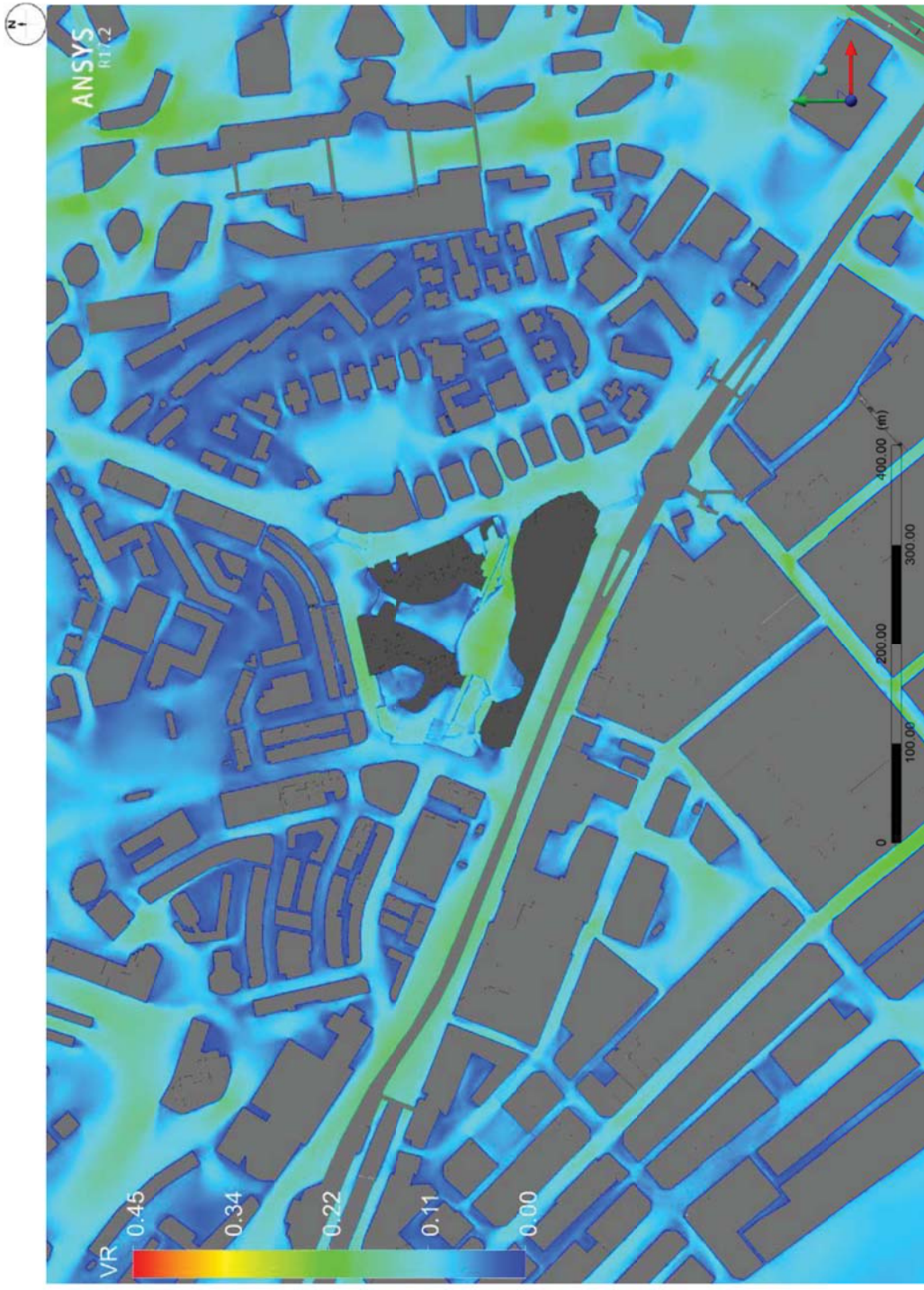


Proposed Scheme - Wind VR contour and vector plot at pedestrian level under SW Wind

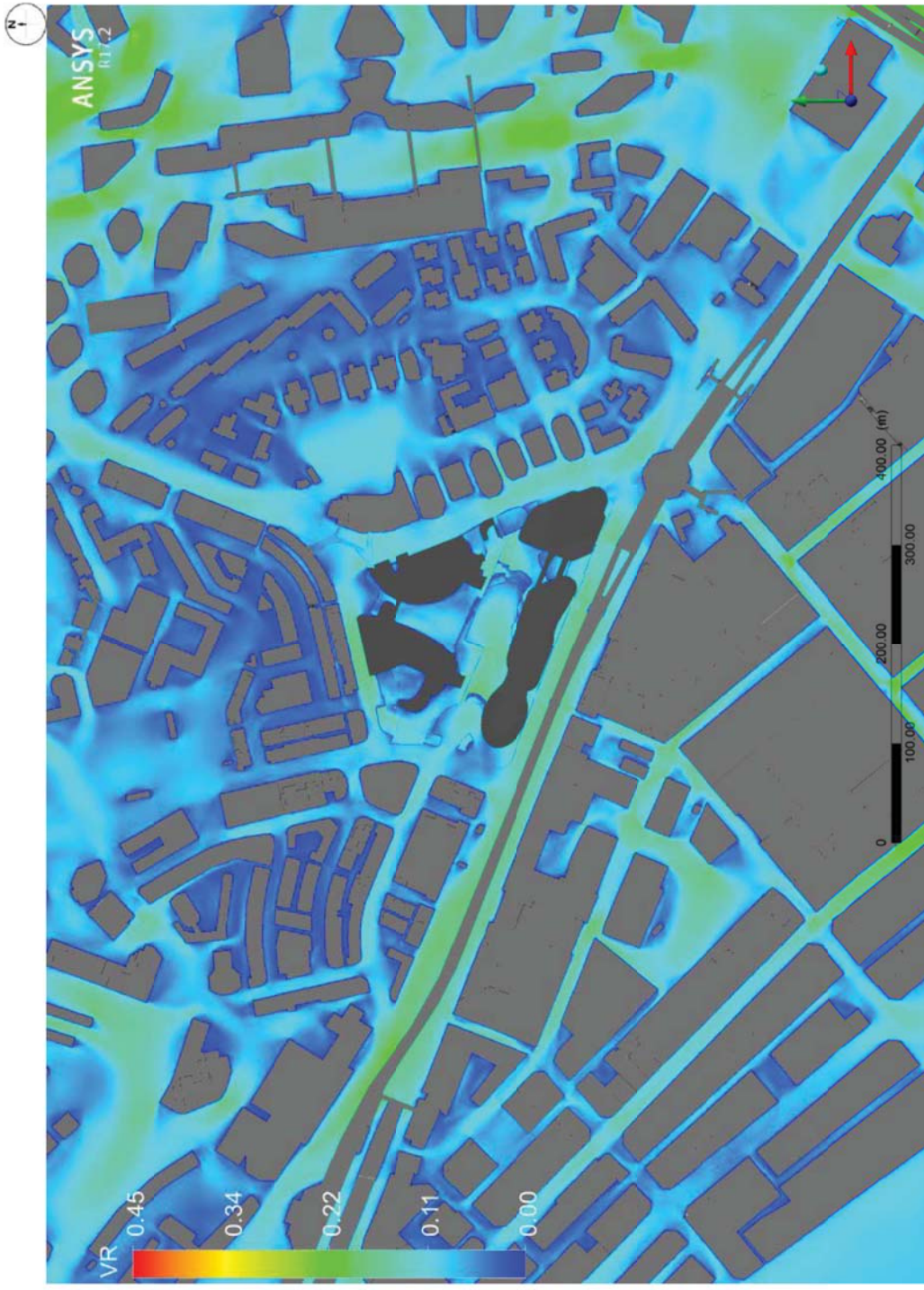


Proposed Scheme - Wind VR contour and vector plot at pedestrian level under WSW Wind

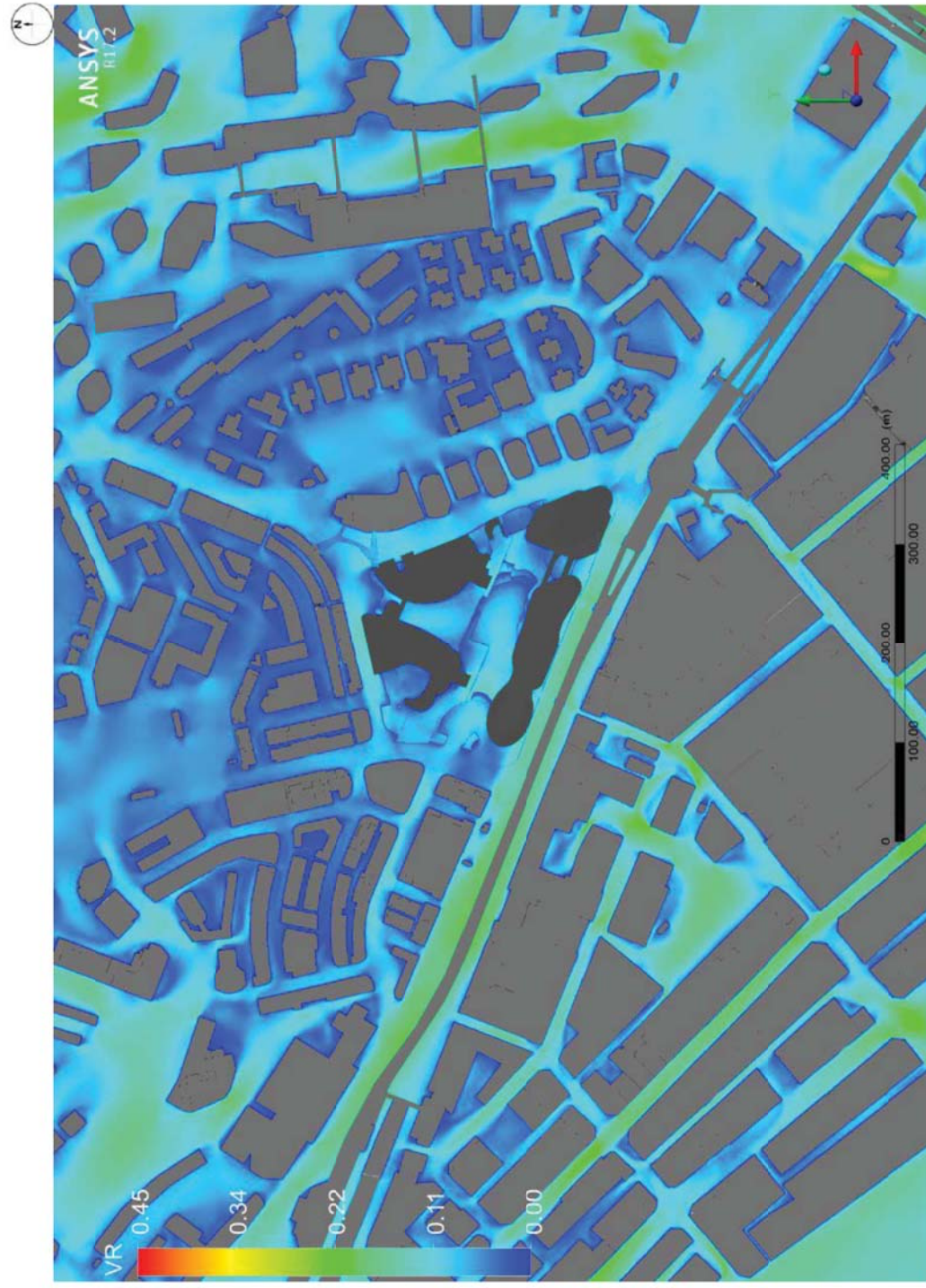






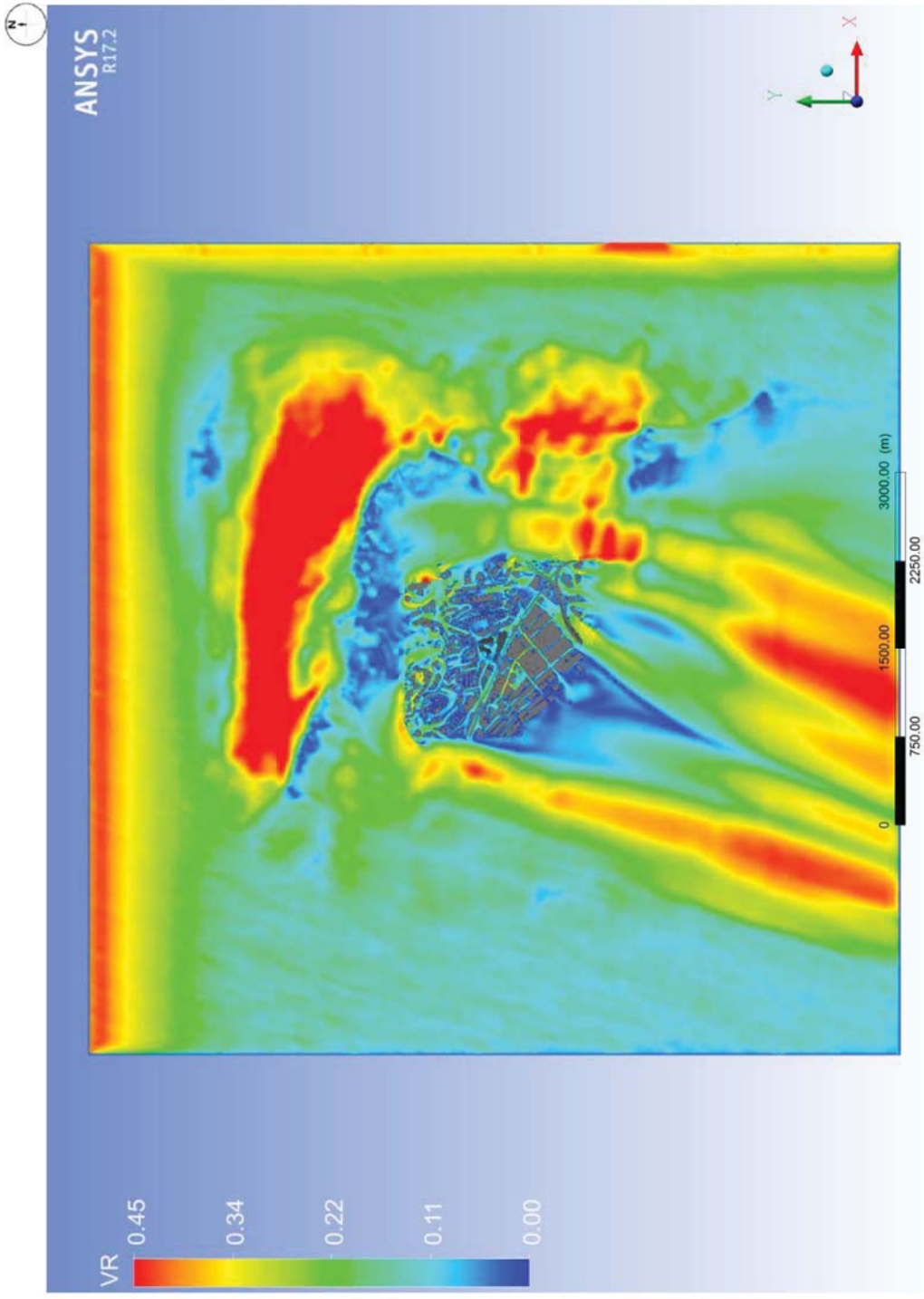


Proposed Scheme – Annual weighted contour at pedestrian level

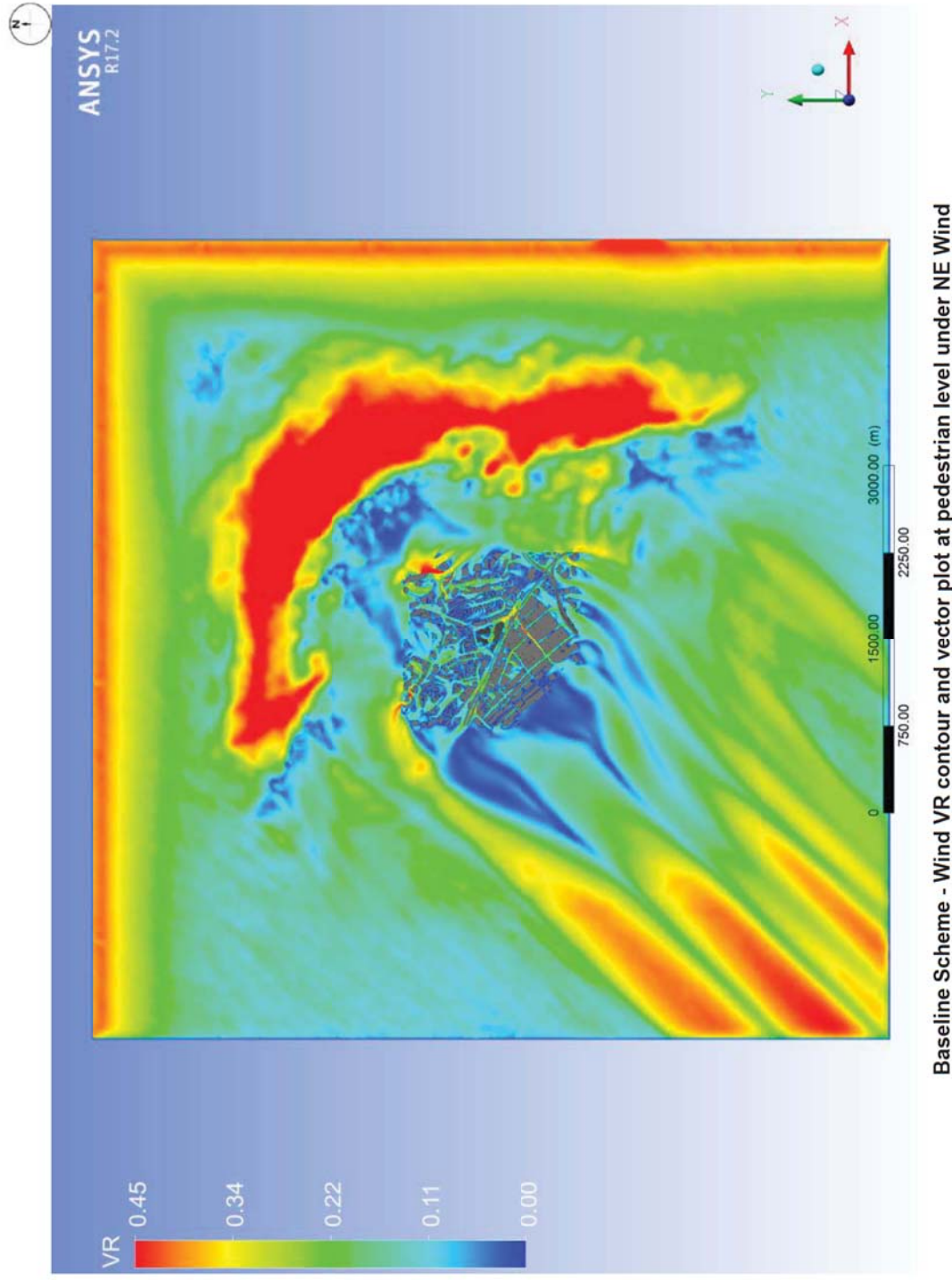


Proposed Scheme – Summer weighted contour at pedestrian level

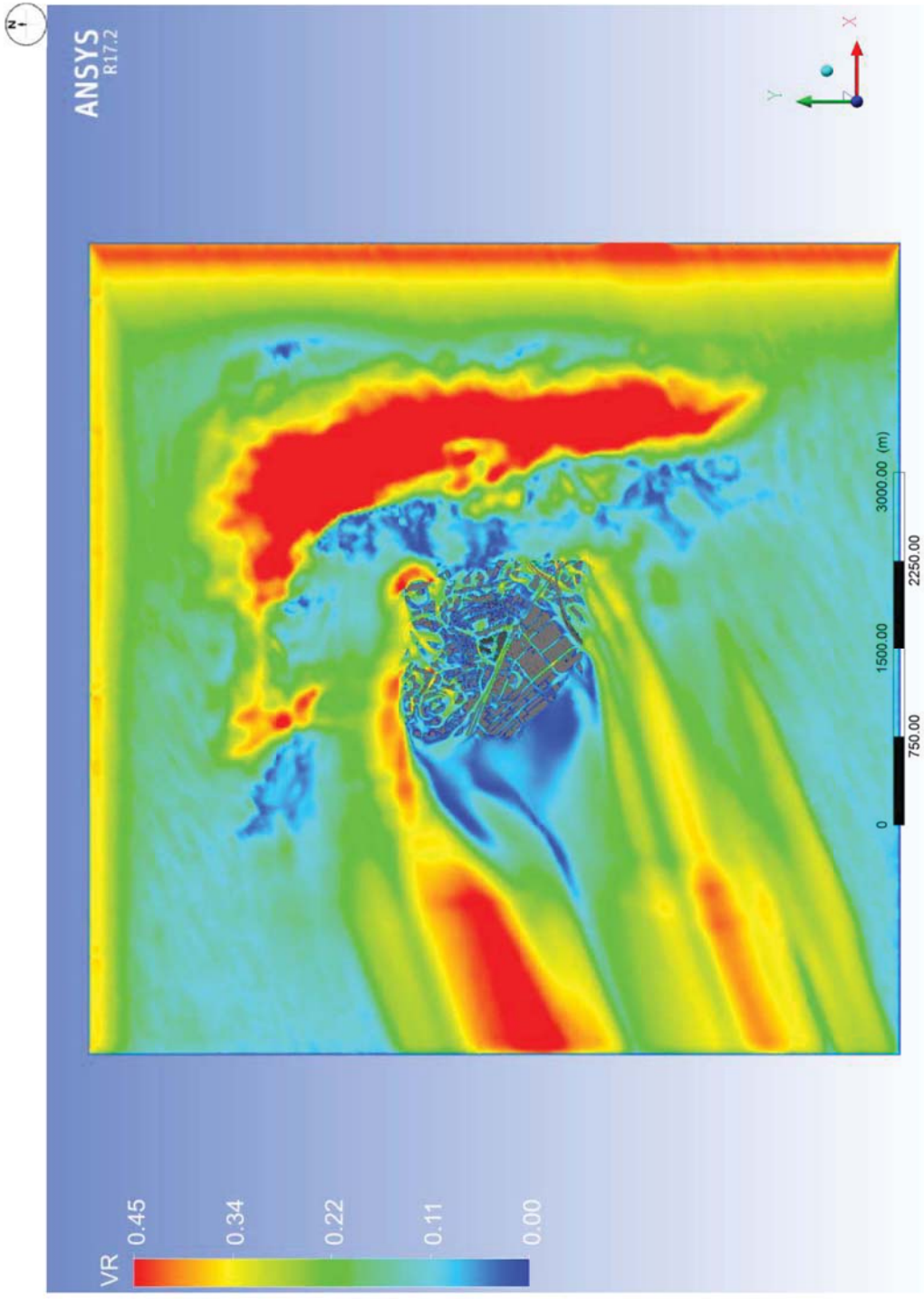




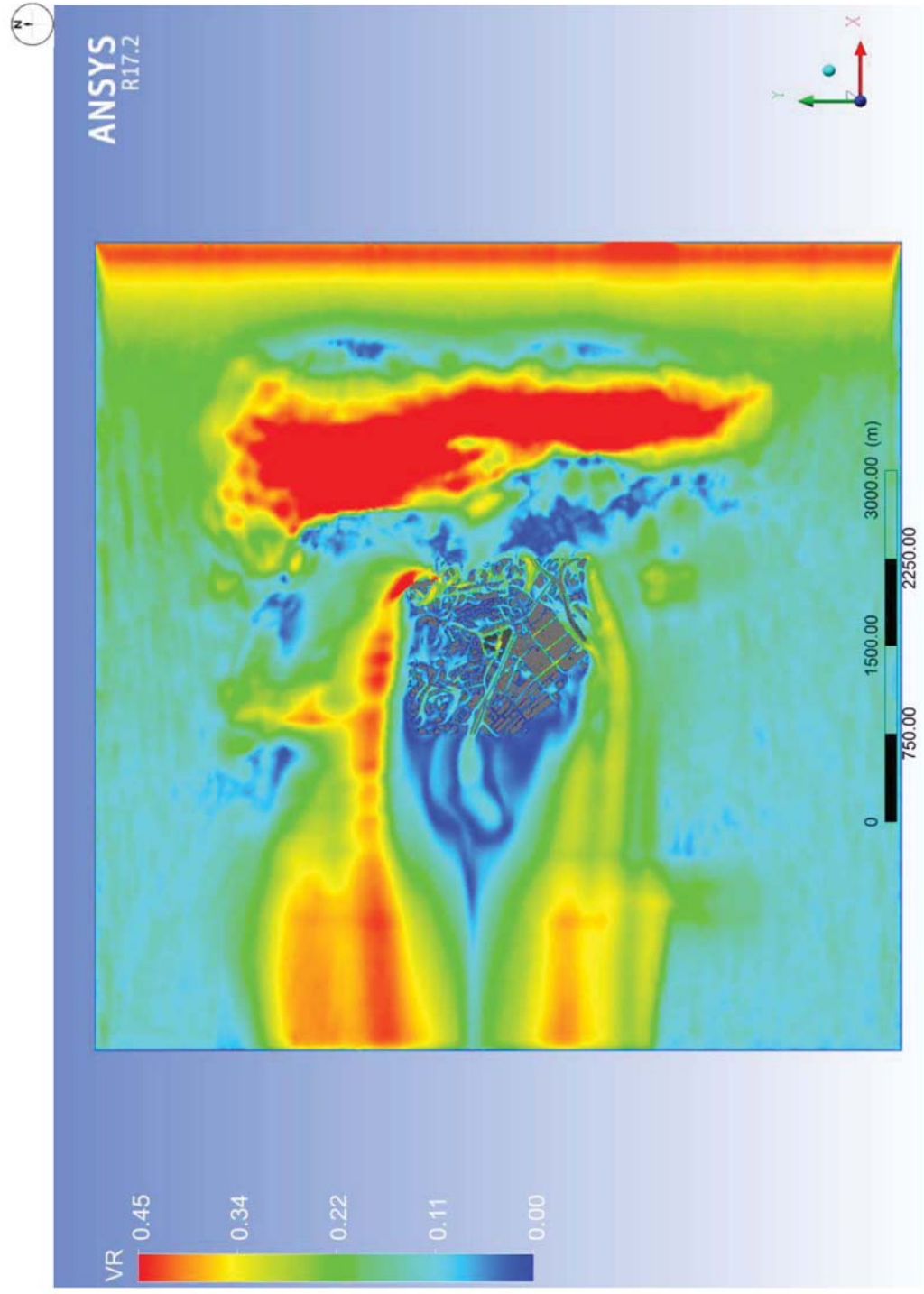
Baseline Scheme - Wind VR contour and vector plot at pedestrian level under NNE Wind



Baseline Scheme - Wind VR contour and vector plot at pedestrian level under NE Wind

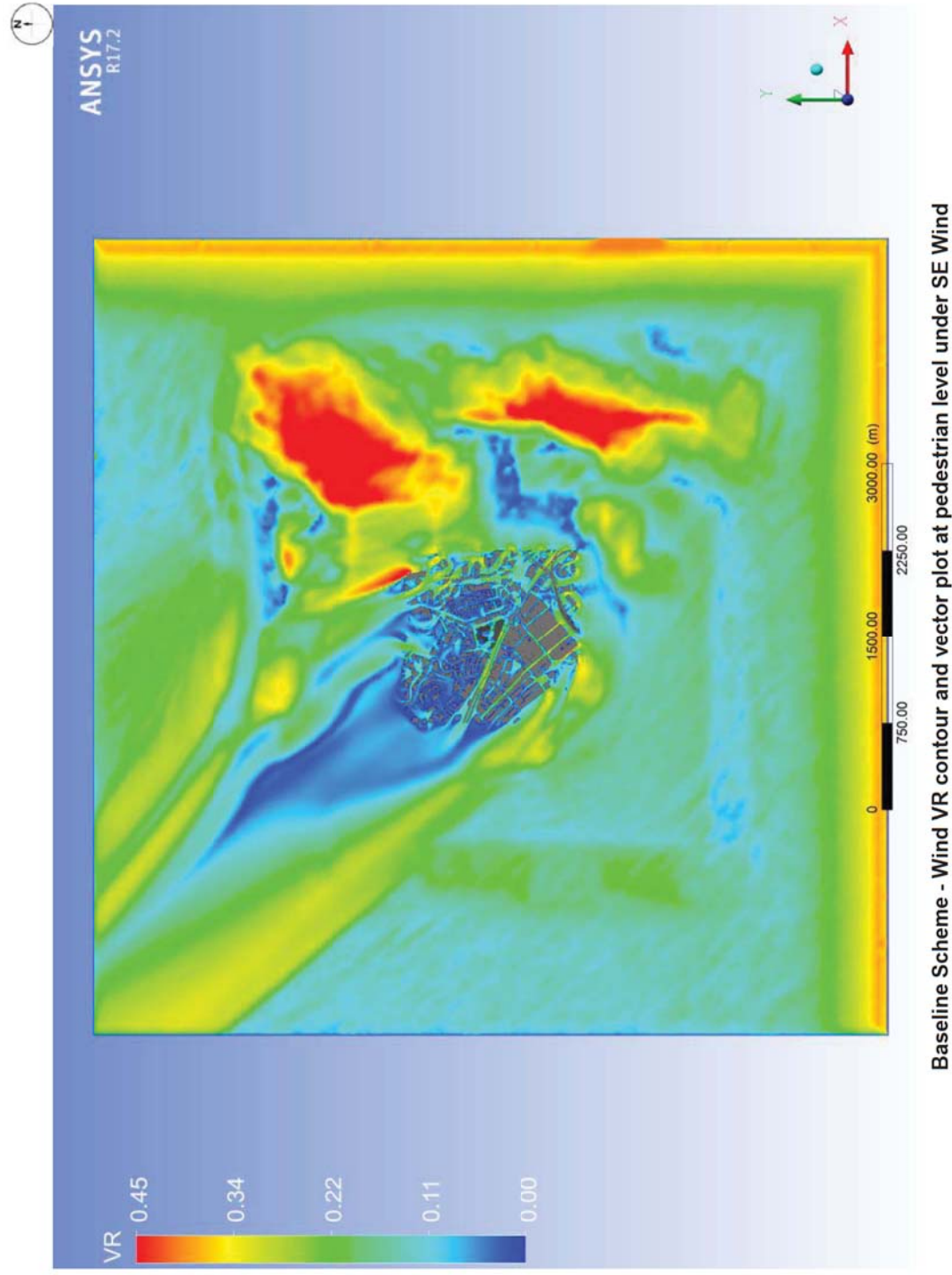
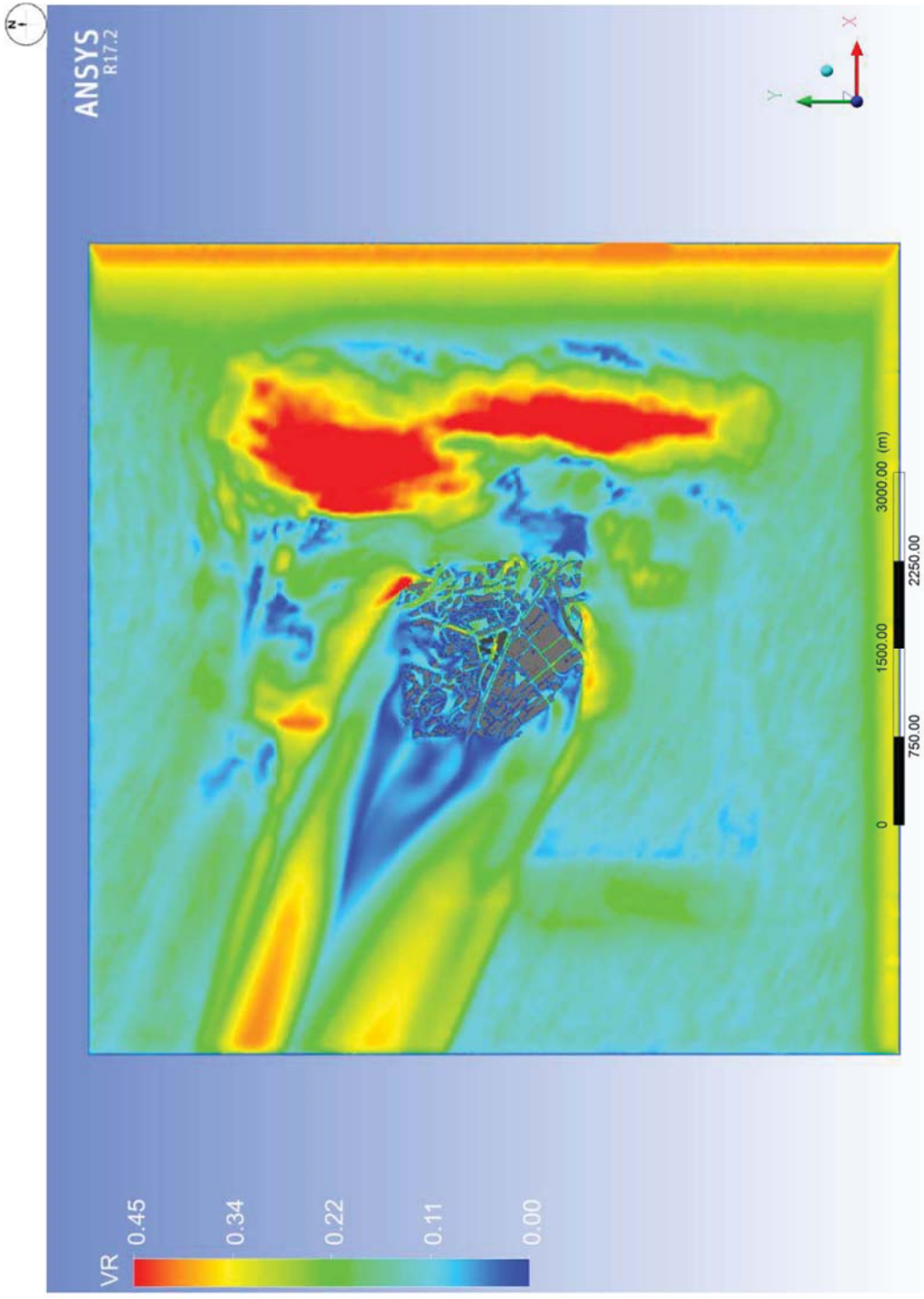


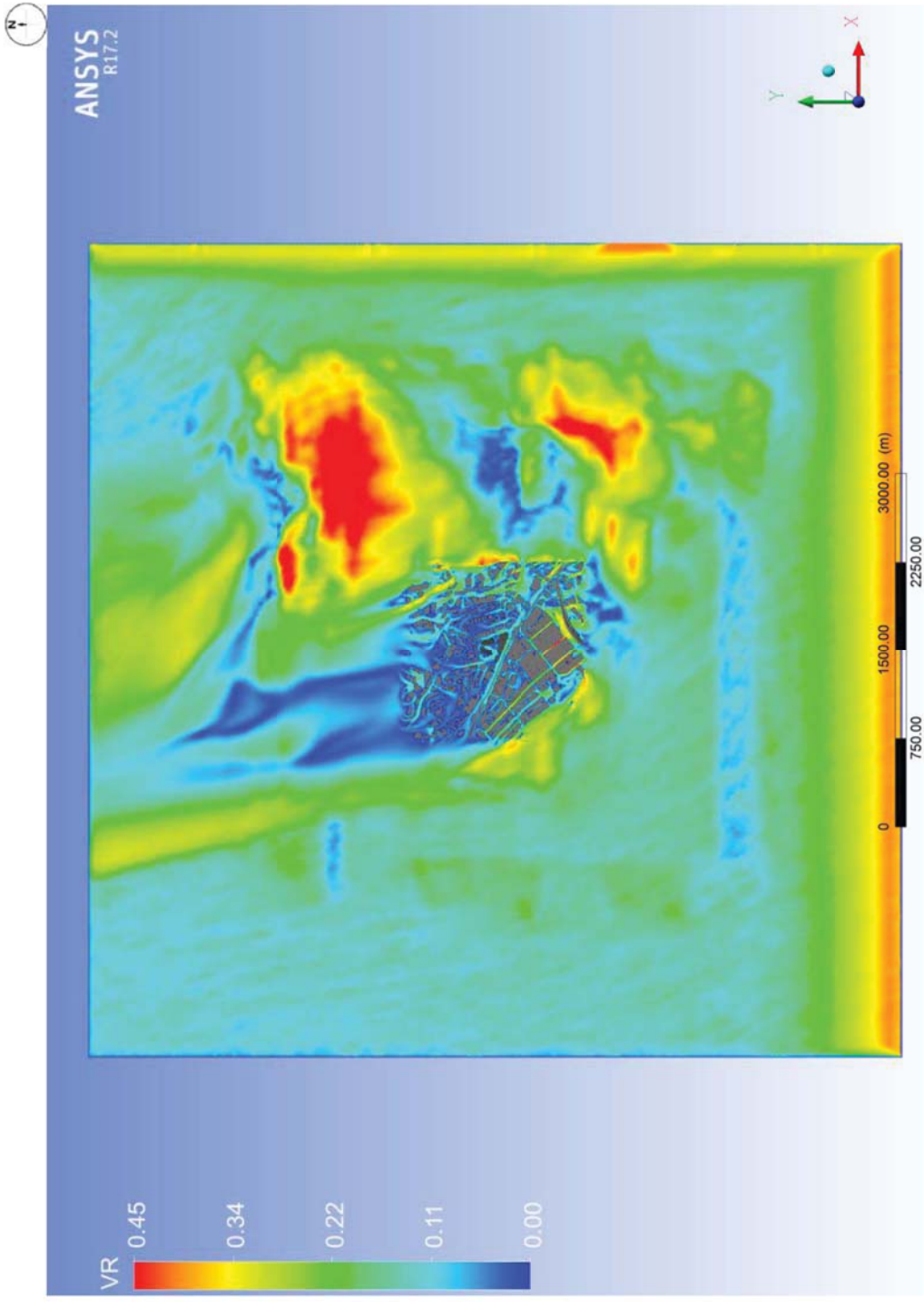
Baseline Scheme - Wind VR contour and vector plot at pedestrian level under ENE Wind



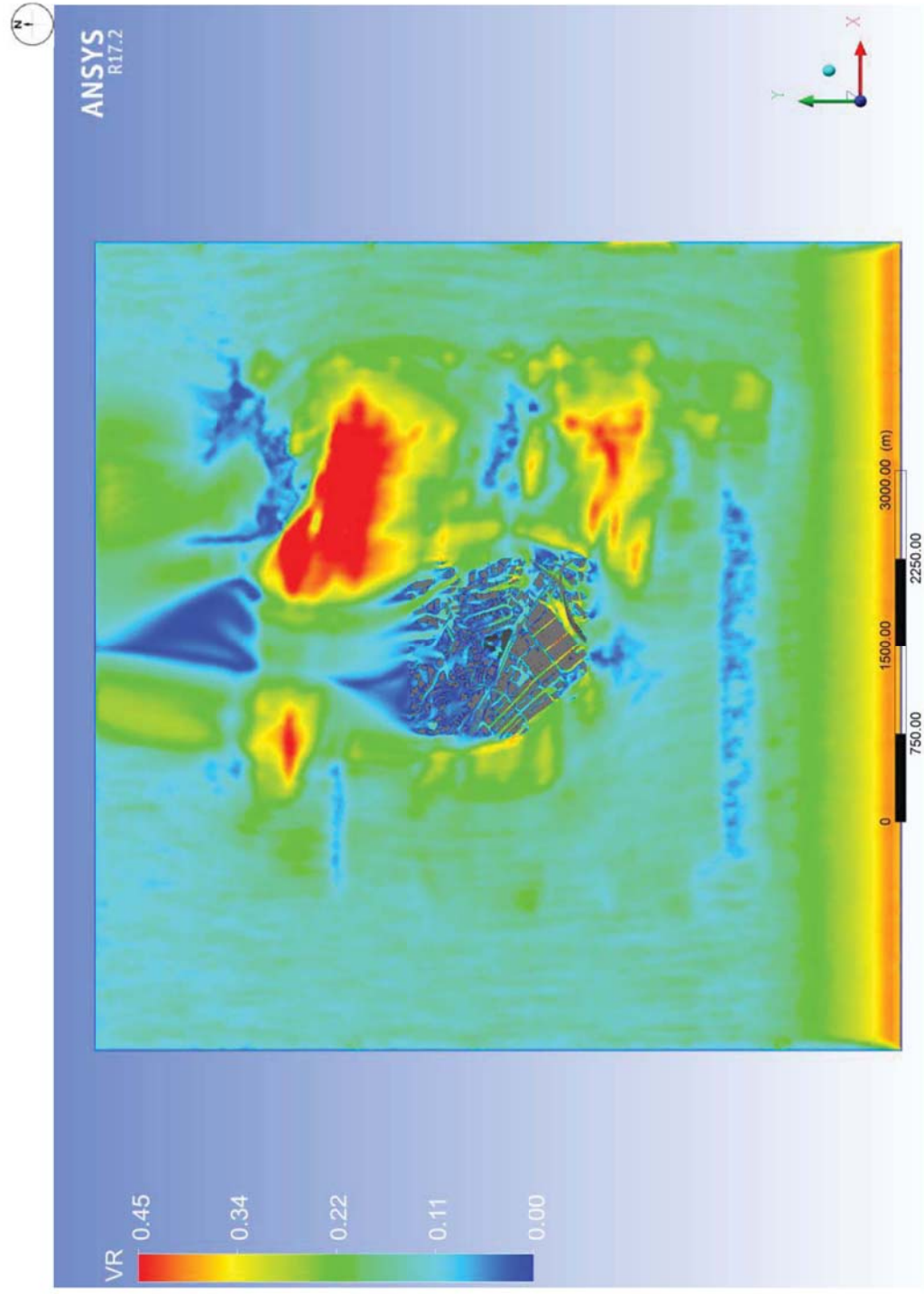
Baseline Scheme - Wind VR contour and vector plot at pedestrian level under E Wind





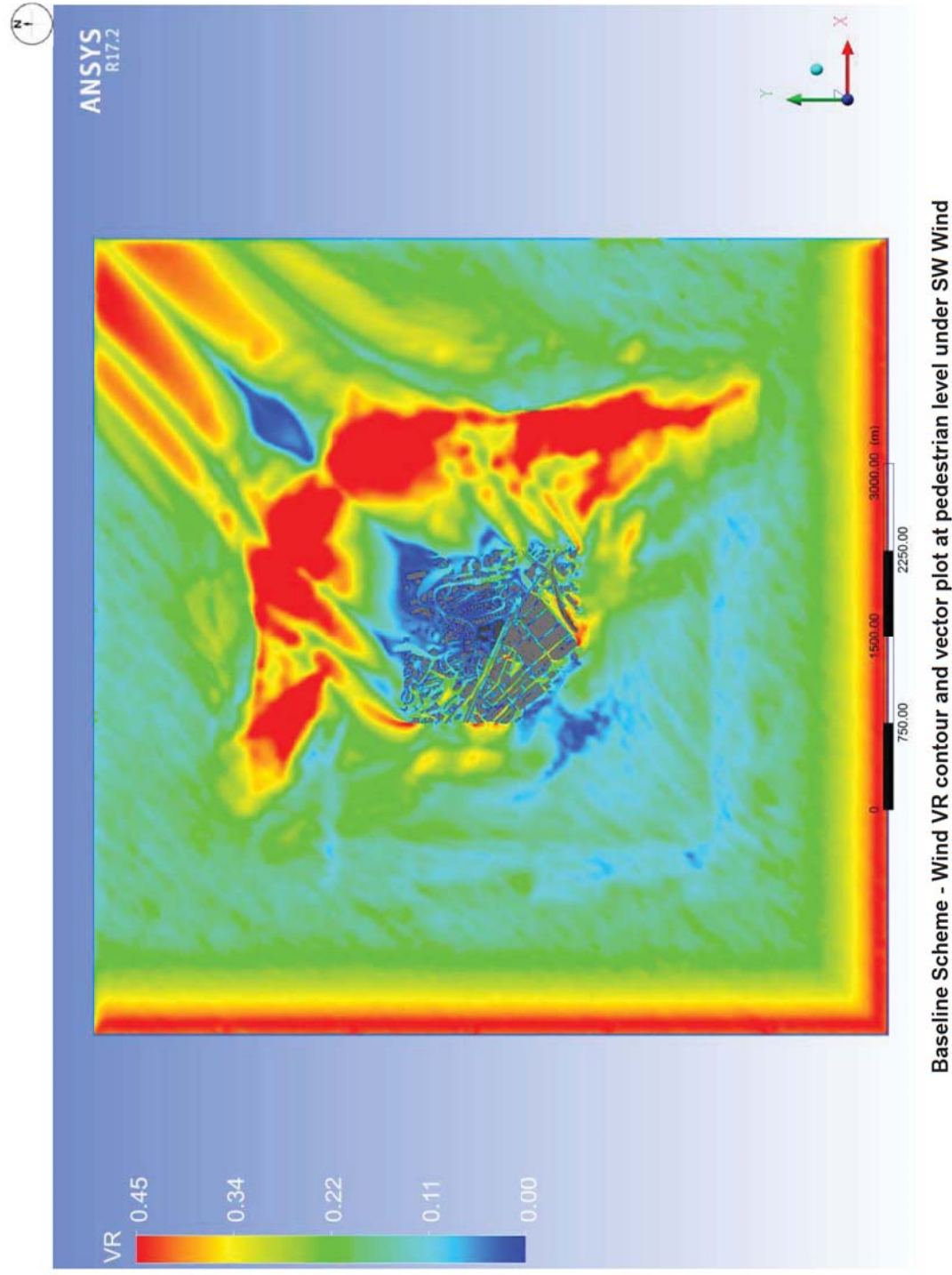
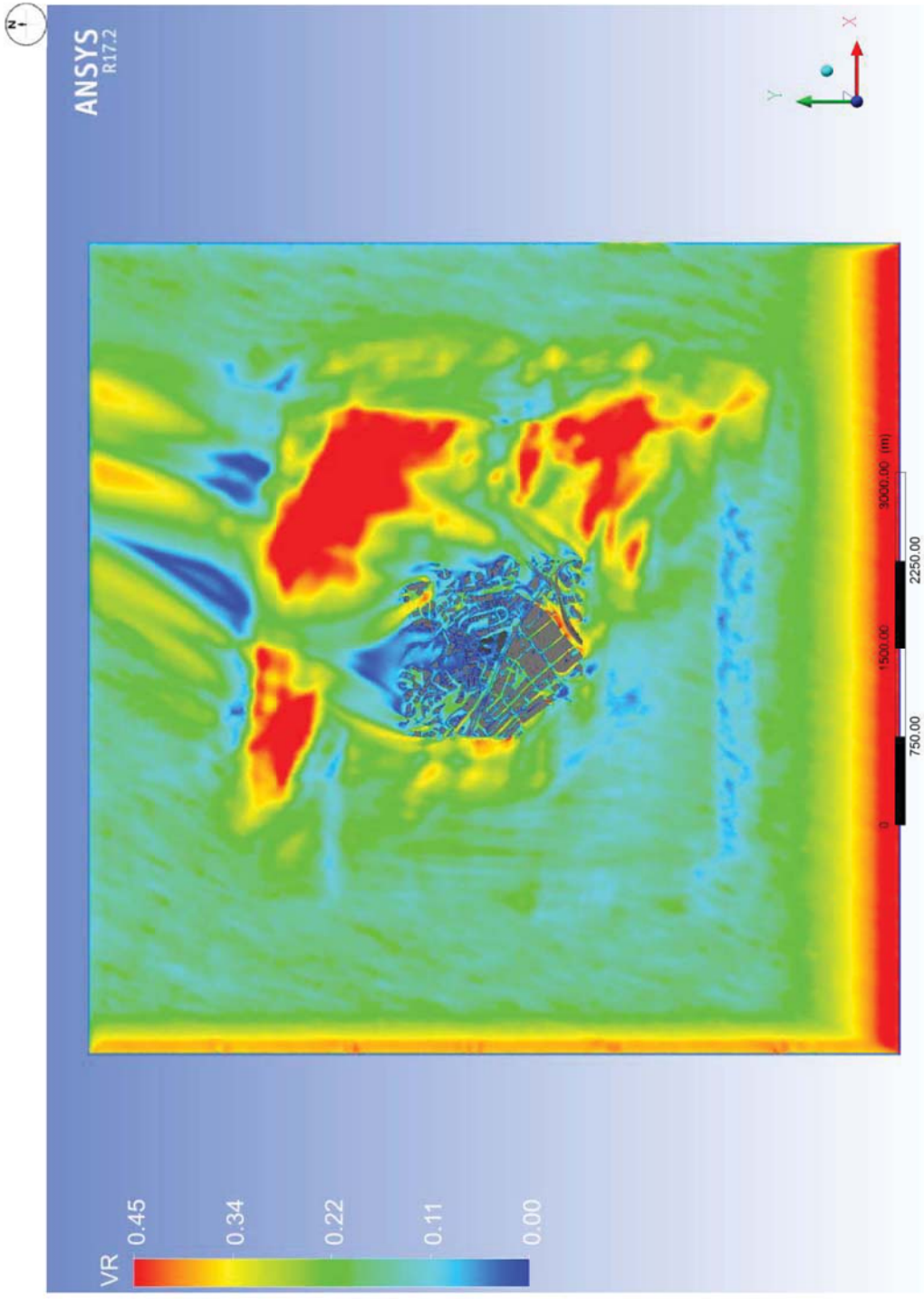


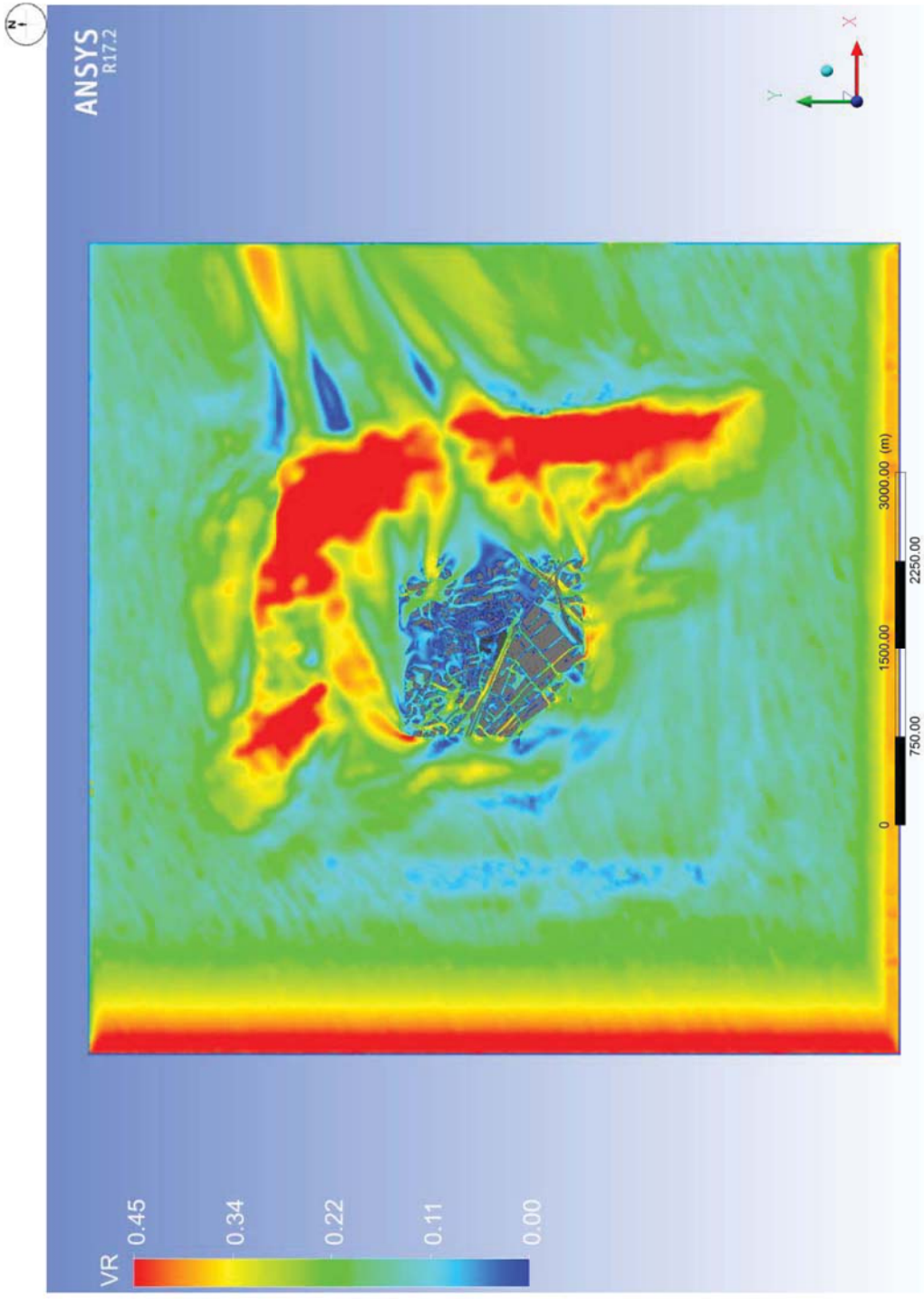
Baseline Scheme - Wind VR contour and vector plot at pedestrian level under SSE Wind



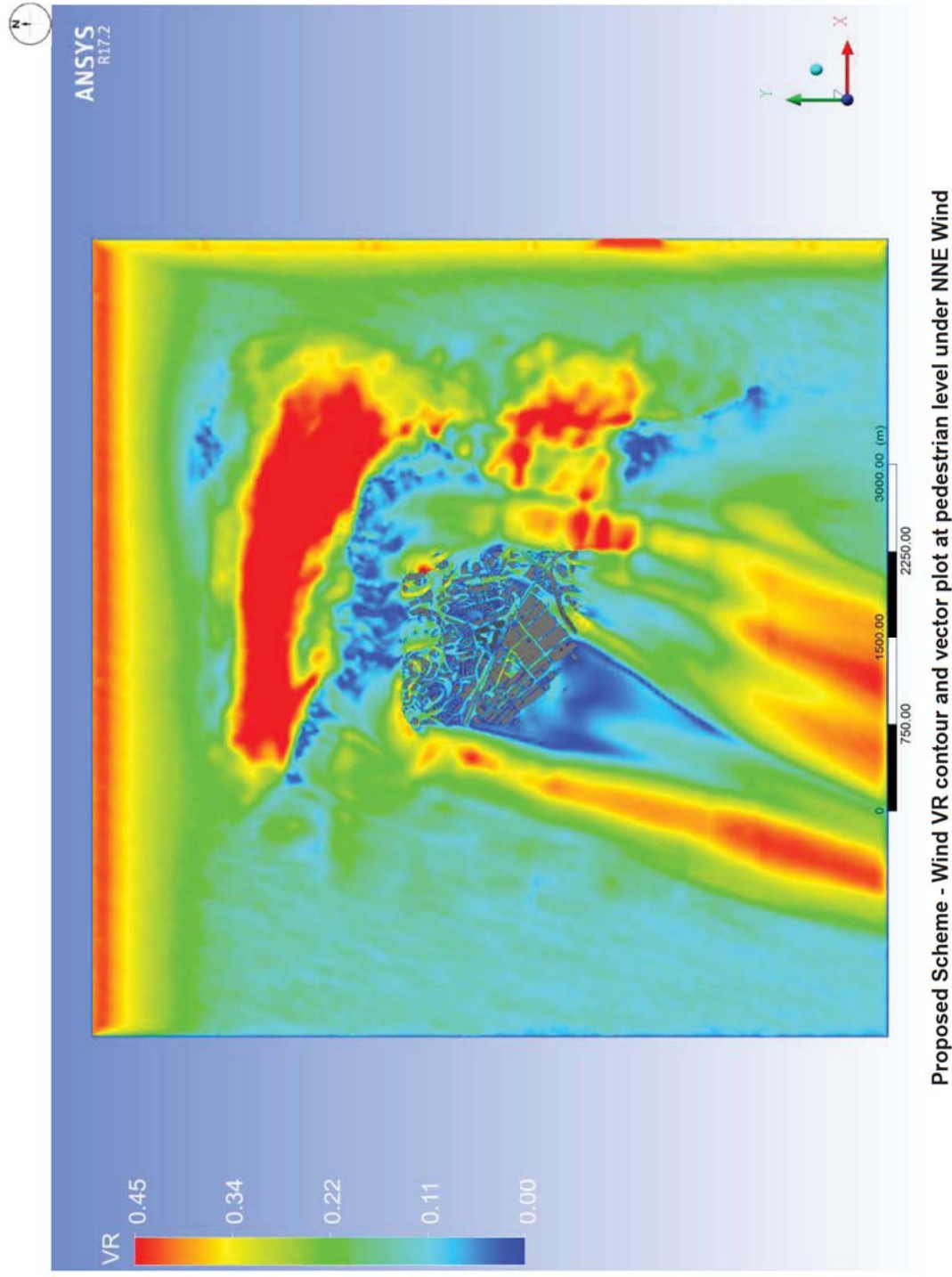
Baseline Scheme - Wind VR contour and vector plot at pedestrian level under S Wind





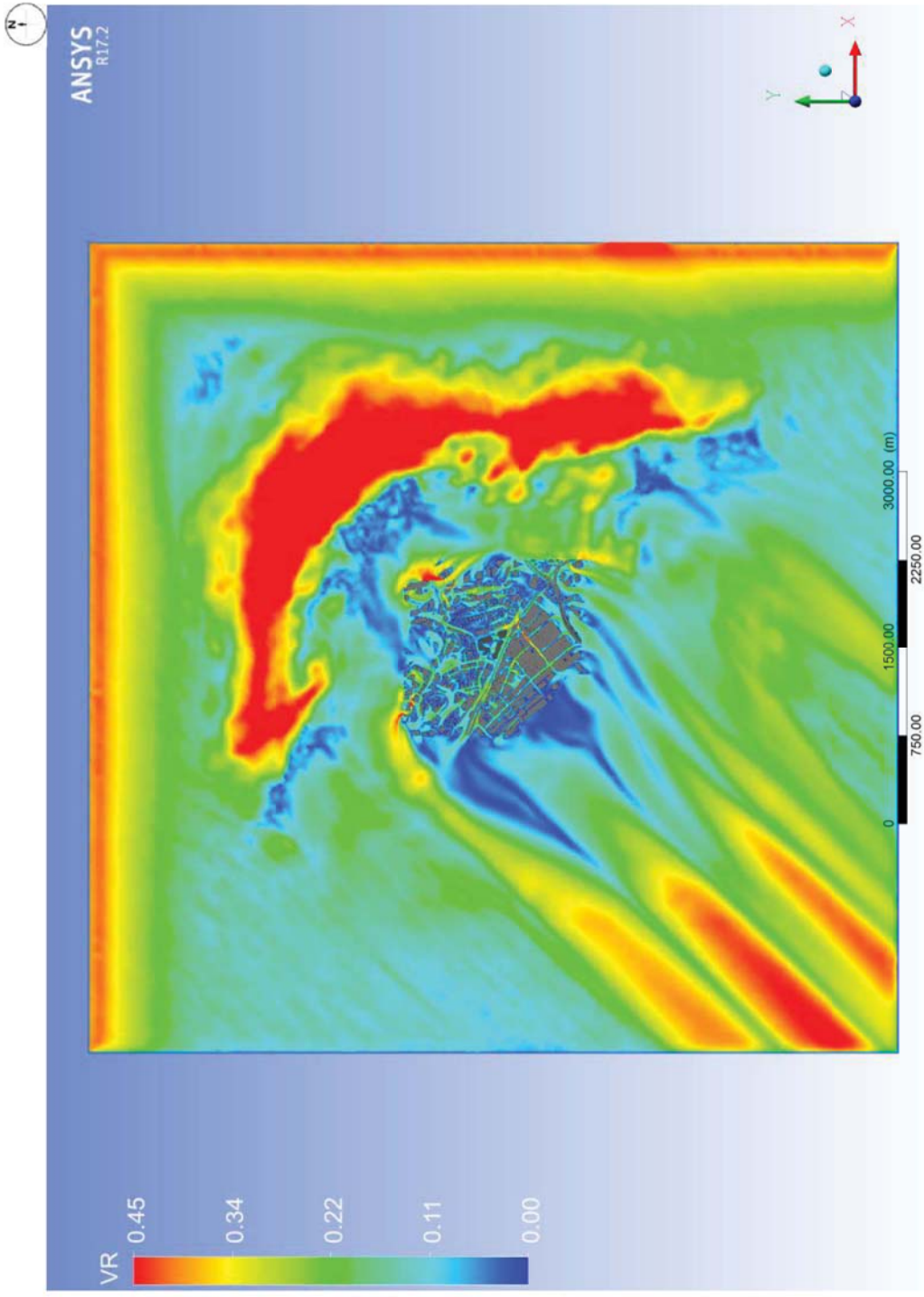


Baseline Scheme - Wind VR contour and vector plot at pedestrian level under WSW Wind

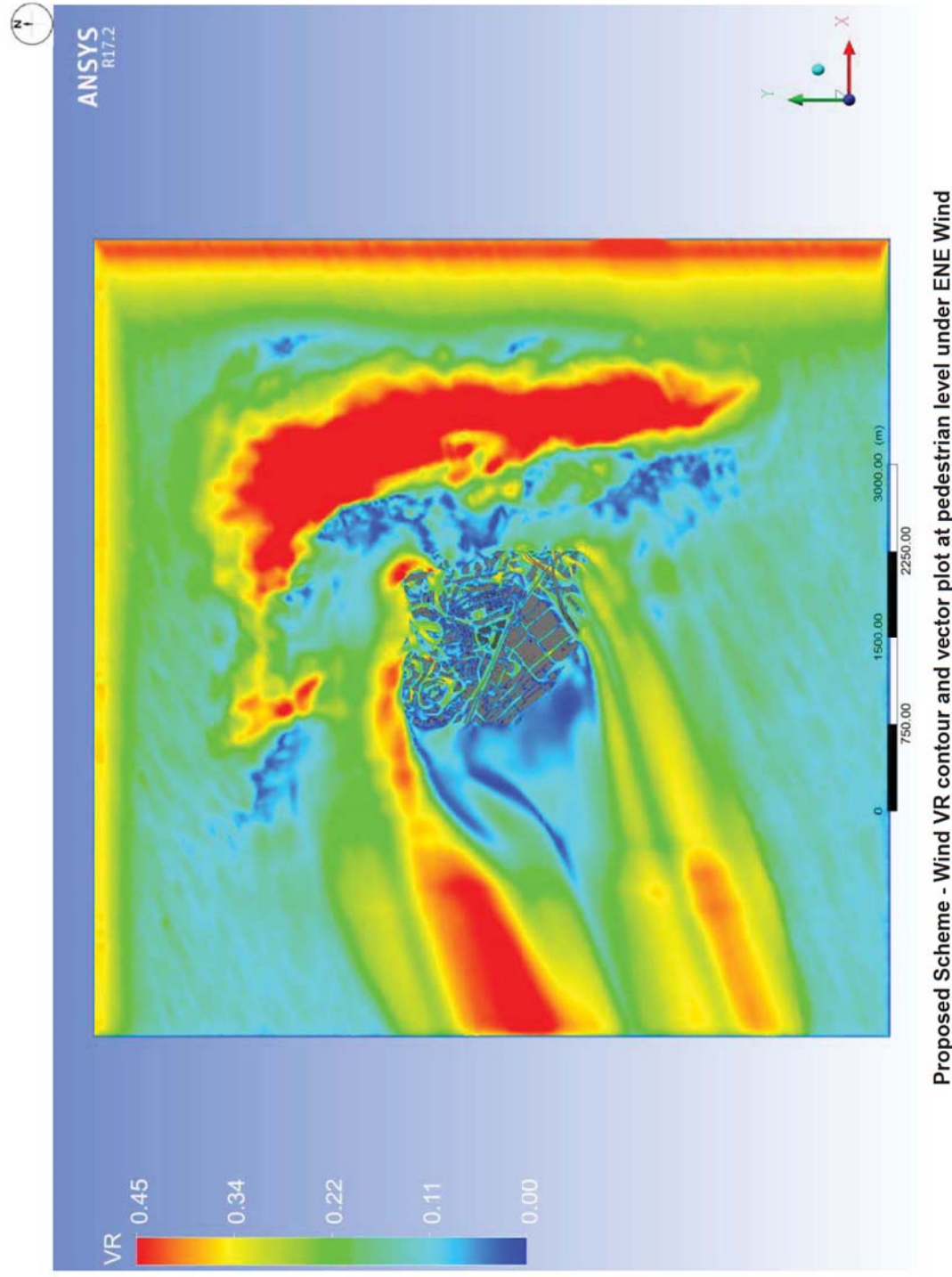


Proposed Scheme - Wind VR contour and vector plot at pedestrian level under NNE Wind

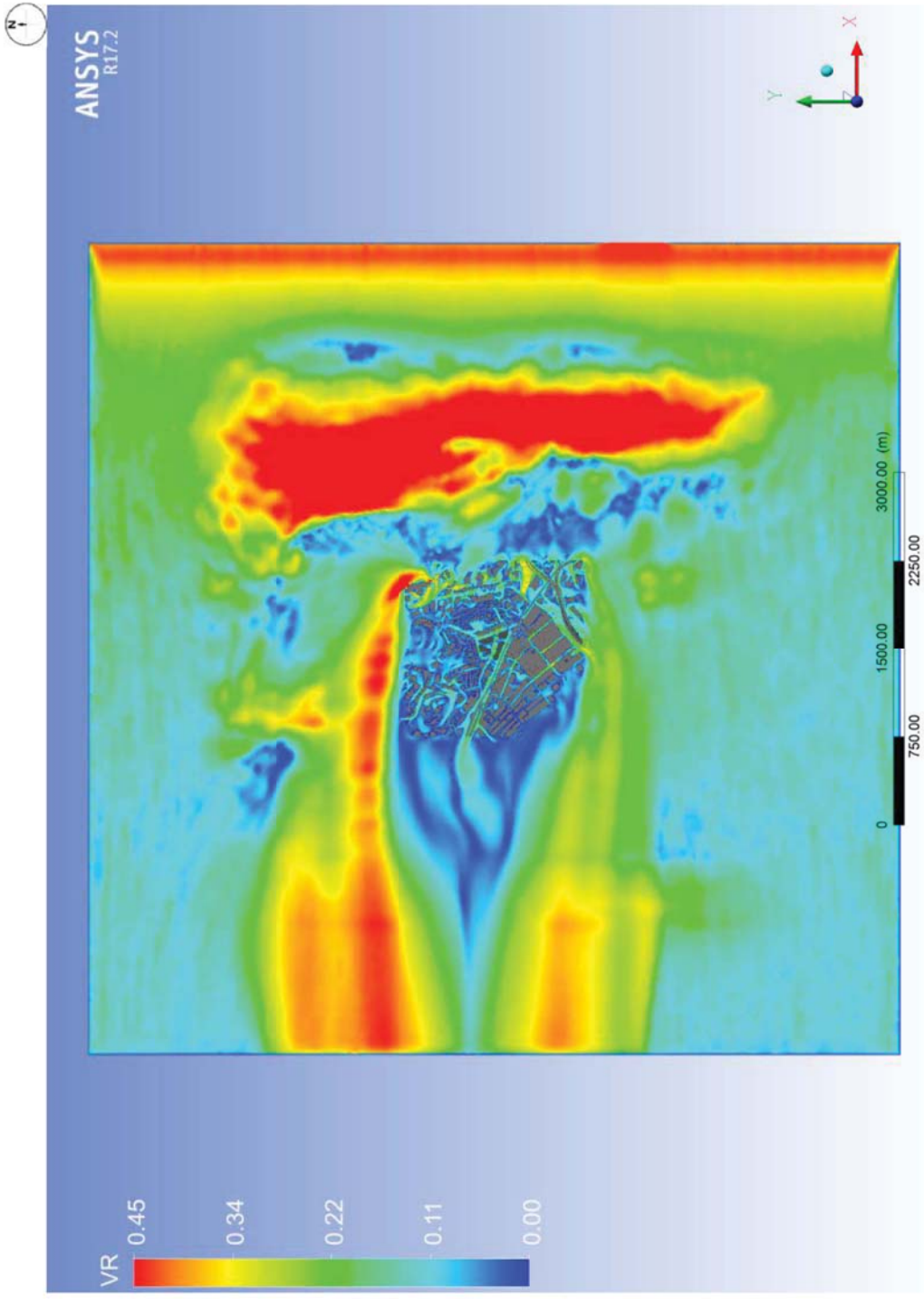




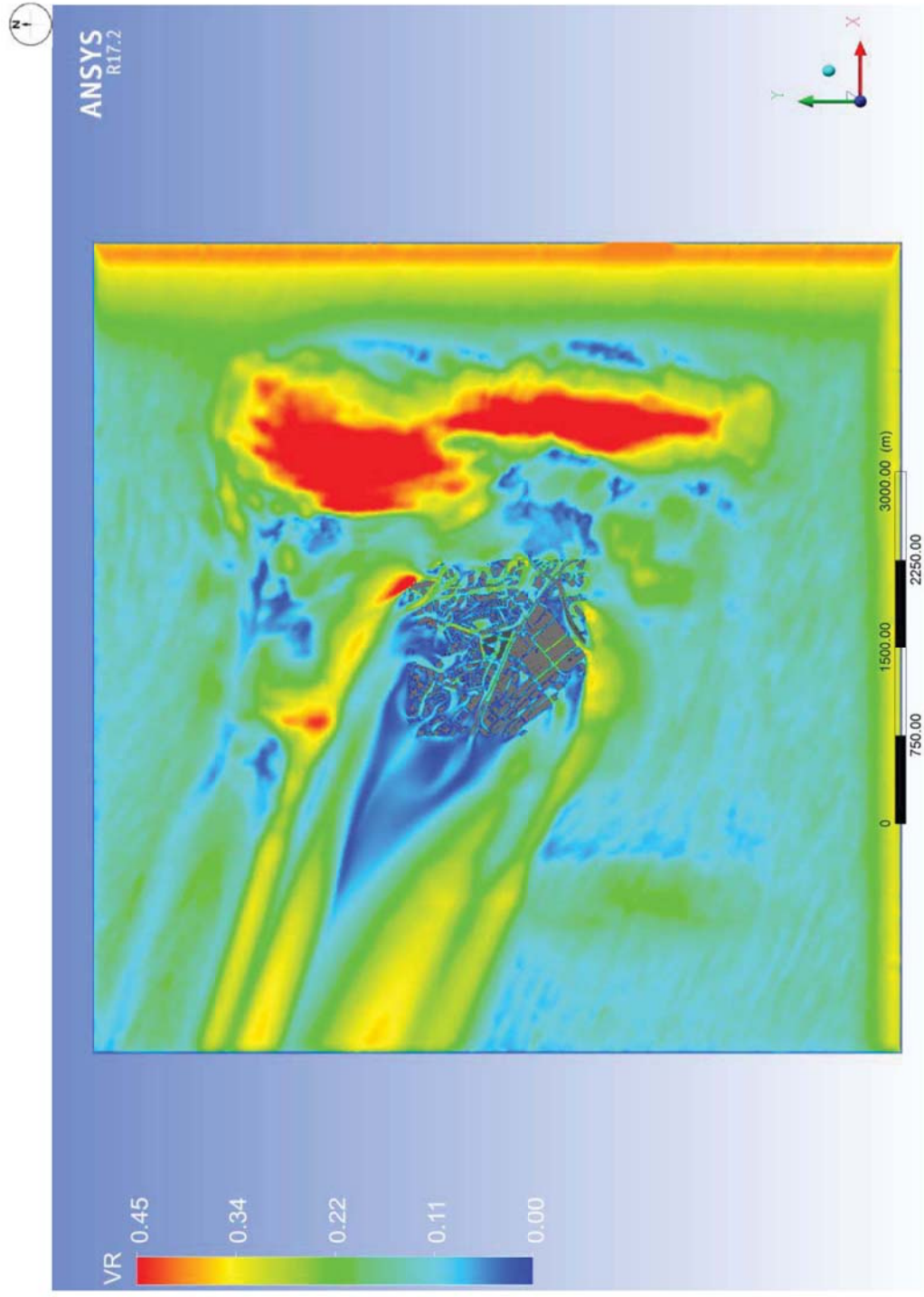
Proposed Scheme - Wind VR contour and vector plot at pedestrian level under NE Wind



Proposed Scheme - Wind VR contour and vector plot at pedestrian level under ENE Wind

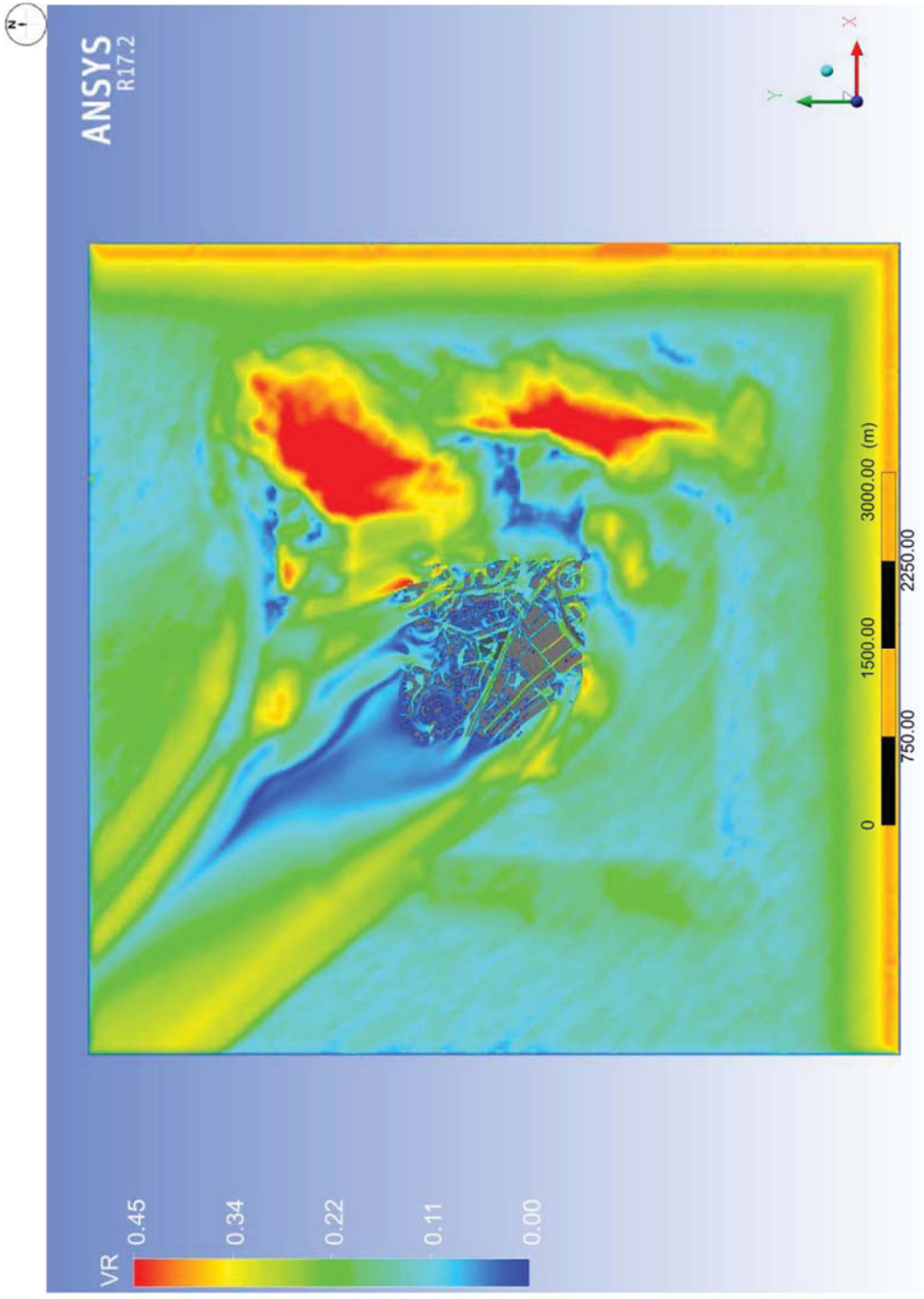


Proposed Scheme - Wind VR contour and vector plot at pedestrian level under E Wind

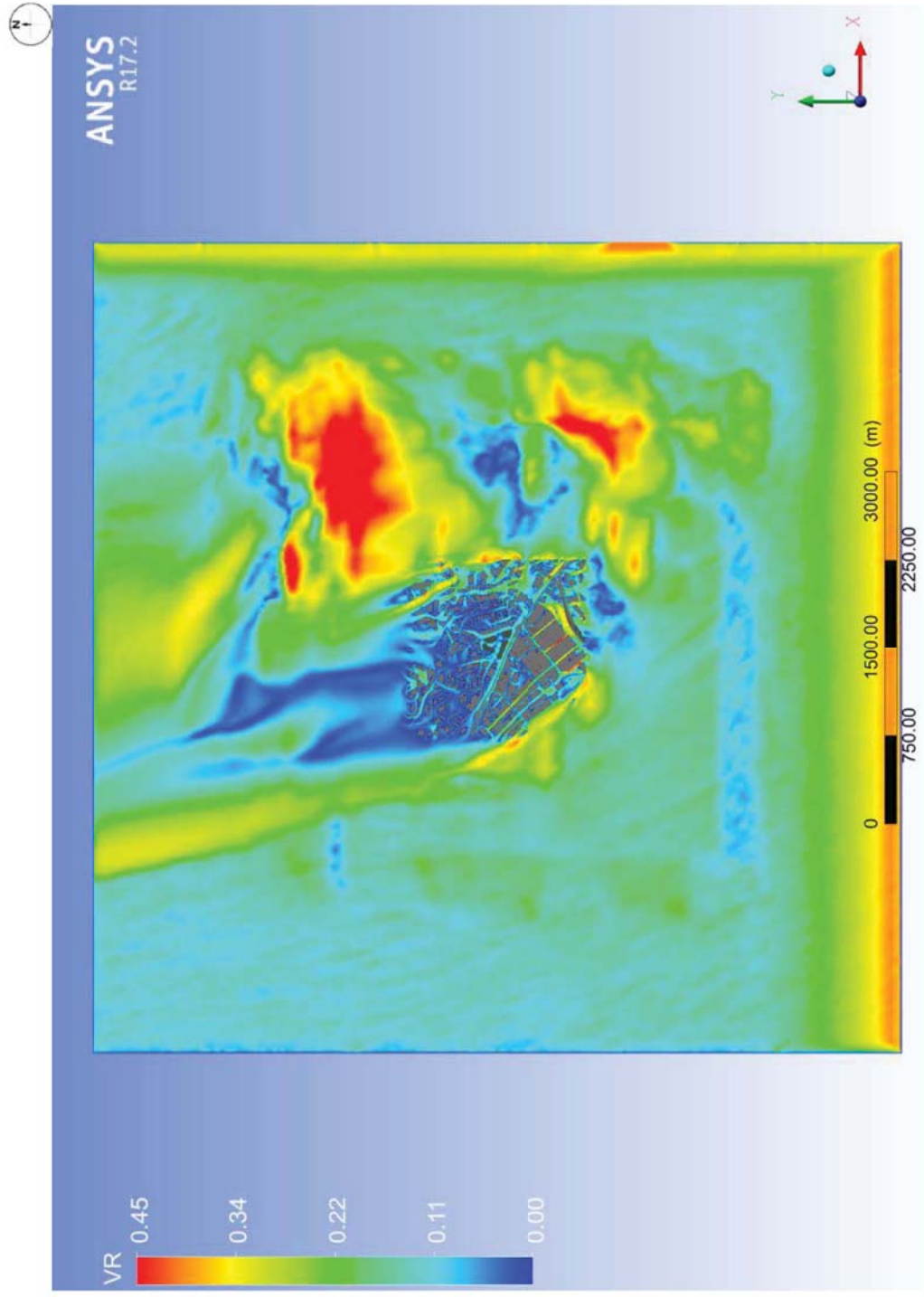


Proposed Scheme - Wind VR contour and vector plot at pedestrian level under ESE Wind

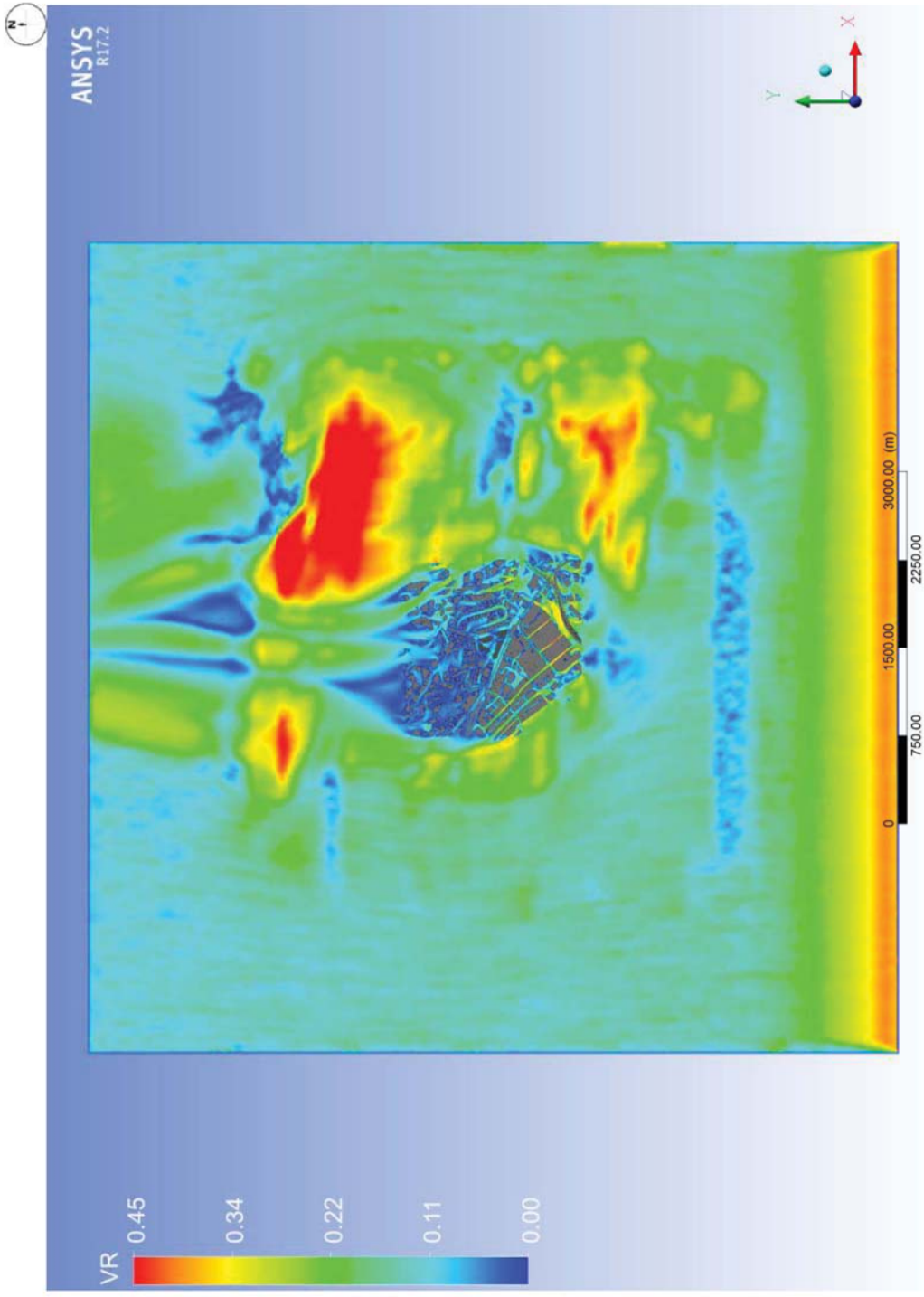




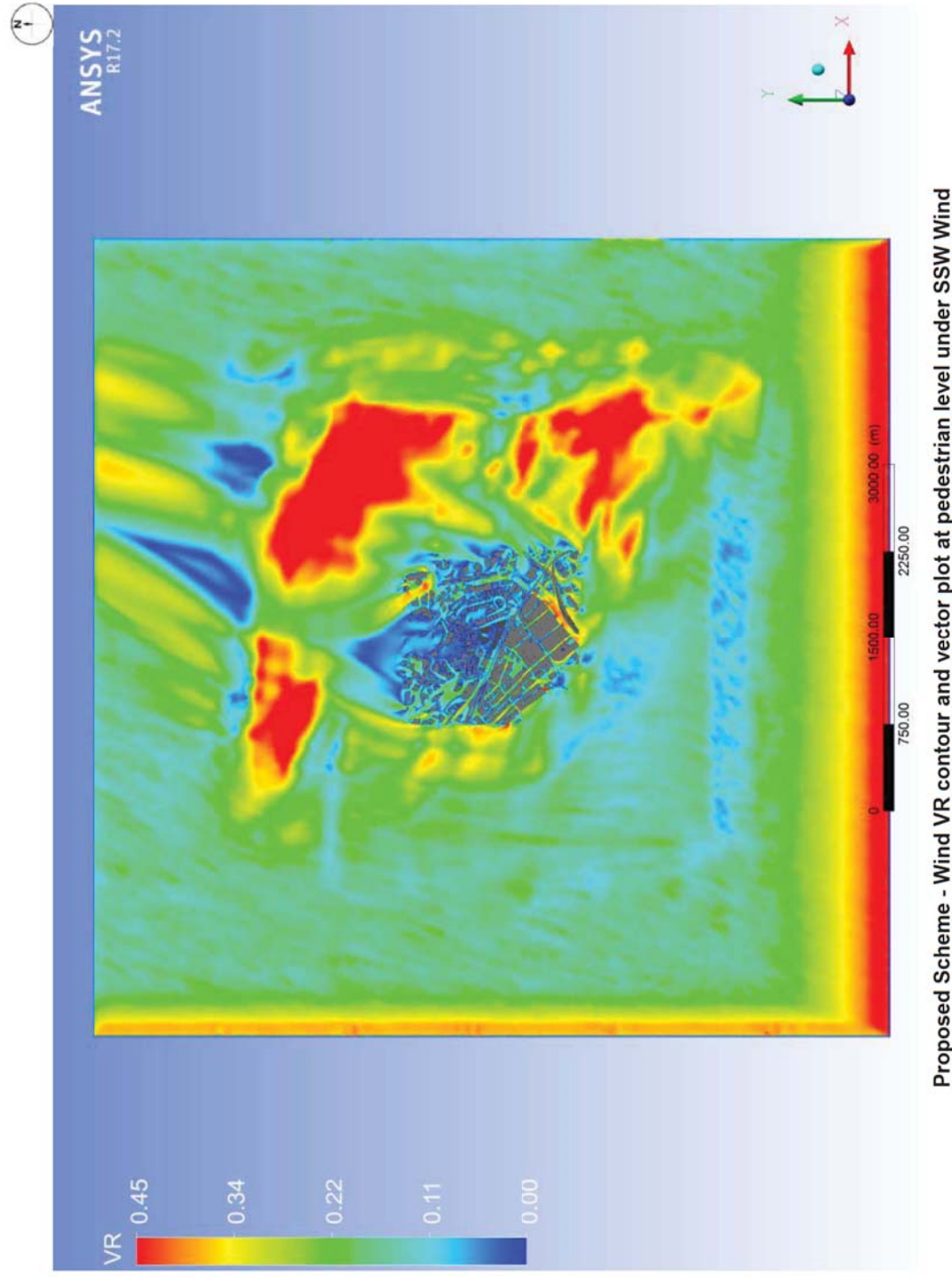
Proposed Scheme - Wind VR contour and vector plot at pedestrian level under SE Wind



Proposed Scheme - Wind VR contour and vector plot at pedestrian level under SSE Wind

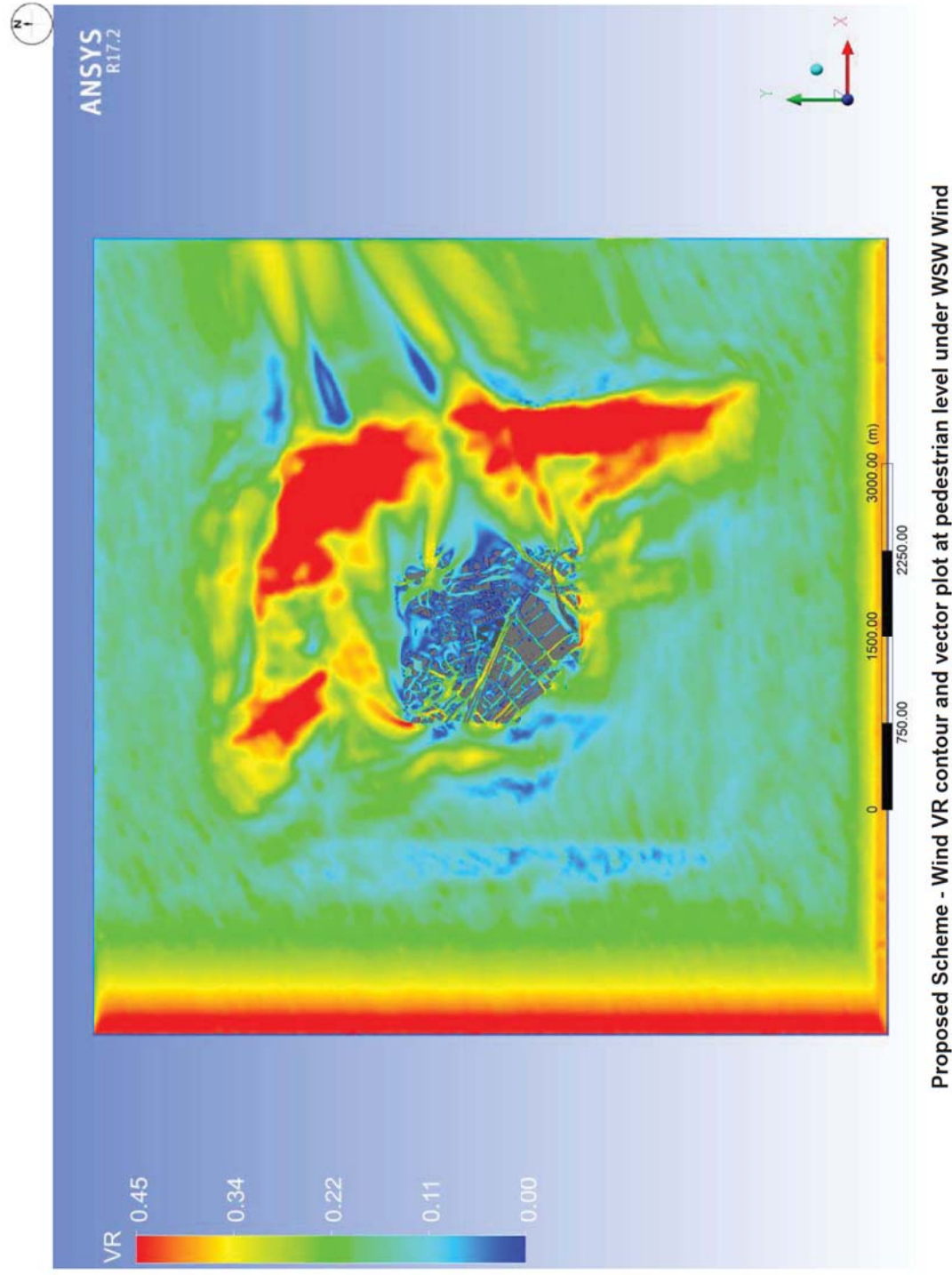
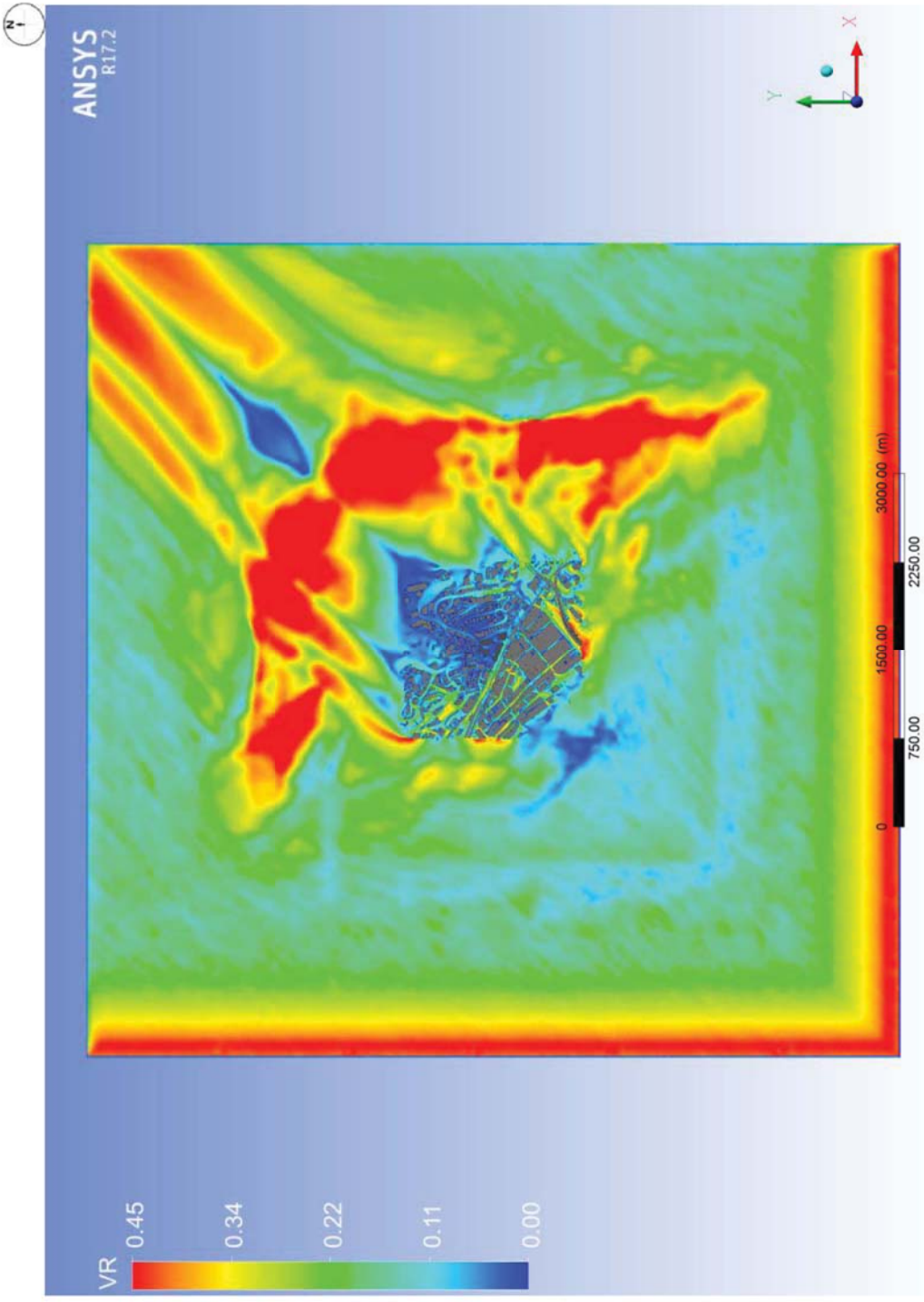


Proposed Scheme - Wind VR contour and vector plot at pedestrian level under S Wind



Proposed Scheme - Wind VR contour and vector plot at pedestrian level under SSW Wind





## APPENDIX D DETAILED WIND VELOCITY RATIOS



| Test Point | Baseline Scheme(VR) |      |      |      |      |      |      |      |      |      |      |        |        | WSW | Annual | Summer |
|------------|---------------------|------|------|------|------|------|------|------|------|------|------|--------|--------|-----|--------|--------|
|            | NNE                 | NE   | ENE  | E    | ESE  | SE   | SSE  | S    | SSW  | SW   | WSW  | Annual | Summer |     |        |        |
| P01        | 0.11                | 0.17 | 0.08 | 0.04 | 0.17 | 0.05 | 0.05 | 0.01 | 0.03 | 0.03 | 0.12 | 0.08   | 0.06   |     |        |        |
| P02        | 0.13                | 0.02 | 0.23 | 0.22 | 0.25 | 0.18 | 0.11 | 0.05 | 0.05 | 0.03 | 0.10 | 0.16   | 0.11   |     |        |        |
| P03        | 0.16                | 0.14 | 0.30 | 0.26 | 0.28 | 0.21 | 0.06 | 0.04 | 0.03 | 0.02 | 0.07 | 0.19   | 0.12   |     |        |        |
| P04        | 0.09                | 0.12 | 0.28 | 0.23 | 0.28 | 0.21 | 0.08 | 0.08 | 0.03 | 0.04 | 0.11 | 0.18   | 0.13   |     |        |        |
| P05        | 0.06                | 0.09 | 0.22 | 0.18 | 0.23 | 0.18 | 0.08 | 0.08 | 0.05 | 0.03 | 0.13 | 0.15   | 0.12   |     |        |        |
| P06        | 0.05                | 0.07 | 0.17 | 0.16 | 0.18 | 0.15 | 0.04 | 0.05 | 0.04 | 0.04 | 0.14 | 0.12   | 0.09   |     |        |        |
| P07        | 0.11                | 0.13 | 0.14 | 0.20 | 0.23 | 0.18 | 0.04 | 0.02 | 0.03 | 0.04 | 0.13 | 0.14   | 0.10   |     |        |        |
| P08        | 0.11                | 0.12 | 0.11 | 0.20 | 0.20 | 0.17 | 0.07 | 0.07 | 0.09 | 0.01 | 0.03 | 0.13   | 0.10   |     |        |        |
| P09        | 0.08                | 0.10 | 0.10 | 0.18 | 0.15 | 0.16 | 0.08 | 0.07 | 0.11 | 0.01 | 0.03 | 0.12   | 0.09   |     |        |        |
| P10        | 0.09                | 0.08 | 0.12 | 0.14 | 0.09 | 0.14 | 0.08 | 0.06 | 0.12 | 0.03 | 0.02 | 0.10   | 0.08   |     |        |        |
| P11        | 0.05                | 0.05 | 0.11 | 0.09 | 0.05 | 0.11 | 0.08 | 0.05 | 0.11 | 0.03 | 0.03 | 0.08   | 0.07   |     |        |        |
| P12        | 0.04                | 0.19 | 0.11 | 0.28 | 0.18 | 0.14 | 0.08 | 0.05 | 0.13 | 0.05 | 0.07 | 0.15   | 0.12   |     |        |        |
| P13        | 0.06                | 0.20 | 0.12 | 0.22 | 0.15 | 0.19 | 0.15 | 0.07 | 0.14 | 0.03 | 0.07 | 0.15   | 0.12   |     |        |        |
| P14        | 0.13                | 0.26 | 0.18 | 0.17 | 0.13 | 0.20 | 0.18 | 0.12 | 0.16 | 0.06 | 0.09 | 0.16   | 0.14   |     |        |        |
| P15        | 0.19                | 0.36 | 0.25 | 0.14 | 0.12 | 0.14 | 0.13 | 0.12 | 0.14 | 0.06 | 0.05 | 0.17   | 0.12   |     |        |        |
| P16        | 0.21                | 0.36 | 0.22 | 0.02 | 0.02 | 0.09 | 0.09 | 0.08 | 0.08 | 0.05 | 0.14 | 0.12   | 0.08   |     |        |        |
| P17        | 0.15                | 0.21 | 0.15 | 0.07 | 0.07 | 0.09 | 0.11 | 0.12 | 0.09 | 0.05 | 0.22 | 0.11   | 0.11   |     |        |        |
| P18        | 0.10                | 0.11 | 0.10 | 0.11 | 0.18 | 0.15 | 0.13 | 0.08 | 0.08 | 0.07 | 0.24 | 0.12   | 0.12   |     |        |        |
| P19        | 0.12                | 0.13 | 0.11 | 0.17 | 0.18 | 0.16 | 0.13 | 0.03 | 0.07 | 0.09 | 0.23 | 0.14   | 0.13   |     |        |        |
| P20        | 0.10                | 0.02 | 0.13 | 0.27 | 0.28 | 0.20 | 0.13 | 0.08 | 0.04 | 0.11 | 0.23 | 0.17   | 0.15   |     |        |        |
| P21        | 0.08                | 0.05 | 0.17 | 0.10 | 0.09 | 0.28 | 0.17 | 0.11 | 0.04 | 0.13 | 0.25 | 0.13   | 0.14   |     |        |        |
| P22        | 0.05                | 0.05 | 0.21 | 0.12 | 0.03 | 0.27 | 0.17 | 0.13 | 0.08 | 0.15 | 0.26 | 0.14   | 0.15   |     |        |        |
| P23        | 0.10                | 0.01 | 0.24 | 0.09 | 0.06 | 0.24 | 0.16 | 0.13 | 0.09 | 0.14 | 0.26 | 0.13   | 0.14   |     |        |        |
| P24        | 0.07                | 0.09 | 0.21 | 0.05 | 0.07 | 0.19 | 0.12 | 0.14 | 0.05 | 0.12 | 0.26 | 0.12   | 0.12   |     |        |        |
| P25        | 0.05                | 0.16 | 0.25 | 0.14 | 0.09 | 0.21 | 0.13 | 0.15 | 0.04 | 0.10 | 0.26 | 0.15   | 0.14   |     |        |        |
| P26        | 0.02                | 0.10 | 0.21 | 0.09 | 0.06 | 0.23 | 0.13 | 0.13 | 0.08 | 0.14 | 0.27 | 0.13   | 0.14   |     |        |        |
| P27        | 0.14                | 0.15 | 0.12 | 0.14 | 0.14 | 0.20 | 0.11 | 0.06 | 0.14 | 0.17 | 0.27 | 0.15   | 0.16   |     |        |        |
| P28        | 0.11                | 0.16 | 0.14 | 0.12 | 0.12 | 0.08 | 0.03 | 0.03 | 0.01 | 0.03 | 0.04 | 0.10   | 0.06   |     |        |        |
| P29        | 0.08                | 0.15 | 0.18 | 0.11 | 0.14 | 0.14 | 0.03 | 0.05 | 0.00 | 0.03 | 0.04 | 0.11   | 0.07   |     |        |        |
| P30        | 0.10                | 0.17 | 0.23 | 0.04 | 0.05 | 0.15 | 0.07 | 0.04 | 0.08 | 0.00 | 0.02 | 0.10   | 0.06   |     |        |        |
| T001       | 0.15                | 0.21 | 0.13 | 0.05 | 0.07 | 0.10 | 0.08 | 0.09 | 0.10 | 0.05 | 0.07 | 0.10   | 0.08   |     |        |        |
| T002       | 0.09                | 0.15 | 0.07 | 0.07 | 0.02 | 0.13 | 0.12 | 0.14 | 0.10 | 0.05 | 0.06 | 0.08   | 0.08   |     |        |        |
| T003       | 0.02                | 0.08 | 0.06 | 0.06 | 0.08 | 0.12 | 0.10 | 0.13 | 0.07 | 0.03 | 0.06 | 0.07   | 0.07   |     |        |        |
| T004       | 0.05                | 0.07 | 0.04 | 0.04 | 0.03 | 0.04 | 0.04 | 0.06 | 0.03 | 0.00 | 0.03 | 0.04   | 0.03   |     |        |        |
| T005       | 0.17                | 0.10 | 0.02 | 0.04 | 0.03 | 0.09 | 0.04 | 0.12 | 0.08 | 0.05 | 0.04 | 0.06   | 0.06   |     |        |        |
| T006       | 0.04                | 0.04 | 0.04 | 0.02 | 0.07 | 0.07 | 0.00 | 0.04 | 0.02 | 0.01 | 0.05 | 0.04   | 0.04   |     |        |        |
| T007       | 0.10                | 0.13 | 0.05 | 0.02 | 0.04 | 0.03 | 0.01 | 0.02 | 0.01 | 0.01 | 0.04 | 0.04   | 0.03   |     |        |        |
| T008       | 0.14                | 0.15 | 0.07 | 0.03 | 0.06 | 0.05 | 0.04 | 0.03 | 0.01 | 0.04 | 0.06 | 0.06   | 0.04   |     |        |        |
| T009       | 0.02                | 0.03 | 0.04 | 0.09 | 0.06 | 0.10 | 0.06 | 0.02 | 0.04 | 0.03 | 0.01 | 0.05   | 0.05   |     |        |        |
| T010       | 0.07                | 0.09 | 0.05 | 0.09 | 0.07 | 0.11 | 0.08 | 0.03 | 0.03 | 0.03 | 0.02 | 0.07   | 0.05   |     |        |        |
| T011       | 0.06                | 0.08 | 0.05 | 0.07 | 0.02 | 0.06 | 0.07 | 0.02 | 0.01 | 0.02 | 0.03 | 0.05   | 0.04   |     |        |        |
| T012       | 0.04                | 0.02 | 0.03 | 0.02 | 0.03 | 0.05 | 0.01 | 0.02 | 0.01 | 0.03 | 0.05 | 0.03   | 0.03   |     |        |        |
| T013       | 0.16                | 0.17 | 0.05 | 0.05 | 0.05 | 0.05 | 0.03 | 0.04 | 0.02 | 0.07 | 0.07 | 0.07   | 0.05   |     |        |        |
| T014       | 0.13                | 0.13 | 0.07 | 0.03 | 0.08 | 0.07 | 0.04 | 0.04 | 0.03 | 0.03 | 0.08 | 0.06   | 0.05   |     |        |        |
| T015       | 0.02                | 0.04 | 0.03 | 0.02 | 0.03 | 0.10 | 0.03 | 0.04 | 0.04 | 0.02 | 0.05 | 0.03   | 0.04   |     |        |        |
| T016       | 0.04                | 0.02 | 0.00 | 0.01 | 0.02 | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 | 0.04 | 0.02   | 0.02   |     |        |        |
| T017       | 0.03                | 0.16 | 0.13 | 0.09 | 0.02 | 0.08 | 0.02 | 0.08 | 0.02 | 0.09 | 0.13 | 0.09   | 0.07   |     |        |        |
| T018       | 0.02                | 0.12 | 0.11 | 0.06 | 0.08 | 0.02 | 0.03 | 0.06 | 0.07 | 0.03 | 0.01 | 0.07   | 0.05   |     |        |        |
| T019       | 0.13                | 0.19 | 0.06 | 0.08 | 0.02 | 0.06 | 0.04 | 0.07 | 0.04 | 0.08 | 0.09 | 0.08   | 0.06   |     |        |        |
| T020       | 0.07                | 0.08 | 0.05 | 0.06 | 0.04 | 0.01 | 0.02 | 0.04 | 0.05 | 0.06 | 0.08 | 0.05   | 0.05   |     |        |        |
| T021       | 0.12                | 0.14 | 0.04 | 0.08 | 0.05 | 0.10 | 0.01 | 0.07 | 0.03 | 0.07 | 0.06 | 0.07   | 0.06   |     |        |        |
| T022       | 0.03                | 0.10 | 0.04 | 0.02 | 0.00 | 0.06 | 0.02 | 0.04 | 0.04 | 0.02 | 0.07 | 0.04   | 0.03   |     |        |        |
| T023       | 0.09                | 0.15 | 0.03 | 0.08 | 0.04 | 0.05 | 0.10 | 0.06 | 0.03 | 0.02 | 0.01 | 0.06   | 0.05   |     |        |        |
| T024       | 0.05                | 0.14 | 0.08 | 0.04 | 0.06 | 0.05 | 0.02 | 0.05 | 0.00 | 0.01 | 0.06 | 0.06   | 0.04   |     |        |        |
| T025       | 0.05                | 0.00 | 0.05 | 0.00 | 0.04 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02   | 0.01   |     |        |        |
| T026       | 0.03                | 0.04 | 0.08 | 0.04 | 0.09 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.04 | 0.05   | 0.03   |     |        |        |
| T027       | 0.09                | 0.03 | 0.04 | 0.02 | 0.05 | 0.04 | 0.03 | 0.01 | 0.02 | 0.03 | 0.07 | 0.04   | 0.03   |     |        |        |
| T028       | 0.06                | 0.02 | 0.04 | 0.02 | 0.07 | 0.05 | 0.01 | 0.03 | 0.04 | 0.03 | 0.06 | 0.04   | 0.04   |     |        |        |
| T029       | 0.03                | 0.05 | 0.01 | 0.03 | 0.04 | 0.00 | 0.01 | 0.03 | 0.05 | 0.02 | 0.06 | 0.03   | 0.03   |     |        |        |
| T030       | 0.03                | 0.03 | 0.02 | 0.05 | 0.09 | 0.09 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.04   | 0.04   |     |        |        |
| T031       | 0.10                | 0.14 | 0.08 | 0.08 | 0.05 | 0.06 | 0.08 | 0.05 | 0.01 | 0.02 | 0.06 | 0.07   | 0.05   |     |        |        |
| T032       | 0.05                | 0.10 | 0.03 | 0.05 | 0.04 | 0.13 | 0.06 | 0.06 | 0.04 | 0.02 | 0.07 | 0.06   | 0.05   |     |        |        |
| T033       | 0.10                | 0.09 | 0.03 | 0.02 | 0.06 | 0.02 | 0.02 | 0.02 | 0.01 | 0.03 | 0.05 | 0.04   | 0.03   |     |        |        |
| T034       | 0.02                | 0.19 | 0.01 | 0.07 | 0.02 | 0.02 | 0.01 | 0.04 | 0.02 | 0.04 | 0.06 | 0.05   | 0.04   |     |        |        |
| T035       | 0.13                | 0.15 | 0.09 | 0.10 | 0.08 | 0.07 | 0.10 | 0.06 | 0.03 | 0.04 | 0.08 | 0.09   | 0.07   |     |        |        |

| Test Point | Baseline Scheme(VR) |      |      |      |      |      |      |      |      |      |      |        |        |  |
|------------|---------------------|------|------|------|------|------|------|------|------|------|------|--------|--------|--|
|            | NNE                 | NE   | ENE  | E    | ESE  | SE   | SSE  | S    | SSW  | SW   | WSW  | Annual | Summer |  |
| T036       | 0.01                | 0.21 | 0.13 | 0.05 | 0.07 | 0.05 | 0.13 | 0.03 | 0.04 | 0.03 | 0.07 | 0.08   | 0.06   |  |
| T037       | 0.05                | 0.11 | 0.03 | 0.02 | 0.05 | 0.01 | 0.01 | 0.03 | 0.03 | 0.02 | 0.07 | 0.04   | 0.03   |  |
| T038       | 0.09                | 0.02 | 0.10 | 0.06 | 0.09 | 0.03 | 0.04 | 0.06 | 0.02 | 0.04 | 0.02 | 0.06   | 0.05   |  |
| T039       | 0.02                | 0.02 | 0.03 | 0.02 | 0.06 | 0.01 | 0.01 | 0.03 | 0.01 | 0.01 | 0.03 | 0.03   | 0.02   |  |
| T040       | 0.08                | 0.22 | 0.00 | 0.02 | 0.06 | 0.04 | 0.04 | 0.02 | 0.04 | 0.08 | 0.08 | 0.05   | 0.05   |  |
| T041       | 0.03                | 0.11 | 0.01 | 0.07 | 0.02 | 0.02 | 0.05 | 0.03 | 0.07 | 0.08 | 0.14 | 0.05   | 0.06   |  |
| T042       | 0.11                | 0.18 | 0.12 | 0.08 | 0.10 | 0.03 | 0.06 | 0.06 | 0.03 | 0.04 | 0.04 | 0.09   | 0.06   |  |
| T043       | 0.09                | 0.09 | 0.11 | 0.04 | 0.06 | 0.05 | 0.11 | 0.01 | 0.05 | 0.06 | 0.08 | 0.07   | 0.06   |  |
| T044       | 0.05                | 0.07 | 0.15 | 0.07 | 0.06 | 0.02 | 0.04 | 0.02 | 0.16 | 0.05 | 0.03 | 0.08   | 0.06   |  |
| T045       | 0.07                | 0.04 | 0.03 | 0.03 | 0.04 | 0.01 | 0.02 | 0.00 | 0.03 | 0.05 | 0.07 | 0.03   | 0.03   |  |
| T046       | 0.04                | 0.01 | 0.05 | 0.03 | 0.02 | 0.01 | 0.01 | 0.00 | 0.01 | 0.07 | 0.08 | 0.03   | 0.03   |  |
| T047       | 0.02                | 0.04 | 0.01 | 0.03 | 0.06 | 0.04 | 0.03 | 0.04 | 0.01 | 0.07 | 0.06 | 0.03   | 0.04   |  |
| T048       | 0.02                | 0.03 | 0.06 | 0.05 | 0.06 | 0.03 | 0.04 | 0.08 | 0.01 | 0.02 | 0.04 | 0.05   | 0.04   |  |
| T049       | 0.07                | 0.09 | 0.07 | 0.04 | 0.06 | 0.03 | 0.05 | 0.06 | 0.04 | 0.04 | 0.04 | 0.05   | 0.05   |  |
| T050       | 0.01                | 0.10 | 0.02 | 0.06 | 0.01 | 0.01 | 0.04 | 0.05 | 0.04 | 0.04 | 0.03 | 0.04   | 0.04   |  |
| T051       | 0.07                | 0.07 | 0.07 | 0.03 | 0.08 | 0.04 | 0.03 | 0.03 | 0.00 | 0.05 | 0.05 | 0.05   | 0.04   |  |
| T052       | 0.04                | 0.01 | 0.05 | 0.06 | 0.05 | 0.03 | 0.08 | 0.01 | 0.04 | 0.05 | 0.06 | 0.05   | 0.05   |  |
| T053       | 0.09                | 0.17 | 0.06 | 0.10 | 0.05 | 0.02 | 0.02 | 0.04 | 0.05 | 0.14 | 0.15 | 0.08   | 0.08   |  |
| T054       | 0.13                | 0.13 | 0.09 | 0.10 | 0.04 | 0.06 | 0.05 | 0.03 | 0.08 | 0.08 | 0.06 | 0.08   | 0.07   |  |
| T055       | 0.10                | 0.11 | 0.03 | 0.09 | 0.06 | 0.04 | 0.07 | 0.11 | 0.07 | 0.07 | 0.10 | 0.07   | 0.08   |  |
| T056       | 0.12                | 0.17 | 0.12 | 0.08 | 0.06 | 0.06 | 0.08 | 0.09 | 0.07 | 0.17 | 0.24 | 0.11   | 0.11   |  |
| T057       | 0.18                | 0.20 | 0.12 | 0.16 | 0.09 | 0.04 | 0.08 | 0.04 | 0.05 | 0.05 | 0.08 | 0.11   | 0.08   |  |
| T058       | 0.11                | 0.13 | 0.10 | 0.10 | 0.10 | 0.01 | 0.05 | 0.01 | 0.14 | 0.07 | 0.06 | 0.09   | 0.07   |  |
| T059       | 0.15                | 0.03 | 0.04 | 0.17 | 0.16 | 0.06 | 0.08 | 0.06 | 0.08 | 0.04 | 0.09 | 0.10   | 0.09   |  |
| T060       | 0.16                | 0.18 | 0.11 | 0.15 | 0.11 | 0.04 | 0.08 | 0.08 | 0.02 | 0.09 | 0.13 | 0.11   | 0.09   |  |
| T061       | 0.23                | 0.16 | 0.07 | 0.16 | 0.02 | 0.22 | 0.09 | 0.03 | 0.13 | 0.20 | 0.20 | 0.13   | 0.13   |  |
| T062       | 0.15                | 0.14 | 0.07 | 0.13 | 0.06 | 0.20 | 0.07 | 0.02 | 0.19 | 0.25 | 0.26 | 0.13   | 0.15   |  |
| T063       | 0.03                | 0.06 | 0.06 | 0.03 | 0.04 | 0.07 | 0.02 | 0.03 | 0.21 | 0.14 | 0.15 | 0.07   | 0.09   |  |
| T064       | 0.14                | 0.17 | 0.16 | 0.09 | 0.07 | 0.13 | 0.09 | 0.10 | 0.05 | 0.04 | 0.06 | 0.11   | 0.08   |  |
| T065       | 0.14                | 0.10 | 0.08 | 0.13 | 0.08 | 0.21 | 0.09 | 0.01 | 0.20 | 0.24 | 0.37 | 0.13   | 0.17   |  |
| T066       | 0.10                | 0.15 | 0.22 | 0.12 | 0.14 | 0.18 | 0.12 | 0.14 | 0.12 | 0.26 | 0.30 | 0.17   | 0.18   |  |
| T067       | 0.18                | 0.34 | 0.18 | 0.08 | 0.10 | 0.07 | 0.11 | 0.17 | 0.16 | 0.07 | 0.21 | 0.14   | 0.13   |  |
| T068       | 0.17                | 0.30 | 0.08 | 0.09 | 0.11 | 0.04 | 0.07 | 0.08 | 0.07 | 0.05 | 0.07 | 0.10   | 0.08   |  |
| T069       | 0.09                | 0.16 | 0.09 | 0.05 | 0.10 | 0.10 | 0.09 | 0.11 | 0.05 | 0.09 | 0.04 | 0.09   | 0.08   |  |
| T070       | 0.15                | 0.18 | 0.06 | 0.11 | 0.08 | 0.09 | 0.11 | 0.03 | 0.03 | 0.03 | 0.01 | 0.08   | 0.06   |  |
| T071       | 0.04                | 0.03 | 0.04 | 0.06 | 0.11 | 0.11 | 0.08 | 0.15 | 0.05 | 0.02 | 0.05 | 0.06   | 0.07   |  |
| T072       | 0.03                | 0.02 | 0.02 | 0.07 | 0.04 | 0.07 | 0.06 | 0.09 | 0.08 | 0.07 | 0.03 | 0.05   | 0.06   |  |
| T073       | 0.05                | 0.12 | 0.03 | 0.10 | 0.12 | 0.12 | 0.04 | 0.12 | 0.06 | 0.04 | 0.03 | 0.08   | 0.08   |  |
| T074       | 0.10                | 0.09 | 0.03 | 0.09 | 0.07 | 0.08 | 0.05 | 0.04 | 0.06 | 0.08 | 0.11 | 0.07   | 0.07   |  |
| T075       | 0.03                | 0.05 | 0.01 | 0.01 | 0.02 | 0.03 | 0.05 | 0.07 | 0.08 | 0.06 | 0.02 | 0.03   | 0.04   |  |
| T076       | 0.01                | 0.01 | 0.03 | 0.05 | 0.11 | 0.01 | 0.00 | 0.01 | 0.04 | 0.02 | 0.06 | 0.04   | 0.04   |  |
| T077       | 0.01                | 0.03 | 0.29 | 0.03 | 0.12 | 0.02 | 0.02 | 0.12 | 0.06 | 0.05 | 0.05 | 0.09   | 0.07   |  |
| T078       | 0.03                | 0.06 | 0.09 | 0.09 | 0.13 | 0.04 | 0.06 | 0.06 | 0.05 | 0.01 | 0.05 | 0.07   | 0.06   |  |
| T079       | 0.13                | 0.12 | 0.06 | 0.13 | 0.09 | 0.08 | 0.04 | 0.19 | 0.17 | 0.13 | 0.04 | 0.10   | 0.11   |  |
| T080       | 0.11                | 0.11 | 0.04 | 0.09 | 0.06 | 0.05 | 0.06 | 0.13 | 0.06 | 0.09 | 0.09 | 0.08   | 0.08   |  |
| T081       | 0.01                | 0.06 | 0.00 | 0.15 | 0.08 | 0.10 | 0.09 | 0.19 | 0.11 | 0.12 | 0.07 | 0.09   | 0.11   |  |
| T082       | 0.03                | 0.14 | 0.05 | 0.09 | 0.06 | 0.01 | 0.03 | 0.17 | 0.04 | 0.01 | 0.01 | 0.06   | 0.05   |  |
| T083       | 0.02                | 0.10 | 0.07 | 0.03 | 0.02 | 0.02 | 0.01 | 0.09 | 0.07 | 0.02 | 0.01 | 0.04   | 0.04   |  |
| T084       | 0.05                | 0.09 | 0.05 | 0.07 | 0.11 | 0.06 | 0.04 | 0.12 | 0.04 | 0.03 | 0.06 | 0.07   | 0.06   |  |
| T085       | 0.05                | 0.01 | 0.08 | 0.02 | 0.02 | 0.05 | 0.06 | 0.09 | 0.11 | 0.00 | 0.02 | 0.04   | 0.05   |  |
| T086       | 0.03                | 0.02 | 0.01 | 0.02 | 0.04 | 0.03 | 0.04 | 0.02 | 0.05 | 0.02 | 0.02 | 0.03   | 0.03   |  |
| T087       | 0.08                | 0.07 | 0.10 | 0.12 | 0.24 | 0.09 | 0.06 | 0.08 | 0.03 | 0.03 | 0.00 | 0.10   | 0.08   |  |
| T088       | 0.02                | 0.03 | 0.02 | 0.07 | 0.05 | 0.09 | 0.08 | 0.09 | 0.10 | 0.02 | 0.00 | 0.05   | 0.06   |  |
| T089       | 0.00                | 0.03 | 0.01 | 0.12 | 0.10 | 0.02 | 0.02 | 0.01 | 0.05 | 0.01 | 0.01 | 0.05   | 0.04   |  |
| T090       | 0.01                | 0.02 | 0.00 | 0.12 | 0.08 | 0.01 | 0.06 | 0.03 | 0.07 | 0.07 | 0.03 | 0.05   | 0.06   |  |
| T091       | 0.03                | 0.06 | 0.05 | 0.07 | 0.05 | 0.01 | 0.04 | 0.03 | 0.01 | 0.01 | 0.01 | 0.04   | 0.03   |  |
| T092       | 0.06                | 0.03 | 0.03 | 0.07 | 0.02 | 0.02 | 0.03 | 0.05 | 0.09 | 0.02 | 0.00 | 0.04   | 0.04   |  |
| T093       | 0.04                | 0.08 | 0.13 | 0.08 | 0.10 | 0.06 | 0.04 | 0.06 | 0.12 | 0.00 | 0.02 | 0.08   | 0.06   |  |
| T094       | 0.07                | 0.08 | 0.20 | 0.08 | 0.19 | 0.02 | 0.03 | 0.04 | 0.09 | 0.01 | 0.06 | 0.10   | 0.07   |  |
| T095       | 0.04                | 0.02 | 0.07 | 0.08 | 0.17 | 0.03 | 0.02 | 0.03 | 0.06 | 0.01 | 0.04 | 0.06   | 0.05   |  |
| T096       | 0.07                | 0.08 | 0.09 | 0.17 | 0.12 | 0.07 | 0.04 | 0.06 | 0.05 | 0.04 | 0.01 | 0.09   | 0.07   |  |
| T097       | 0.06                | 0.05 | 0.18 | 0.11 | 0.23 | 0.07 | 0.02 | 0.03 | 0.10 | 0.03 | 0.06 | 0.11   | 0.08   |  |
| T098       | 0.16                | 0.16 | 0.14 | 0.14 | 0.32 | 0.10 | 0.07 | 0.03 | 0.08 | 0.06 | 0.03 | 0.14   | 0.10   |  |
| T099       | 0.23                | 0.18 | 0.16 | 0.11 | 0.29 | 0.18 | 0.10 | 0.14 | 0.10 | 0.07 | 0.06 | 0.15   | 0.13   |  |
| T100       | 0.09                | 0.03 | 0.06 | 0.03 | 0.08 | 0.00 | 0.02 | 0.05 | 0.03 | 0.03 | 0.13 | 0.05   | 0.05   |  |



| Test Point | Baseline Scheme(VR) |      |      |      |      |      |      |      |      |      |      |      |      | Annual | Summer |
|------------|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|--------|--------|
|            | NNE                 | NE   | ENE  | E    | ESE  | SE   | SSE  | S    | SSW  | SW   | WSW  | WSW  | WSW  |        |        |
| T101       | 0.06                | 0.06 | 0.10 | 0.02 | 0.04 | 0.03 | 0.02 | 0.03 | 0.01 | 0.04 | 0.12 | 0.04 | 0.12 | 0.05   | 0.04   |
| T102       | 0.07                | 0.19 | 0.28 | 0.16 | 0.11 | 0.26 | 0.14 | 0.14 | 0.03 | 0.16 | 0.34 | 0.16 | 0.34 | 0.18   | 0.16   |
| T103       | 0.06                | 0.04 | 0.16 | 0.20 | 0.22 | 0.29 | 0.16 | 0.10 | 0.07 | 0.14 | 0.29 | 0.14 | 0.29 | 0.16   | 0.17   |
| T104       | 0.10                | 0.25 | 0.16 | 0.16 | 0.20 | 0.20 | 0.14 | 0.08 | 0.06 | 0.08 | 0.26 | 0.08 | 0.26 | 0.16   | 0.14   |
| T105       | 0.12                | 0.02 | 0.05 | 0.08 | 0.04 | 0.09 | 0.04 | 0.08 | 0.24 | 0.25 | 0.05 | 0.25 | 0.05 | 0.09   | 0.12   |
| T106       | 0.37                | 0.19 | 0.19 | 0.14 | 0.09 | 0.11 | 0.04 | 0.01 | 0.12 | 0.18 | 0.11 | 0.18 | 0.11 | 0.15   | 0.11   |
| T107       | 0.15                | 0.08 | 0.06 | 0.06 | 0.03 | 0.08 | 0.02 | 0.11 | 0.26 | 0.24 | 0.20 | 0.24 | 0.20 | 0.10   | 0.14   |
| T108       | 0.13                | 0.16 | 0.04 | 0.12 | 0.04 | 0.04 | 0.05 | 0.15 | 0.30 | 0.43 | 0.24 | 0.43 | 0.24 | 0.13   | 0.19   |
| T109       | 0.21                | 0.22 | 0.10 | 0.14 | 0.05 | 0.04 | 0.02 | 0.12 | 0.27 | 0.35 | 0.30 | 0.35 | 0.30 | 0.15   | 0.18   |
| T110       | 0.30                | 0.26 | 0.16 | 0.18 | 0.04 | 0.07 | 0.08 | 0.13 | 0.16 | 0.13 | 0.11 | 0.13 | 0.11 | 0.15   | 0.12   |
| T111       | 0.23                | 0.18 | 0.08 | 0.05 | 0.11 | 0.08 | 0.05 | 0.03 | 0.03 | 0.03 | 0.02 | 0.03 | 0.02 | 0.08   | 0.05   |
| T112       | 0.22                | 0.13 | 0.08 | 0.01 | 0.04 | 0.08 | 0.07 | 0.14 | 0.22 | 0.28 | 0.17 | 0.28 | 0.17 | 0.10   | 0.14   |
| T113       | 0.15                | 0.17 | 0.18 | 0.01 | 0.06 | 0.07 | 0.04 | 0.11 | 0.17 | 0.23 | 0.14 | 0.23 | 0.14 | 0.11   | 0.12   |
| T114       | 0.06                | 0.02 | 0.02 | 0.06 | 0.14 | 0.09 | 0.06 | 0.05 | 0.13 | 0.15 | 0.09 | 0.15 | 0.09 | 0.07   | 0.10   |
| T115       | 0.14                | 0.11 | 0.05 | 0.10 | 0.12 | 0.11 | 0.02 | 0.11 | 0.15 | 0.19 | 0.10 | 0.19 | 0.10 | 0.11   | 0.12   |
| T116       | 0.10                | 0.01 | 0.03 | 0.12 | 0.02 | 0.02 | 0.05 | 0.12 | 0.08 | 0.20 | 0.11 | 0.20 | 0.11 | 0.07   | 0.10   |
| T117       | 0.06                | 0.11 | 0.12 | 0.08 | 0.07 | 0.06 | 0.10 | 0.06 | 0.20 | 0.18 | 0.16 | 0.18 | 0.16 | 0.11   | 0.12   |
| T118       | 0.26                | 0.18 | 0.13 | 0.06 | 0.10 | 0.11 | 0.03 | 0.09 | 0.16 | 0.02 | 0.10 | 0.02 | 0.10 | 0.11   | 0.09   |
| T119       | 0.17                | 0.15 | 0.14 | 0.03 | 0.04 | 0.08 | 0.07 | 0.16 | 0.25 | 0.14 | 0.15 | 0.14 | 0.15 | 0.11   | 0.13   |
| T120       | 0.13                | 0.13 | 0.11 | 0.07 | 0.03 | 0.03 | 0.07 | 0.15 | 0.21 | 0.04 | 0.13 | 0.04 | 0.13 | 0.09   | 0.10   |
| T121       | 0.10                | 0.14 | 0.11 | 0.12 | 0.16 | 0.15 | 0.04 | 0.08 | 0.13 | 0.14 | 0.11 | 0.14 | 0.11 | 0.12   | 0.12   |
| T122       | 0.27                | 0.37 | 0.20 | 0.13 | 0.09 | 0.11 | 0.07 | 0.09 | 0.07 | 0.11 | 0.13 | 0.11 | 0.13 | 0.15   | 0.11   |
| T123       | 0.17                | 0.30 | 0.10 | 0.05 | 0.10 | 0.16 | 0.20 | 0.02 | 0.08 | 0.07 | 0.12 | 0.07 | 0.12 | 0.11   | 0.10   |
| T124       | 0.06                | 0.24 | 0.14 | 0.24 | 0.23 | 0.25 | 0.22 | 0.25 | 0.17 | 0.02 | 0.02 | 0.02 | 0.02 | 0.18   | 0.16   |
| T125       | 0.10                | 0.14 | 0.12 | 0.26 | 0.16 | 0.12 | 0.23 | 0.25 | 0.21 | 0.02 | 0.01 | 0.02 | 0.01 | 0.16   | 0.15   |
| T126       | 0.11                | 0.16 | 0.11 | 0.26 | 0.12 | 0.12 | 0.27 | 0.27 | 0.25 | 0.05 | 0.11 | 0.05 | 0.11 | 0.17   | 0.17   |
| T127       | 0.07                | 0.19 | 0.04 | 0.20 | 0.05 | 0.06 | 0.26 | 0.26 | 0.26 | 0.08 | 0.14 | 0.08 | 0.14 | 0.13   | 0.16   |
| T128       | 0.07                | 0.14 | 0.05 | 0.23 | 0.04 | 0.10 | 0.29 | 0.33 | 0.31 | 0.18 | 0.12 | 0.18 | 0.12 | 0.15   | 0.19   |
| T129       | 0.04                | 0.17 | 0.01 | 0.07 | 0.05 | 0.06 | 0.01 | 0.06 | 0.11 | 0.15 | 0.18 | 0.15 | 0.18 | 0.07   | 0.09   |
| T130       | 0.03                | 0.05 | 0.08 | 0.02 | 0.02 | 0.01 | 0.01 | 0.03 | 0.11 | 0.18 | 0.20 | 0.18 | 0.20 | 0.06   | 0.08   |
| T131       | 0.13                | 0.14 | 0.26 | 0.17 | 0.17 | 0.02 | 0.05 | 0.02 | 0.13 | 0.13 | 0.22 | 0.13 | 0.22 | 0.15   | 0.13   |
| T132       | 0.06                | 0.06 | 0.14 | 0.07 | 0.06 | 0.05 | 0.04 | 0.03 | 0.12 | 0.09 | 0.20 | 0.09 | 0.20 | 0.08   | 0.09   |
| T133       | 0.15                | 0.21 | 0.19 | 0.13 | 0.12 | 0.18 | 0.07 | 0.03 | 0.01 | 0.06 | 0.13 | 0.06 | 0.13 | 0.13   | 0.09   |
| T134       | 0.07                | 0.09 | 0.01 | 0.01 | 0.05 | 0.05 | 0.05 | 0.08 | 0.02 | 0.16 | 0.04 | 0.16 | 0.04 | 0.04   | 0.06   |
| T135       | 0.18                | 0.07 | 0.13 | 0.03 | 0.15 | 0.14 | 0.11 | 0.17 | 0.14 | 0.02 | 0.16 | 0.14 | 0.02 | 0.10   | 0.11   |
| T136       | 0.09                | 0.25 | 0.11 | 0.17 | 0.14 | 0.16 | 0.17 | 0.19 | 0.12 | 0.07 | 0.10 | 0.07 | 0.10 | 0.14   | 0.13   |
| T137       | 0.05                | 0.09 | 0.08 | 0.20 | 0.04 | 0.08 | 0.27 | 0.31 | 0.29 | 0.12 | 0.05 | 0.12 | 0.05 | 0.14   | 0.18   |
| T138       | 0.08                | 0.07 | 0.06 | 0.22 | 0.05 | 0.08 | 0.25 | 0.32 | 0.29 | 0.15 | 0.08 | 0.15 | 0.08 | 0.14   | 0.11   |
| T139       | 0.25                | 0.18 | 0.22 | 0.06 | 0.22 | 0.13 | 0.09 | 0.11 | 0.11 | 0.07 | 0.05 | 0.07 | 0.05 | 0.16   | 0.17   |
| T140       | 0.18                | 0.26 | 0.19 | 0.13 | 0.07 | 0.11 | 0.07 | 0.08 | 0.19 | 0.25 | 0.33 | 0.19 | 0.25 | 0.09   | 0.06   |
| T141       | 0.19                | 0.17 | 0.14 | 0.09 | 0.03 | 0.07 | 0.03 | 0.09 | 0.01 | 0.10 | 0.01 | 0.10 | 0.01 | 0.10   | 0.06   |
| T142       | 0.23                | 0.07 | 0.24 | 0.06 | 0.09 | 0.02 | 0.03 | 0.02 | 0.03 | 0.07 | 0.06 | 0.07 | 0.06 | 0.08   | 0.07   |
| T143       | 0.10                | 0.12 | 0.06 | 0.08 | 0.06 | 0.05 | 0.04 | 0.08 | 0.11 | 0.04 | 0.10 | 0.04 | 0.10 | 0.06   | 0.07   |
| T144       | 0.02                | 0.13 | 0.02 | 0.05 | 0.08 | 0.07 | 0.04 | 0.10 | 0.07 | 0.05 | 0.11 | 0.05 | 0.11 | 0.08   | 0.07   |
| S01        | 0.13                | 0.10 | 0.07 | 0.09 | 0.04 | 0.06 | 0.12 | 0.10 | 0.10 | 0.05 | 0.03 | 0.05 | 0.03 | 0.09   | 0.07   |
| S02        | 0.12                | 0.11 | 0.13 | 0.10 | 0.08 | 0.07 | 0.11 | 0.05 | 0.06 | 0.03 | 0.07 | 0.03 | 0.07 | 0.04   | 0.03   |
| S03        | 0.03                | 0.03 | 0.06 | 0.03 | 0.04 | 0.03 | 0.04 | 0.03 | 0.03 | 0.02 | 0.05 | 0.02 | 0.05 | 0.16   | 0.13   |
| S04        | 0.07                | 0.09 | 0.16 | 0.26 | 0.29 | 0.16 | 0.12 | 0.13 | 0.07 | 0.04 | 0.06 | 0.04 | 0.06 | 0.11   | 0.07   |
| S05        | 0.09                | 0.14 | 0.14 | 0.17 | 0.15 | 0.04 | 0.10 | 0.04 | 0.02 | 0.00 | 0.03 | 0.00 | 0.03 | 0.17   | 0.11   |
| S06        | 0.11                | 0.20 | 0.18 | 0.30 | 0.26 | 0.13 | 0.11 | 0.03 | 0.03 | 0.01 | 0.07 | 0.01 | 0.07 | 0.10   | 0.06   |
| S07        | 0.06                | 0.11 | 0.10 | 0.17 | 0.15 | 0.08 | 0.03 | 0.03 | 0.02 | 0.01 | 0.05 | 0.01 | 0.05 | 0.14   | 0.10   |
| S08        | 0.10                | 0.17 | 0.14 | 0.22 | 0.21 | 0.06 | 0.12 | 0.13 | 0.04 | 0.03 | 0.05 | 0.03 | 0.05 | 0.20   | 0.13   |
| S09        | 0.14                | 0.25 | 0.21 | 0.33 | 0.32 | 0.12 | 0.11 | 0.07 | 0.04 | 0.01 | 0.08 | 0.01 | 0.08 | 0.19   | 0.13   |
| S10        | 0.13                | 0.23 | 0.18 | 0.33 | 0.32 | 0.15 | 0.08 | 0.06 | 0.05 | 0.01 | 0.07 | 0.01 | 0.07 | 0.00   | 0.00   |

| Test Point | Proposed Scheme(VR) |      |      |      |      |      |      |      |      |      |      |      | Annual | Summer |
|------------|---------------------|------|------|------|------|------|------|------|------|------|------|------|--------|--------|
|            | NNE                 | NE   | ENE  | E    | ESE  | SE   | SSE  | S    | SSW  | SW   | WSW  |      |        |        |
| P01        | 0.09                | 0.18 | 0.09 | 0.06 | 0.23 | 0.07 | 0.05 | 0.01 | 0.05 | 0.03 | 0.12 | 0.10 | 0.08   |        |
| P02        | 0.12                | 0.05 | 0.21 | 0.18 | 0.27 | 0.17 | 0.05 | 0.01 | 0.05 | 0.03 | 0.09 | 0.14 | 0.10   |        |
| P03        | 0.16                | 0.12 | 0.28 | 0.21 | 0.29 | 0.23 | 0.07 | 0.08 | 0.01 | 0.00 | 0.07 | 0.18 | 0.11   |        |
| P04        | 0.10                | 0.09 | 0.27 | 0.20 | 0.28 | 0.23 | 0.14 | 0.10 | 0.04 | 0.03 | 0.11 | 0.17 | 0.13   |        |
| P05        | 0.06                | 0.09 | 0.21 | 0.16 | 0.22 | 0.17 | 0.13 | 0.08 | 0.05 | 0.03 | 0.13 | 0.14 | 0.11   |        |
| P06        | 0.05                | 0.09 | 0.16 | 0.15 | 0.15 | 0.11 | 0.07 | 0.04 | 0.02 | 0.03 | 0.13 | 0.11 | 0.08   |        |
| P07        | 0.07                | 0.07 | 0.12 | 0.18 | 0.18 | 0.14 | 0.09 | 0.10 | 0.07 | 0.03 | 0.12 | 0.12 | 0.11   |        |
| P08        | 0.10                | 0.07 | 0.10 | 0.18 | 0.18 | 0.14 | 0.13 | 0.11 | 0.08 | 0.02 | 0.03 | 0.12 | 0.10   |        |
| P09        | 0.08                | 0.06 | 0.07 | 0.17 | 0.15 | 0.13 | 0.14 | 0.11 | 0.10 | 0.03 | 0.04 | 0.11 | 0.10   |        |
| P10        | 0.09                | 0.07 | 0.13 | 0.14 | 0.09 | 0.11 | 0.15 | 0.11 | 0.12 | 0.05 | 0.03 | 0.11 | 0.10   |        |
| P11        | 0.07                | 0.06 | 0.14 | 0.14 | 0.04 | 0.08 | 0.12 | 0.07 | 0.11 | 0.04 | 0.03 | 0.10 | 0.08   |        |
| P12        | 0.05                | 0.14 | 0.15 | 0.26 | 0.06 | 0.10 | 0.12 | 0.03 | 0.12 | 0.04 | 0.03 | 0.13 | 0.09   |        |
| P13        | 0.03                | 0.17 | 0.13 | 0.24 | 0.12 | 0.15 | 0.14 | 0.09 | 0.12 | 0.05 | 0.02 | 0.14 | 0.11   |        |
| P14        | 0.08                | 0.23 | 0.12 | 0.17 | 0.12 | 0.15 | 0.14 | 0.11 | 0.13 | 0.06 | 0.02 | 0.13 | 0.11   |        |
| P15        | 0.16                | 0.34 | 0.17 | 0.11 | 0.12 | 0.14 | 0.14 | 0.13 | 0.12 | 0.07 | 0.03 | 0.14 | 0.11   |        |
| P16        | 0.17                | 0.33 | 0.20 | 0.08 | 0.15 | 0.09 | 0.08 | 0.08 | 0.08 | 0.07 | 0.13 | 0.14 | 0.10   |        |
| P17        | 0.07                | 0.25 | 0.13 | 0.05 | 0.05 | 0.07 | 0.13 | 0.08 | 0.08 | 0.12 | 0.18 | 0.10 | 0.10   |        |
| P18        | 0.07                | 0.16 | 0.10 | 0.15 | 0.18 | 0.23 | 0.18 | 0.10 | 0.07 | 0.11 | 0.20 | 0.14 | 0.14   |        |
| P19        | 0.06                | 0.17 | 0.07 | 0.15 | 0.18 | 0.22 | 0.17 | 0.05 | 0.04 | 0.11 | 0.18 | 0.13 | 0.13   |        |
| P20        | 0.05                | 0.17 | 0.10 | 0.18 | 0.23 | 0.23 | 0.16 | 0.09 | 0.02 | 0.14 | 0.21 | 0.15 | 0.15   |        |
| P21        | 0.05                | 0.18 | 0.13 | 0.19 | 0.21 | 0.26 | 0.19 | 0.12 | 0.02 | 0.14 | 0.23 | 0.16 | 0.16   |        |
| P22        | 0.05                | 0.18 | 0.13 | 0.17 | 0.18 | 0.22 | 0.17 | 0.11 | 0.04 | 0.15 | 0.25 | 0.15 | 0.15   |        |
| P23        | 0.05                | 0.18 | 0.15 | 0.17 | 0.15 | 0.19 | 0.15 | 0.11 | 0.05 | 0.15 | 0.26 | 0.15 | 0.15   |        |
| P24        | 0.01                | 0.03 | 0.03 | 0.03 | 0.02 | 0.03 | 0.02 | 0.02 | 0.01 | 0.02 | 0.04 | 0.02 | 0.02   |        |
| P25        | 0.03                | 0.16 | 0.19 | 0.17 | 0.13 | 0.17 | 0.15 | 0.12 | 0.07 | 0.13 | 0.26 | 0.15 | 0.15   |        |
| P26        | 0.00                | 0.04 | 0.05 | 0.04 | 0.03 | 0.04 | 0.04 | 0.03 | 0.03 | 0.04 | 0.07 | 0.04 | 0.04   |        |
| P27        | 0.09                | 0.15 | 0.14 | 0.09 | 0.15 | 0.11 | 0.12 | 0.09 | 0.15 | 0.18 | 0.27 | 0.13 | 0.15   |        |
| P28        | 0.09                | 0.15 | 0.09 | 0.08 | 0.10 | 0.08 | 0.03 | 0.03 | 0.01 | 0.02 | 0.04 | 0.08 | 0.05   |        |
| P29        | 0.07                | 0.14 | 0.12 | 0.14 | 0.11 | 0.13 | 0.09 | 0.07 | 0.02 | 0.02 | 0.03 | 0.10 | 0.07   |        |
| P30        | 0.09                | 0.19 | 0.18 | 0.01 | 0.11 | 0.19 | 0.11 | 0.05 | 0.08 | 0.01 | 0.01 | 0.09 | 0.07   |        |
| T001       | 0.18                | 0.21 | 0.12 | 0.06 | 0.07 | 0.09 | 0.08 | 0.06 | 0.09 | 0.05 | 0.09 | 0.10 | 0.08   |        |
| T002       | 0.09                | 0.20 | 0.07 | 0.06 | 0.08 | 0.13 | 0.13 | 0.12 | 0.11 | 0.04 | 0.05 | 0.09 | 0.09   |        |
| T003       | 0.01                | 0.10 | 0.05 | 0.07 | 0.08 | 0.11 | 0.10 | 0.11 | 0.07 | 0.03 | 0.07 | 0.07 | 0.07   |        |
| T004       | 0.04                | 0.09 | 0.03 | 0.04 | 0.04 | 0.04 | 0.05 | 0.03 | 0.02 | 0.01 | 0.04 | 0.04 | 0.03   |        |
| T005       | 0.16                | 0.12 | 0.03 | 0.05 | 0.03 | 0.05 | 0.03 | 0.10 | 0.08 | 0.04 | 0.04 | 0.06 | 0.05   |        |
| T006       | 0.03                | 0.03 | 0.02 | 0.02 | 0.09 | 0.06 | 0.02 | 0.03 | 0.03 | 0.01 | 0.05 | 0.03 | 0.03   |        |
| T007       | 0.09                | 0.09 | 0.05 | 0.02 | 0.04 | 0.04 | 0.03 | 0.01 | 0.01 | 0.01 | 0.06 | 0.04 | 0.03   |        |
| T008       | 0.17                | 0.22 | 0.10 | 0.02 | 0.04 | 0.05 | 0.05 | 0.03 | 0.04 | 0.03 | 0.10 | 0.07 | 0.05   |        |
| T009       | 0.06                | 0.03 | 0.05 | 0.07 | 0.08 | 0.06 | 0.06 | 0.02 | 0.03 | 0.02 | 0.00 | 0.05 | 0.04   |        |
| T010       | 0.11                | 0.08 | 0.05 | 0.08 | 0.07 | 0.06 | 0.04 | 0.02 | 0.03 | 0.02 | 0.04 | 0.06 | 0.04   |        |
| T011       | 0.10                | 0.08 | 0.06 | 0.06 | 0.05 | 0.06 | 0.05 | 0.02 | 0.02 | 0.01 | 0.05 | 0.05 | 0.04   |        |
| T012       | 0.04                | 0.02 | 0.03 | 0.02 | 0.06 | 0.04 | 0.01 | 0.02 | 0.01 | 0.05 | 0.08 | 0.03 | 0.04   |        |
| T013       | 0.16                | 0.17 | 0.10 | 0.06 | 0.13 | 0.02 | 0.01 | 0.04 | 0.04 | 0.08 | 0.11 | 0.09 | 0.07   |        |
| T014       | 0.12                | 0.12 | 0.08 | 0.04 | 0.11 | 0.09 | 0.04 | 0.04 | 0.05 | 0.05 | 0.08 | 0.07 | 0.06   |        |
| T015       | 0.09                | 0.02 | 0.03 | 0.01 | 0.04 | 0.07 | 0.04 | 0.02 | 0.03 | 0.01 | 0.06 | 0.03 | 0.03   |        |
| T016       | 0.02                | 0.02 | 0.00 | 0.01 | 0.02 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.03 | 0.01 | 0.01   |        |
| T017       | 0.17                | 0.16 | 0.12 | 0.08 | 0.07 | 0.07 | 0.01 | 0.07 | 0.04 | 0.09 | 0.14 | 0.09 | 0.08   |        |
| T018       | 0.09                | 0.10 | 0.05 | 0.08 | 0.13 | 0.05 | 0.05 | 0.05 | 0.06 | 0.04 | 0.04 | 0.07 | 0.06   |        |
| T019       | 0.12                | 0.20 | 0.08 | 0.08 | 0.01 | 0.03 | 0.02 | 0.06 | 0.04 | 0.10 | 0.10 | 0.08 | 0.06   |        |
| T020       | 0.07                | 0.07 | 0.03 | 0.07 | 0.09 | 0.03 | 0.07 | 0.04 | 0.04 | 0.06 | 0.09 | 0.06 | 0.06   |        |
| T021       | 0.10                | 0.14 | 0.08 | 0.08 | 0.06 | 0.12 | 0.03 | 0.06 | 0.03 | 0.08 | 0.06 | 0.08 | 0.07   |        |
| T022       | 0.05                | 0.08 | 0.03 | 0.02 | 0.06 | 0.07 | 0.03 | 0.03 | 0.03 | 0.02 | 0.05 | 0.04 | 0.04   |        |
| T023       | 0.10                | 0.16 | 0.06 | 0.03 | 0.07 | 0.10 | 0.07 | 0.05 | 0.03 | 0.02 | 0.00 | 0.06 | 0.05   |        |
| T024       | 0.06                | 0.15 | 0.06 | 0.03 | 0.06 | 0.02 | 0.03 | 0.03 | 0.01 | 0.02 | 0.06 | 0.05 | 0.04   |        |
| T025       | 0.05                | 0.02 | 0.04 | 0.01 | 0.05 | 0.03 | 0.01 | 0.02 | 0.03 | 0.00 | 0.01 | 0.02 | 0.02   |        |
| T026       | 0.03                | 0.03 | 0.07 | 0.03 | 0.09 | 0.01 | 0.03 | 0.02 | 0.04 | 0.00 | 0.04 | 0.04 | 0.03   |        |
| T027       | 0.08                | 0.03 | 0.03 | 0.04 | 0.04 | 0.05 | 0.03 | 0.00 | 0.01 | 0.03 | 0.06 | 0.04 | 0.03   |        |
| T028       | 0.05                | 0.01 | 0.04 | 0.02 | 0.06 | 0.08 | 0.05 | 0.05 | 0.01 | 0.02 | 0.06 | 0.04 | 0.04   |        |
| T029       | 0.03                | 0.06 | 0.01 | 0.02 | 0.03 | 0.07 | 0.05 | 0.03 | 0.03 | 0.01 | 0.07 | 0.03 | 0.04   |        |
| T030       | 0.02                | 0.04 | 0.02 | 0.06 | 0.14 | 0.08 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02 | 0.05 | 0.04   |        |
| T031       | 0.14                | 0.15 | 0.08 | 0.07 | 0.05 | 0.06 | 0.07 | 0.02 | 0.03 | 0.01 | 0.06 | 0.07 | 0.05   |        |
| T032       | 0.09                | 0.15 | 0.06 | 0.05 | 0.01 | 0.14 | 0.07 | 0.04 | 0.05 | 0.02 | 0.07 | 0.06 | 0.05   |        |
| T033       | 0.09                | 0.09 | 0.03 | 0.01 | 0.04 | 0.04 | 0.03 | 0.02 | 0.02 | 0.02 | 0.05 | 0.04 | 0.03   |        |
| T034       | 0.02                | 0.18 | 0.07 | 0.06 | 0.05 | 0.01 | 0.02 | 0.03 | 0.03 | 0.05 | 0.07 | 0.06 | 0.05   |        |
| T035       | 0.12                | 0.17 | 0.08 | 0.11 | 0.07 | 0.08 | 0.02 | 0.06 | 0.03 | 0.05 | 0.09 | 0.09 | 0.07   |        |



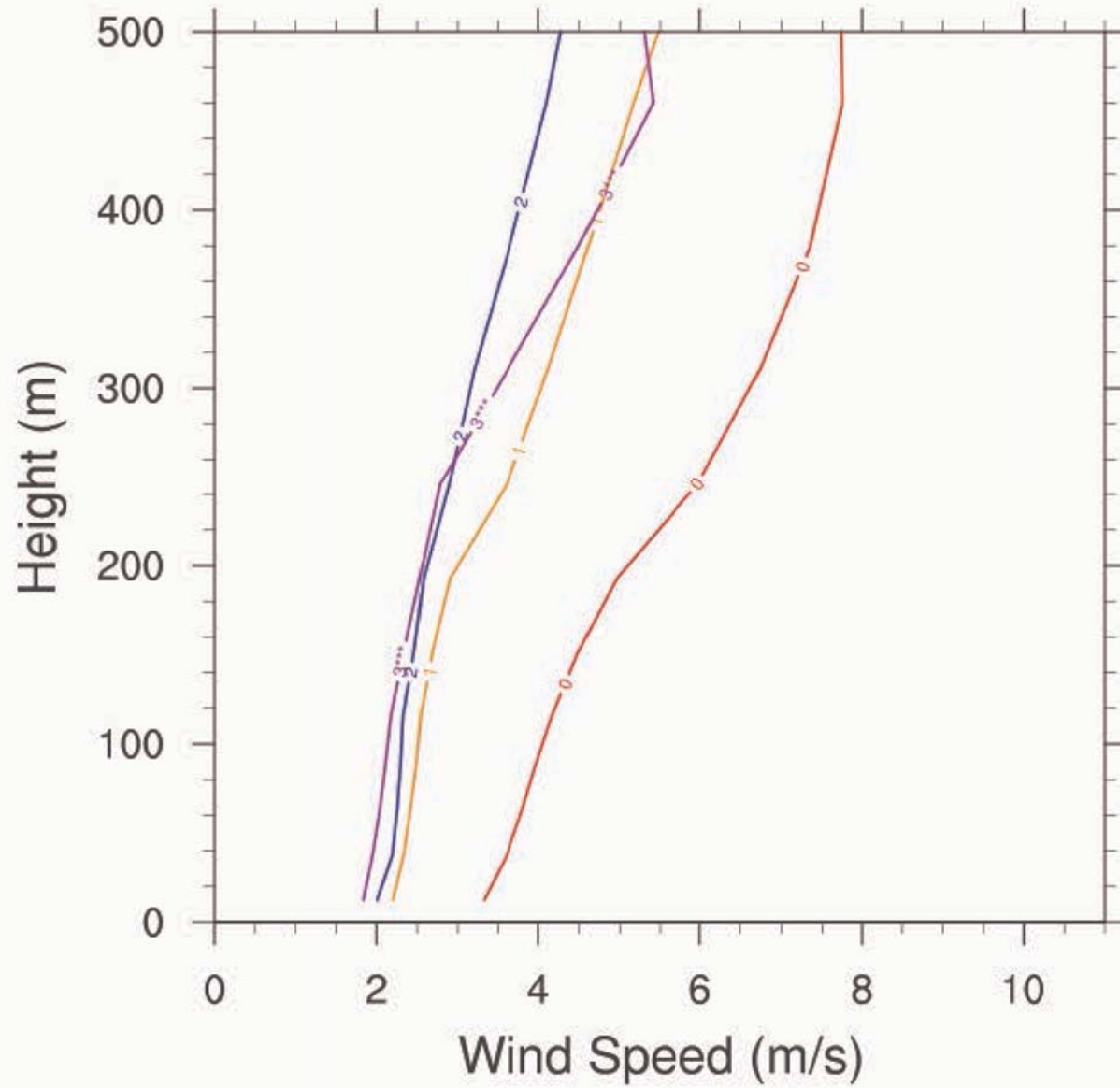
| Test Point | Proposed Scheme(VR) |      |      |      |      |      |      |      |      |      |      |        |        |  |
|------------|---------------------|------|------|------|------|------|------|------|------|------|------|--------|--------|--|
|            | NNE                 | NE   | ENE  | E    | ESE  | SE   | SSE  | S    | SSW  | SW   | WSW  | Annual | Summer |  |
| T036       | 0.06                | 0.23 | 0.14 | 0.06 | 0.08 | 0.11 | 0.11 | 0.02 | 0.04 | 0.03 | 0.06 | 0.09   | 0.07   |  |
| T037       | 0.06                | 0.13 | 0.08 | 0.03 | 0.04 | 0.08 | 0.03 | 0.01 | 0.03 | 0.03 | 0.06 | 0.06   | 0.04   |  |
| T038       | 0.10                | 0.03 | 0.01 | 0.06 | 0.07 | 0.05 | 0.03 | 0.05 | 0.02 | 0.04 | 0.03 | 0.05   | 0.04   |  |
| T039       | 0.03                | 0.03 | 0.04 | 0.03 | 0.04 | 0.06 | 0.04 | 0.02 | 0.01 | 0.01 | 0.05 | 0.03   | 0.03   |  |
| T040       | 0.03                | 0.22 | 0.02 | 0.02 | 0.03 | 0.04 | 0.02 | 0.01 | 0.04 | 0.09 | 0.09 | 0.05   | 0.05   |  |
| T041       | 0.04                | 0.08 | 0.02 | 0.07 | 0.03 | 0.02 | 0.03 | 0.00 | 0.07 | 0.09 | 0.14 | 0.05   | 0.06   |  |
| T042       | 0.12                | 0.19 | 0.14 | 0.09 | 0.07 | 0.05 | 0.03 | 0.07 | 0.03 | 0.03 | 0.05 | 0.09   | 0.06   |  |
| T043       | 0.01                | 0.07 | 0.06 | 0.01 | 0.08 | 0.13 | 0.10 | 0.01 | 0.05 | 0.06 | 0.09 | 0.06   | 0.06   |  |
| T044       | 0.06                | 0.01 | 0.14 | 0.07 | 0.07 | 0.09 | 0.05 | 0.02 | 0.14 | 0.05 | 0.03 | 0.08   | 0.07   |  |
| T045       | 0.09                | 0.03 | 0.04 | 0.04 | 0.01 | 0.02 | 0.02 | 0.01 | 0.03 | 0.06 | 0.06 | 0.04   | 0.03   |  |
| T046       | 0.06                | 0.01 | 0.05 | 0.03 | 0.02 | 0.00 | 0.01 | 0.00 | 0.01 | 0.06 | 0.07 | 0.03   | 0.03   |  |
| T047       | 0.02                | 0.03 | 0.04 | 0.01 | 0.03 | 0.03 | 0.03 | 0.04 | 0.00 | 0.06 | 0.05 | 0.03   | 0.03   |  |
| T048       | 0.01                | 0.04 | 0.08 | 0.01 | 0.04 | 0.07 | 0.05 | 0.09 | 0.01 | 0.01 | 0.01 | 0.04   | 0.03   |  |
| T049       | 0.08                | 0.11 | 0.07 | 0.06 | 0.06 | 0.04 | 0.02 | 0.08 | 0.04 | 0.02 | 0.06 | 0.06   | 0.05   |  |
| T050       | 0.03                | 0.12 | 0.05 | 0.05 | 0.03 | 0.06 | 0.03 | 0.06 | 0.04 | 0.04 | 0.04 | 0.05   | 0.04   |  |
| T051       | 0.04                | 0.03 | 0.04 | 0.03 | 0.05 | 0.01 | 0.00 | 0.03 | 0.00 | 0.04 | 0.04 | 0.03   | 0.03   |  |
| T052       | 0.01                | 0.04 | 0.01 | 0.00 | 0.02 | 0.12 | 0.06 | 0.00 | 0.03 | 0.05 | 0.06 | 0.03   | 0.04   |  |
| T053       | 0.08                | 0.21 | 0.08 | 0.07 | 0.08 | 0.08 | 0.01 | 0.05 | 0.06 | 0.13 | 0.15 | 0.09   | 0.08   |  |
| T054       | 0.14                | 0.14 | 0.07 | 0.09 | 0.10 | 0.11 | 0.03 | 0.05 | 0.08 | 0.10 | 0.07 | 0.09   | 0.08   |  |
| T055       | 0.10                | 0.11 | 0.03 | 0.07 | 0.06 | 0.10 | 0.05 | 0.12 | 0.06 | 0.07 | 0.09 | 0.07   | 0.08   |  |
| T056       | 0.11                | 0.18 | 0.13 | 0.08 | 0.11 | 0.07 | 0.08 | 0.06 | 0.07 | 0.17 | 0.25 | 0.11   | 0.12   |  |
| T057       | 0.18                | 0.23 | 0.10 | 0.11 | 0.14 | 0.17 | 0.05 | 0.04 | 0.05 | 0.05 | 0.07 | 0.11   | 0.08   |  |
| T058       | 0.10                | 0.16 | 0.10 | 0.07 | 0.10 | 0.10 | 0.04 | 0.08 | 0.12 | 0.08 | 0.05 | 0.09   | 0.08   |  |
| T059       | 0.13                | 0.13 | 0.13 | 0.08 | 0.12 | 0.16 | 0.10 | 0.06 | 0.07 | 0.06 | 0.10 | 0.10   | 0.09   |  |
| T060       | 0.16                | 0.22 | 0.10 | 0.11 | 0.14 | 0.16 | 0.08 | 0.10 | 0.01 | 0.09 | 0.14 | 0.12   | 0.10   |  |
| T061       | 0.20                | 0.18 | 0.15 | 0.19 | 0.12 | 0.16 | 0.10 | 0.03 | 0.13 | 0.19 | 0.19 | 0.16   | 0.14   |  |
| T062       | 0.13                | 0.16 | 0.13 | 0.17 | 0.12 | 0.13 | 0.08 | 0.02 | 0.20 | 0.25 | 0.26 | 0.15   | 0.16   |  |
| T063       | 0.03                | 0.09 | 0.06 | 0.03 | 0.03 | 0.03 | 0.02 | 0.03 | 0.19 | 0.14 | 0.14 | 0.06   | 0.09   |  |
| T064       | 0.12                | 0.19 | 0.11 | 0.10 | 0.10 | 0.12 | 0.08 | 0.10 | 0.03 | 0.02 | 0.05 | 0.10   | 0.07   |  |
| T065       | 0.12                | 0.12 | 0.18 | 0.17 | 0.15 | 0.14 | 0.09 | 0.01 | 0.20 | 0.25 | 0.36 | 0.16   | 0.18   |  |
| T066       | 0.09                | 0.16 | 0.17 | 0.13 | 0.16 | 0.21 | 0.13 | 0.12 | 0.11 | 0.26 | 0.28 | 0.16   | 0.18   |  |
| T067       | 0.16                | 0.29 | 0.20 | 0.05 | 0.12 | 0.06 | 0.12 | 0.14 | 0.15 | 0.06 | 0.13 | 0.13   | 0.11   |  |
| T068       | 0.15                | 0.27 | 0.08 | 0.02 | 0.15 | 0.05 | 0.07 | 0.07 | 0.07 | 0.04 | 0.05 | 0.09   | 0.07   |  |
| T069       | 0.08                | 0.11 | 0.09 | 0.04 | 0.13 | 0.11 | 0.09 | 0.12 | 0.06 | 0.09 | 0.03 | 0.08   | 0.08   |  |
| T070       | 0.13                | 0.15 | 0.06 | 0.11 | 0.07 | 0.15 | 0.14 | 0.01 | 0.04 | 0.04 | 0.01 | 0.09   | 0.07   |  |
| T071       | 0.03                | 0.06 | 0.05 | 0.06 | 0.10 | 0.12 | 0.10 | 0.10 | 0.06 | 0.02 | 0.05 | 0.07   | 0.07   |  |
| T072       | 0.03                | 0.03 | 0.02 | 0.09 | 0.05 | 0.04 | 0.05 | 0.12 | 0.11 | 0.07 | 0.04 | 0.06   | 0.07   |  |
| T073       | 0.04                | 0.09 | 0.00 | 0.14 | 0.08 | 0.06 | 0.03 | 0.13 | 0.10 | 0.05 | 0.06 | 0.08   | 0.08   |  |
| T074       | 0.08                | 0.07 | 0.08 | 0.08 | 0.07 | 0.09 | 0.04 | 0.06 | 0.06 | 0.06 | 0.10 | 0.07   | 0.07   |  |
| T075       | 0.02                | 0.04 | 0.01 | 0.09 | 0.01 | 0.01 | 0.05 | 0.10 | 0.10 | 0.05 | 0.01 | 0.04   | 0.05   |  |
| T076       | 0.01                | 0.04 | 0.07 | 0.06 | 0.13 | 0.01 | 0.02 | 0.02 | 0.04 | 0.00 | 0.05 | 0.05   | 0.04   |  |
| T077       | 0.02                | 0.04 | 0.30 | 0.09 | 0.15 | 0.04 | 0.04 | 0.11 | 0.06 | 0.04 | 0.05 | 0.11   | 0.08   |  |
| T078       | 0.04                | 0.07 | 0.08 | 0.04 | 0.09 | 0.06 | 0.06 | 0.05 | 0.08 | 0.01 | 0.03 | 0.06   | 0.05   |  |
| T079       | 0.12                | 0.10 | 0.11 | 0.14 | 0.11 | 0.03 | 0.08 | 0.18 | 0.16 | 0.10 | 0.05 | 0.11   | 0.11   |  |
| T080       | 0.10                | 0.09 | 0.07 | 0.10 | 0.08 | 0.06 | 0.06 | 0.16 | 0.08 | 0.09 | 0.08 | 0.09   | 0.09   |  |
| T081       | 0.06                | 0.05 | 0.04 | 0.12 | 0.05 | 0.10 | 0.09 | 0.19 | 0.13 | 0.12 | 0.06 | 0.09   | 0.10   |  |
| T082       | 0.04                | 0.13 | 0.05 | 0.06 | 0.08 | 0.01 | 0.01 | 0.19 | 0.03 | 0.01 | 0.01 | 0.06   | 0.05   |  |
| T083       | 0.07                | 0.03 | 0.08 | 0.03 | 0.05 | 0.04 | 0.01 | 0.12 | 0.07 | 0.02 | 0.01 | 0.05   | 0.04   |  |
| T084       | 0.04                | 0.06 | 0.05 | 0.07 | 0.10 | 0.09 | 0.04 | 0.07 | 0.07 | 0.03 | 0.06 | 0.06   | 0.06   |  |
| T085       | 0.03                | 0.01 | 0.07 | 0.01 | 0.01 | 0.05 | 0.05 | 0.10 | 0.09 | 0.01 | 0.02 | 0.04   | 0.04   |  |
| T086       | 0.02                | 0.02 | 0.04 | 0.03 | 0.03 | 0.04 | 0.05 | 0.02 | 0.04 | 0.02 | 0.01 | 0.03   | 0.03   |  |
| T087       | 0.08                | 0.04 | 0.07 | 0.10 | 0.20 | 0.08 | 0.03 | 0.03 | 0.06 | 0.03 | 0.01 | 0.08   | 0.06   |  |
| T088       | 0.01                | 0.02 | 0.02 | 0.08 | 0.08 | 0.09 | 0.07 | 0.08 | 0.07 | 0.01 | 0.01 | 0.05   | 0.05   |  |
| T089       | 0.01                | 0.02 | 0.02 | 0.13 | 0.09 | 0.03 | 0.01 | 0.01 | 0.03 | 0.02 | 0.00 | 0.05   | 0.04   |  |
| T090       | 0.02                | 0.01 | 0.00 | 0.09 | 0.09 | 0.04 | 0.02 | 0.02 | 0.09 | 0.07 | 0.03 | 0.05   | 0.06   |  |
| T091       | 0.04                | 0.06 | 0.05 | 0.04 | 0.04 | 0.02 | 0.01 | 0.01 | 0.03 | 0.01 | 0.01 | 0.04   | 0.02   |  |
| T092       | 0.04                | 0.03 | 0.03 | 0.03 | 0.01 | 0.03 | 0.01 | 0.03 | 0.07 | 0.01 | 0.00 | 0.03   | 0.03   |  |
| T093       | 0.01                | 0.05 | 0.17 | 0.06 | 0.08 | 0.08 | 0.05 | 0.08 | 0.06 | 0.00 | 0.02 | 0.07   | 0.05   |  |
| T094       | 0.06                | 0.06 | 0.22 | 0.13 | 0.19 | 0.02 | 0.01 | 0.05 | 0.09 | 0.02 | 0.05 | 0.11   | 0.07   |  |
| T095       | 0.03                | 0.02 | 0.03 | 0.06 | 0.13 | 0.03 | 0.01 | 0.05 | 0.05 | 0.01 | 0.03 | 0.05   | 0.04   |  |
| T096       | 0.06                | 0.06 | 0.08 | 0.12 | 0.09 | 0.07 | 0.12 | 0.08 | 0.04 | 0.03 | 0.01 | 0.08   | 0.07   |  |
| T097       | 0.06                | 0.05 | 0.18 | 0.12 | 0.21 | 0.09 | 0.09 | 0.06 | 0.10 | 0.04 | 0.06 | 0.11   | 0.09   |  |
| T098       | 0.14                | 0.20 | 0.15 | 0.11 | 0.30 | 0.12 | 0.10 | 0.06 | 0.07 | 0.06 | 0.03 | 0.14   | 0.10   |  |
| T099       | 0.20                | 0.23 | 0.22 | 0.07 | 0.29 | 0.18 | 0.10 | 0.14 | 0.11 | 0.07 | 0.06 | 0.16   | 0.13   |  |
| T100       | 0.09                | 0.04 | 0.03 | 0.02 | 0.06 | 0.01 | 0.01 | 0.04 | 0.01 | 0.05 | 0.13 | 0.04   | 0.04   |  |

| Test Point | Proposed Scheme(VR) |      |      |      |      |      |      |      |      |      |      |        |        |  |
|------------|---------------------|------|------|------|------|------|------|------|------|------|------|--------|--------|--|
|            | NNE                 | NE   | ENE  | E    | ESE  | SE   | SSE  | S    | SSW  | SW   | WSW  | Annual | Summer |  |
| T101       | 0.05                | 0.01 | 0.08 | 0.01 | 0.04 | 0.04 | 0.03 | 0.05 | 0.01 | 0.04 | 0.11 | 0.04   | 0.04   |  |
| T102       | 0.05                | 0.20 | 0.21 | 0.19 | 0.14 | 0.20 | 0.13 | 0.09 | 0.05 | 0.14 | 0.31 | 0.17   | 0.15   |  |
| T103       | 0.04                | 0.21 | 0.14 | 0.19 | 0.22 | 0.24 | 0.15 | 0.07 | 0.03 | 0.09 | 0.28 | 0.16   | 0.15   |  |
| T104       | 0.09                | 0.34 | 0.09 | 0.19 | 0.23 | 0.28 | 0.17 | 0.12 | 0.06 | 0.06 | 0.22 | 0.17   | 0.15   |  |
| T105       | 0.10                | 0.05 | 0.09 | 0.09 | 0.02 | 0.07 | 0.05 | 0.08 | 0.24 | 0.26 | 0.09 | 0.10   | 0.13   |  |
| T106       | 0.35                | 0.20 | 0.23 | 0.17 | 0.12 | 0.12 | 0.04 | 0.05 | 0.14 | 0.18 | 0.11 | 0.17   | 0.13   |  |
| T107       | 0.14                | 0.11 | 0.01 | 0.06 | 0.05 | 0.08 | 0.02 | 0.11 | 0.26 | 0.25 | 0.21 | 0.09   | 0.14   |  |
| T108       | 0.11                | 0.20 | 0.10 | 0.15 | 0.09 | 0.05 | 0.07 | 0.15 | 0.28 | 0.40 | 0.25 | 0.15   | 0.20   |  |
| T109       | 0.21                | 0.24 | 0.13 | 0.18 | 0.06 | 0.04 | 0.02 | 0.11 | 0.25 | 0.36 | 0.29 | 0.16   | 0.19   |  |
| T110       | 0.27                | 0.28 | 0.20 | 0.22 | 0.01 | 0.07 | 0.07 | 0.12 | 0.16 | 0.20 | 0.13 | 0.17   | 0.14   |  |
| T111       | 0.20                | 0.20 | 0.10 | 0.06 | 0.07 | 0.07 | 0.03 | 0.00 | 0.04 | 0.05 | 0.03 | 0.08   | 0.05   |  |
| T112       | 0.23                | 0.14 | 0.09 | 0.07 | 0.04 | 0.09 | 0.07 | 0.15 | 0.22 | 0.28 | 0.16 | 0.12   | 0.15   |  |
| T113       | 0.17                | 0.19 | 0.21 | 0.02 | 0.06 | 0.08 | 0.03 | 0.12 | 0.16 | 0.23 | 0.14 | 0.12   | 0.12   |  |
| T114       | 0.01                | 0.07 | 0.02 | 0.06 | 0.09 | 0.11 | 0.05 | 0.05 | 0.13 | 0.11 | 0.08 | 0.07   | 0.09   |  |
| T115       | 0.06                | 0.08 | 0.05 | 0.11 | 0.13 | 0.11 | 0.02 | 0.13 | 0.17 | 0.20 | 0.12 | 0.10   | 0.13   |  |
| T116       | 0.06                | 0.01 | 0.05 | 0.11 | 0.03 | 0.03 | 0.04 | 0.11 | 0.07 | 0.21 | 0.11 | 0.07   | 0.09   |  |
| T117       | 0.08                | 0.12 | 0.16 | 0.15 | 0.05 | 0.06 | 0.10 | 0.07 | 0.16 | 0.22 | 0.17 | 0.13   | 0.13   |  |
| T118       | 0.27                | 0.15 | 0.18 | 0.06 | 0.09 | 0.10 | 0.03 | 0.10 | 0.17 | 0.03 | 0.12 | 0.11   | 0.10   |  |
| T119       | 0.15                | 0.11 | 0.18 | 0.01 | 0.02 | 0.05 | 0.06 | 0.18 | 0.25 | 0.13 | 0.18 | 0.10   | 0.12   |  |
| T120       | 0.14                | 0.11 | 0.15 | 0.06 | 0.04 | 0.02 | 0.07 | 0.14 | 0.18 | 0.02 | 0.17 | 0.09   | 0.09   |  |
| T121       | 0.06                | 0.07 | 0.06 | 0.07 | 0.12 | 0.14 | 0.04 | 0.11 | 0.15 | 0.10 | 0.10 | 0.09   | 0.10   |  |
| T122       | 0.23                | 0.36 | 0.10 | 0.12 | 0.07 | 0.09 | 0.10 | 0.11 | 0.06 | 0.12 | 0.13 | 0.13   | 0.11   |  |
| T123       | 0.16                | 0.31 | 0.04 | 0.06 | 0.18 | 0.18 | 0.17 | 0.03 | 0.07 | 0.09 | 0.13 | 0.12   | 0.11   |  |
| T124       | 0.08                | 0.22 | 0.05 | 0.24 | 0.27 | 0.26 | 0.27 | 0.23 | 0.07 | 0.03 | 0.05 | 0.17   | 0.15   |  |
| T125       | 0.08                | 0.10 | 0.16 | 0.26 | 0.17 | 0.11 | 0.27 | 0.28 | 0.23 | 0.02 | 0.01 | 0.17   | 0.16   |  |
| T126       | 0.10                | 0.16 | 0.15 | 0.22 | 0.13 | 0.12 | 0.31 | 0.29 | 0.24 | 0.07 | 0.10 | 0.17   | 0.17   |  |
| T127       | 0.05                | 0.15 | 0.06 | 0.14 | 0.06 | 0.08 | 0.29 | 0.28 | 0.25 | 0.09 | 0.14 | 0.13   | 0.16   |  |
| T128       | 0.08                | 0.09 | 0.09 | 0.19 | 0.05 | 0.11 | 0.32 | 0.34 | 0.30 | 0.13 | 0.13 | 0.15   | 0.19   |  |
| T129       | 0.15                | 0.16 | 0.07 | 0.07 | 0.08 | 0.07 | 0.04 | 0.05 | 0.11 | 0.15 | 0.20 | 0.09   | 0.11   |  |
| T130       | 0.10                | 0.05 | 0.06 | 0.02 | 0.03 | 0.02 | 0.02 | 0.02 | 0.11 | 0.18 | 0.21 | 0.06   | 0.09   |  |
| T131       | 0.08                | 0.15 | 0.23 | 0.18 | 0.20 | 0.03 | 0.03 | 0.02 | 0.13 | 0.14 | 0.23 | 0.15   | 0.13   |  |
| T132       | 0.11                | 0.09 | 0.11 | 0.08 | 0.06 | 0.02 | 0.03 | 0.03 | 0.12 | 0.09 | 0.21 | 0.08   | 0.09   |  |
| T133       | 0.14                | 0.22 | 0.16 | 0.15 | 0.16 | 0.15 | 0.03 | 0.03 | 0.01 | 0.04 | 0.12 | 0.13   | 0.08   |  |
| T134       | 0.05                | 0.05 | 0.04 | 0.07 | 0.06 | 0.04 | 0.04 | 0.10 | 0.04 | 0.20 | 0.07 | 0.07   | 0.08   |  |
| T135       | 0.18                | 0.05 | 0.18 | 0.02 | 0.16 | 0.16 | 0.11 | 0.16 | 0.19 | 0.02 | 0.22 | 0.12   | 0.13   |  |
| T136       | 0.08                | 0.23 | 0.06 | 0.16 | 0.17 | 0.16 | 0.20 | 0.18 | 0.05 | 0.08 | 0.09 | 0.13   | 0.13   |  |
| T137       | 0.05                | 0.07 | 0.02 | 0.16 | 0.04 | 0.07 | 0.30 | 0.33 | 0.29 | 0.13 | 0.11 | 0.14   | 0.17   |  |
| T138       | 0.08                | 0.04 | 0.09 | 0.18 | 0.05 | 0.10 | 0.26 | 0.33 | 0.27 | 0.12 | 0.10 | 0.14   | 0.10   |  |
| T139       | 0.23                | 0.22 | 0.20 | 0.06 | 0.21 | 0.11 | 0.10 | 0.10 | 0.10 | 0.07 | 0.04 | 0.17   | 0.18   |  |
| T140       | 0.16                | 0.27 | 0.20 | 0.15 | 0.12 | 0.10 | 0.09 | 0.06 | 0.19 | 0.26 | 0.35 | 0.10   | 0.07   |  |
| T141       | 0.24                | 0.16 | 0.12 | 0.07 | 0.09 | 0.08 | 0.03 | 0.08 | 0.03 | 0.11 | 0.02 | 0.11   | 0.07   |  |
| T142       | 0.31                | 0.06 | 0.19 | 0.08 | 0.12 | 0.03 | 0.03 | 0.03 | 0.05 | 0.08 | 0.08 | 0.07   | 0.07   |  |
| T143       | 0.11                | 0.12 | 0.07 | 0.07 | 0.05 | 0.06 | 0.03 | 0.08 | 0.07 | 0.05 | 0.11 | 0.07   | 0.07   |  |
| T144       | 0.02                | 0.14 | 0.04 | 0.07 | 0.05 | 0.07 | 0.04 | 0.10 | 0.05 | 0.06 | 0.12 | 0.08   | 0.09   |  |
| S01        | 0.13                | 0.09 | 0.03 | 0.05 | 0.08 | 0.16 | 0.16 | 0.11 | 0.11 | 0.06 | 0.07 | 0.10   | 0.09   |  |
| S02        | 0.13                | 0.10 | 0.06 | 0.12 | 0.12 | 0.16 | 0.09 | 0.08 | 0.07 | 0.04 | 0.07 | 0.05   | 0.06   |  |
| S03        | 0.07                | 0.04 | 0.03 | 0.03 | 0.03 | 0.17 | 0.10 | 0.08 | 0.03 | 0.03 | 0.06 | 0.14   | 0.11   |  |
| S04        | 0.06                | 0.11 | 0.17 | 0.20 | 0.21 | 0.20 | 0.14 | 0.11 | 0.05 | 0.03 | 0.03 | 0.05   | 0.03   |  |
| S05        | 0.07                | 0.07 | 0.12 | 0.04 | 0.03 | 0.04 | 0.04 | 0.02 | 0.02 | 0.02 | 0.04 | 0.11   | 0.07   |  |
| S06        | 0.09                | 0.11 | 0.15 | 0.16 | 0.15 | 0.08 | 0.05 | 0.04 | 0.01 | 0.02 | 0.05 | 0.10   | 0.07   |  |
| S07        | 0.05                | 0.08 | 0.12 | 0.15 | 0.17 | 0.11 | 0.06 | 0.05 | 0.02 | 0.01 | 0.05 | 0.17   | 0.12   |  |
| S08        | 0.13                | 0.16 | 0.23 | 0.22 | 0.21 | 0.18 | 0.13 | 0.12 | 0.05 | 0.04 | 0.06 | 0.14   | 0.09   |  |
| S09        | 0.10                | 0.14 | 0.19 | 0.20 | 0.16 | 0.14 | 0.09 | 0.08 | 0.03 | 0.02 | 0.08 | 0.12   | 0.09   |  |
| S10        | 0.09                | 0.12 | 0.16 | 0.17 | 0.14 | 0.15 | 0.12 | 0.08 | 0.04 | 0.01 | 0.07 | 0.00   | 0.00   |  |



## APPENDIX E WIND PROFILE CURVE

e\_01549\_wind200





## **Annex 6: Environmental review (ER)**



Proposed Redevelopment  
in Kwun Tong Town Centre Development  
(DA 4 and 5)  
Environmental Assessment

Prepared by:  
**Ramboll Environ Hong Kong Limited**

Date:  
**December 2017**

Report Number:  
**R5741\_V2.1**



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## Contents

|   | Page |
|---|------|
| 1.0 Introduction .....  | 1    |
| 1.1 Study Background .....  | 1    |
| 1.2 Environmental Appraisal of the Proposed Development .....               | 2    |
| 2.0 Traffic Noise Impact Assessment .....                                   | 4    |
| 2.1 Assessment Criteria .....   | 4    |
| 2.2 Assessment Methodology .....  | 4    |
| 2.3 Noise Sensitive Receivers .....   | 4    |
| 2.4 Assessment Results and Proposed Traffic Noise Mitigation Measures ..... | 4    |
| 2.4.1 Assessment Result .....   | 6    |
| 2.4.2 Discussions on Mitigation Measures Proposed .....                     | 6    |
| 2.4.3 Conclusion .....  | 7    |
| 3.0 Railway Noise Impact Assessment .....                                   | 8    |
| 3.1 Scope of Assessment .....   | 8    |
| 3.2 Assessment Criteria .....   | 8    |
| 3.3 Operational Characteristics of MTR .....                                | 8    |
| 3.4 Assessment Methodology .....  | 9    |
| 3.5 Noise Sensitive Receiver .....  | 10   |
| 3.6 Results and Discussions .....   | 11   |
| 3.6.1 Upon Completion of Podium Construction at DA 4 and 5 .....            | 11   |
| 3.6.2 Conclusion .....  | 11   |
| 4.0 Overall Conclusions .....   | 12   |

## List of Tables

|         |  |   |
|---------|--|---|
| Table 1 | Proposed acoustic window (baffle type) and enhanced acoustic balcony .....                             | 6 |
| Table 2 | Acceptable Noise Levels at NSRs of the Development Having Direct Line of Sight to the Major Road ..... | 8 |
| Table 3 | HKPSG Railway Noise Standards .....  | 8 |
| Table 4 | Train Frequency adopted for Railway Noise Impact Assessment .....                                      | 9 |
| Table 5 | Average Sound Exposure Levels .....  | 9 |

## List of Figures

|           |  |
|-----------|--|
| Figure 1  | Location of the Subject Site and its Environs  |
| Figure 2  | Master Layout Plan of 1999 Units - GBP Scheme (Mar 2017 version)   |
| Figure 3  | Comparison between Previous 727 GBP Scheme and Current GBP Scheme  |
| Figure 4a | Locations of the Representative Noise Sensitive Receivers and Noise Mitigation Measures for Traffic Noise Impact Assessment (6/F to 12/F)  |
| Figure 4b | Locations of the Representative Noise Sensitive Receivers and Noise Mitigation Measures for Traffic Noise Impact Assessment (15/F to 50/F) |
| Figure 5  | Location of Railway Noise Measurement  |
| Figure 6  | Identification of Railway Track within 300m from the Application Site  |
| Figure 7  | Locations of the Representative Noise Sensitive Receivers for Railway Noise Impact Assessment  |

|           |  |
|-----------|--|
| Figure 8  | HKPSG Vehicular Emission Buffer Distance for Nearby Road Network |
| Figure 9  | Locations of Chimneys  |
| Figure 10 | Comparison of Change of Tower Disposition                        |

## List of Annexes

|          |   |
|----------|---|
| Annex 1  | Master Layout Plan  |
| Annex 2  | Comparison of Layout Change between the Approved 727 Scheme and the Current Scheme within DAs 4 and 5           |
| Annex 3  | Traffic Forecast and Transport Department's Reply   |
| Annex 4a | Traffic Noise Impact Assessment Results   |
| Annex 4b | Traffic Noise Impact Assessment Results of Previous Submission  |
| Annex 5  | Railway Noise Impact Assessment and sample calculation – After Completion of the Podium Structure at DA 4 and 5 |
| Annex 6  | Not Used  |
| Annex 7  | Design and Elevation of the acoustic window (baffle type) and enhanced acoustic balcony                         |
| Annex 8  | Typical Design of the Maintenance Window  |
| Annex 9  | MTRC's letter on train frequency  |
| Annex 10 | Tentative Development Programme   |



## 1.0 Introduction

### 1.1 Study Background

**1.1.1** The proposed development is located at Kwun Tong Town Centre Redevelopment Site (Main Site), and it consists of two portions, residential development at DA 2 and 3 and commercial development at DA 4 and 5. A planning application of the proposed development (Main Site) was approved on 13 February 2009 (Ref: A/K14/576) (hereafter name as Approved 576 Scheme). Subsequently, two town planning applications with revised schemes on the residential development at DA 2 and 3 were submitted under the Town Planning Ordinance. One was submitted on 21 May 2012 (Ref: A/K14/576-2) and was approved with conditions on 24 October 2012. Another scheme with 1869 units scheme was submitted on 15 Jan 2015 and was approved with conditions on 27 Apr 2015 (Ref: A/K14/576-3). Afterwards, a further revised scheme with 1999 units was submitted in Aug 2015 and was approved with conditions on 18 Dec 2015 (Ref: A/K14/727) (hereafter name as 727 Scheme). In the above planning applications, the changes are related to the design of the residential development at DA 2 and 3, i.e. the commercial development at DA 4 and 5 is same as that of the Approved 576 Scheme.

**1.1.2** After the approval of the planning applications, the proposed development at DA 2 and 3 has undergone detailed design and Building Plan submission, and construction work is now ongoing for DA 2 and 3. In April 2017, a planning application was submitted to the TPB for separating DA 4 and 5 into two separate packages, enhancing pedestrian connections to the MTR station by providing a new deck, and refining the layouts of the commercial development and public open space within DA 4 and DA 5, i.e. the design of the DA 2 and 3 are same as the latest design of the 727 Scheme received from the Project Architect of DA 2 and 3. Therefore, an update on environmental assessment should be conducted for the refinements in design of the commercial and G/IC development and open space layout within DA 4 and 5 to the approved 727 scheme in December 2015. The comparison of layout changes between the approved 727 scheme and the current scheme within DA 4 and 5 are shown in **Annex 2**. The tentative development programme is shown in **Annex 10**.

#### Objectives for this Environmental Assessment

**1.1.3** **Figure 1** shows the location of the Subject Site and its environs; and **Figure 2** shows the Master Layout Plan for the Proposed Scheme. It must be noted that the residential development at DA 2 and 3 are the latest design provided by the Project Architect for the 727 Scheme. DA 2 and 3, and DA 4 and 5 are at different stages of planning and development, i.e. DA 2 and 3 is already under construction whilst DA 4 and 5 is only at the planning stage of seeking approval from the TPB on the refined design. This planning application is to mainly to seek approval from the TPB for the proposed refinements in design for the commercial and G/IC development and open space layout within DAs 4 and 5.

**1.1.4** In view of the above, this environmental assessment would assess 1) if the proposed amendment at DA 4 and 5 would be subject to any adverse environmental impacts, and 2) if there is any adverse environmental impact arising from the proposed amendments at DA 4 and 5 to the residential development at DA 2 and 3 of the 727 Scheme. Sufficient mitigation measures would be recommended if it is necessary.

## 1.2 Environmental Appraisal of the Proposed Development

### Air Quality

**1.2.1** As the proposed amendment at DAs 4 and 5 are mainly for commercial developments, they would not rely on openable window for ventilation. The location of fresh air intake will be situated at the area where the HKPSG's recommended buffer distance for vehicular emission of >20m for Primary Distributor (Kwun Tong Road) and >10m for District Distributor (Hong Ning Road and Hip Wo Street). For the proposed open space amendment, it is located behind the proposed commercial developments and have sufficient buffer distance to the nearby roads. As such, the proposed amendment will not subject to adverse air quality impact. **Figure 8** shows the buffer distance for the proposed amendment at DAs 4 and 5.

**1.2.2** Based on the site visits carried out in November 2014 and Sep 2017 and the checking with the management offices of the buildings, most of the surrounding chimneys have been demolished or stopped in use (Number 24, 27, 35, 42 and 52), and there is no chimney within 200m of the proposed development. Therefore, the Subject Site would not be subject to adverse chimney emission impact as the relevant HKPSG recommended buffer distance for chimney emissions is complied. **Figure 9** shows the location of the remaining active chimneys.

**1.2.3** As shown in **Figure 10** which is a comparison with the master layout plan of the previous planning application Scheme (i.e. 576) and the 727 Scheme, the disposition of the residential towers is similar. It has been demonstrated in the previous submissions that the proposed development would not be subject to unacceptable air quality impact at all levels.

### Noise

**1.2.4** The proposed amendment involve refinements in design of the commercial development and open space at DAs 4 and 5. For the proposed commercial development, it includes office, hotel and G/IC. It is confirmed that the commercial developments would be equipped with central air-conditioning system, and therefore it would not rely on opened windows for ventilation. Therefore, the future occupants would not be subject to any adverse noise impact.

**1.2.5** Since the proposed commercial development would be equipped with central air-conditioning system, the associated mechanical equipment is considered to be fixed noise sources if they are not located at indoor. At this planning stage, there are no information on the design of these fixed noise sources. However, it is confirmed that these future fixed noise sources within the commercial sub-zone area would be designed and installed to meet the relevant noise criteria in the HKPSG.

**1.2.6** Based on the current layout of DA 4 and DA 5, traffic noise impact assessment on the residential development at DA 2 and 3 has been updated. In the approved 727 scheme submission, the compliance rate of the proposed development at DA 2 and 3 was about 89% (Annex 4b) with the original design of the DA 4 and 5. The traffic noise performance of the residential development at DA 2 and 3 has been reviewed for the proposed refinements in design of the DAs 4 and 5 in this submission. Based on the updated results, it is found that the refinements in design of the DAs 4 and 5 would not cause any adverse impact upon the residential development at DA 2 and 3. The compliance rate at DA 2 and 3 would still be about 89%. Details of the traffic noise impact are presented in Chapter 2. Section 2.4 describes the details of the mitigation measures proposed for mitigating the potential traffic noise impact.

**1.2.7** In addition, the railway noise impact upon the residential development at DAs 2 and 3 with the refined design of the commercial development at DA 4 and 5 has also been reviewed. It is found that the proposed commercial development can still provide sufficient shielding effect for the

residential towers within DAs 2 and 3 behind. The predicted noise level at the noise sensitive receivers at DA 2 and 3 can comply with relevant noise criterion. Details of the railway noise impact assessment are presented in the Chapter 3.

- 1.2.8** The existing bus terminus in the vicinity of the proposed development at Yue Man Square is a temporary bus terminus. This bus terminus will be relocated to the covered bus terminus within the DA 2 and 3 of the proposed development. The location of the future bus terminus is shown in **Annex 1**. As the existing bus terminus will not be in operation after the completion of the DA 2 and 3, the future residents at DA 2 and 3 will not be subject to potential noise impact from the existing bus terminus.
- 1.2.9** Based on the site visits carried out between 2015 and 2016, the landuse surrounding the residential portion of the proposed development is for residential use, i.e. no fixed noise sources. The commercial development of the proposed development is located at the southern portion. Kwun Tong Road and the MTRC Kwun Tong Line are located immediate south of the proposed development. There are commercial buildings and industrial buildings located further south on the opposite side of the Kwun Tong Road and MTRC Kwun Tong Line, i.e. the noisy road and railway are located in between. However, the busy road traffic noise and the railway noise are dominating the noise environment of the area and for the proposed development. Therefore, the industrial noise impact upon the proposed development due to the commercial buildings and industrial buildings is expected to be minimal and acceptable.

## 2.0 Traffic Noise Impact Assessment

### 2.1 Assessment Criteria

- 2.1.1** Noise standards are recommended in Chapter 9, “Environment”, of the Hong Kong Planning Standards and Guidelines (HKPSG) for planning against possible noise impact from road traffic, railway and aircrafts. According to the guidelines, the maximum road traffic noise level, measured in terms of L10(1-hr.), at facades of residential development like the proposed development is 70 dB(A).

### 2.2 Assessment Methodology

- 2.2.1** The assessment concerns the prediction of the maximum hourly L10 traffic noise level at noise sensitive receivers (NSRs) of the Proposed Development due to the projected traffic flow on the adjacent major road networks within 15 years from the operation year of the proposed development. The traffic data provided by the project traffic consultant – Atkins for year 2041 and that for the 727 scheme for year 2039 were reviewed, and the traffic data for the year 2039 is considered as the worst case scenario within 15 years upon completion of the whole proposed development in 2026. Traffic forecast of year 2041 and 2039, as well as the comparison of this two set of traffic data are attached in **Annex 3**. For the traffic forecast of year 2039, Transport Department had no comment on this, and the relevant reply is also attached in **Annex 3**.

- 2.2.2** The U.K. Department of Transport’s procedure “Calculation of Road Traffic Noise” has been applied to predict the hourly L10 noise level generated from road traffic at selected representative noise sensitive receivers (NSRs) of the Proposed Development. The predicted noise levels were then compared with the HKPSG noise criterion for assessing the impact.

### 2.3 Noise Sensitive Receivers

- 2.3.1** Noise Sensitive Receivers (NSRs) likely to be subject to adverse traffic noise impact have been identified in this assessment. Their locations at the current scheme are shown in **Figure 4**. The assessment points were taken at 1.2 m above the floors of the selected storey and 1m away from the facades of openable windows.

### 2.4 Assessment Results and Proposed Traffic Noise Mitigation Measures

- 2.4.1** In order to minimise the potential traffic noise impact, mitigation measures have been incorporated or considered in formulating the building layout. **Figure 4** shows the location of the mitigation measures proposed for mitigating the potential adverse traffic noise impact.

The mitigation measures proposed in the current scheme include:

- 2.4.1.1** Setback for residential buildings – Kwun Tong Road, that has high traffic flow and percentage of heavy vehicles, is located to the south of the Proposed Development. The residential towers have been located with maximum allowed setback distances from Kwun Tong Road.
- 2.4.1.2** Provision of podium – The residential towers are sitting on a podium which provides shielding effect for the residential towers behind.
- 2.4.1.3** Noise tolerant building as screening structure – A multi-storey noise tolerant building structure and a high-rise office/retail/hotel block with central air-conditioning will be located at the



southern portion of the Proposed Development, i.e. DA 4 and 5, in order to provide effective screening for the traffic noise from Kwun Tong Road.

- 2.4.1.4** Orientations of buildings – the residential towers close to the Mut Wah Street and Hip Wo Street are orientated to minimize angle of view to the road traffic.
- 2.4.1.5** Use of maintenance windows – Maintenance windows with maximum 300mm clear opening with special keys will be provided for some of the leading facades facing Mut Wah Street, Hong Ning Road, and Hip Wo Street. The maintenance windows will not be used for ventilation purpose. Design of the maintenance window is shown in **Annex 8**.
- 2.4.1.6** Vertical fins (some of them with sound absorption material) of 1.0 to 1.8m in length are proposed at some locations. Locations of the vertical fins (and sound absorption material) are also shown in **Figure 4**. For conservative assessment, it must be noted that the noise reduction provided by the vertical fin in reducing the traffic noise is not more than 3 dB.
- 2.4.1.7** Purpose-built noise barriers – The proposed noise barriers in terms of extended canopy facing Mut Wah Street and Hip Wo Street will effectively reduce the road traffic noise impact on the NSRs behind. Location of the extended canopy and their associated dimensions are also shown in **Figure 4**.
- 2.4.1.8** Acoustic window (baffle type) will be provided for mitigating traffic noise impact. The design and dimension of the acoustic window (baffle type) are shown in Table 1 below. It is confirmed by the Project Architect that the designs of the acoustic window (baffle type) would meet all relevant Buildings Ordinance requirements. For the reduction provided by the acoustic window (baffle type) on traffic noise, it is a difference between the in-out difference provided by the acoustic window (baffle type) and that provided by an ordinary window. In the road traffic noise assessment, it is assumed that a 3 dB reduction would be provided for the acoustic window (baffle) as a conservative approach. **Figure 4a, Figure 4b and Figure 7** show the locations of the acoustic window (baffle type).
- 2.4.1.9** Enhanced acoustic balcony will be provided for mitigating the traffic noise impact. The design and dimension of the enhanced acoustic balcony are shown in Table 1 below. The parapet of the enhanced acoustic balconies should be solid walls and there would be no gap and opening in-between the parapet walls. It is confirmed by the Project Architect that the designs of the enhanced acoustic balcony would meet all relevant Buildings Ordinance requirements. It is assumed that a 3 dB reduction would be provided for the enhanced acoustic balcony as a conservative approach. **Figure 4a, Figure 4b and Figure 7** show the locations of the enhanced acoustic balcony.
- 2.4.1.10** Acoustic balcony will be provided for mitigating the road traffic noise impact. The balcony ceiling will be applied with sound absorption material. The balcony will have solid parapet of 1.2m high on 3 sides and depth of at least 1.1m plus its location above the roads. The parapet should be solid walls and there would be no gap and opening in-between the parapet walls. It is assumed that the balcony can provide 2 dB reduction at these locations. The locations of acoustic balcony are shown in **Figure 4a and Figure 4b**.

**Table 1 Proposed acoustic window (baffle type) and enhanced acoustic balcony**

| Acoustic window (baffle type) / Enhanced acoustic balcony      | Provisions   |
|--|--|
| Acoustic window (baffle type) for Master-bedrooms and Bedrooms | <ul style="list-style-type: none"> <li>Minimum 100mm overlapping</li> <li>100mm gap</li> <li>Inner window opening with 3mm thick MPA (40mm cavity)</li> </ul>  |
| Enhanced acoustic balcony for Living rooms                     | <ul style="list-style-type: none"> <li>Solid balustrade of 1.25m above balcony floor</li> <li>Acoustic ceiling</li> <li>Sliding door with MPA at exterior facing side (40mm cavity)</li> <li>100mm gap</li> <li>Minimum 100mm overlapping</li> </ul> |

## 2.4.2 Assessment Result

- 2.4.2.1** The modelled results at the representative NSRs are shown in **Annex 4a**.
- 2.4.2.2** With the implementation of effective and practical traffic noise mitigation measures mentioned above, which can be found in the EPD's web site for innovative noise mitigation designs and measures, the compliance rate of the proposed development with DA 2 and 3 is about 89%.
- 2.4.2.3** According to Appendix 4.4: Suitable Window Types for Noise Insulation in Chapter 9 of HKPSG, it is recommended to have openable well-gasketed window with 6mm window pane and air conditioning system as indirect mitigation measures for any facades with traffic noise exceedance. However, in order to provide better quality of windows and living, single frame double pane window (e.g. 6mm glass + 8mm air + 6 mm glass or other configurations that can provide the sound transmission class 31 or above) and air conditioning systems will be provided for these openable windows with exceedance in this project.

## 2.4.3 Discussions on Mitigation Measures Proposed

- 2.4.3.1** As mentioned in section 2.4, there are a number of noise mitigation measures proposed, including
1. Provision of maximum building set-back. Since there are requirements for provision of the sufficient air corridor between residential towers and public open space within the proposed development, the setback distances from the residential towers to the local busy roads (Hip Wo Street, Mut Wah Street and Hong Ning Road) as well as the major road (Kwun Tong Road) have been maximized;
  2. Provision of Podium. The coverage of the podium has been maximized after the consideration of a balance with air ventilation, visual impact and noise reduction performance;
  3. Use of Noise Tolerant Building as screening structure. The multi-storey noise tolerant building structure and a high-rise office/retail/hotel block at the southern portion of the Proposed Development would provide effective screening for the traffic noise from Kwun Tong Road for the residential towers behind;

4. Building block design with careful building orientation to minimise the angle of view of some facades. The residential towers close to the Mut Wah Street and Hip Wo Street are orientated to minimize angle of view to the road traffic;
  5. Careful internal layout with the use of maintenance windows at facades facing noisy roads (Hip Wo Street, Mut Wah Street, Hong Ning Road and Kwun Tong Road);
  6. Provision of vertical fins (some of them with sound absorption material) at some locations to reduce angle of view from the noise sensitive use to the noisy roads. The locations of the fins are shown in **Figure 4**. The possibility of using vertical fins at other areas has been studied, but it was found that the fins would not be effective as they are perpendicular to the road which cannot reduce much angle of view to the road. Therefore, no additional vertical fins are provided;
  7. Provision of noise shielding walls in terms of canopy at podium. Extensive canopies have been provided for the podium facing Mut Wah Street and Hip Wo Street where the residential blocks are located. The locations and dimensions of the canopies are shown in **Figure 4**. Further extension of the canopies towards the road would have obstruction to the air ventilation passing along the roads;
  8. Provision of acoustic window (baffle type). Acoustic window (baffle type) have been proposed at some locations for mitigating traffic noise. However, for some of the units affected by traffic noise, acoustic window (baffle type) cannot be applied, as those units are constrained by requirements on natural lighting and ventilation under Building (Planning) Regulations, which cannot be met with the windows and doors openings sizing of acoustic window (baffle type).
  9. Provision of acoustic balcony. The balcony ceiling of some NSRs is applied with sound absorption material to mitigate the traffic noise impact. The locations of acoustic balcony are shown in **Figure 4**.
  10. Provision of enhanced acoustic balcony. Enhanced acoustic balcony have been proposed at some locations for mitigating traffic noise.
- 2.4.3.2** All practical noise mitigation measures have been duly considered and exhausted where appropriate. Upgraded indirect measures in terms of provision of single frame double pane window and air conditioning systems will be provided for these openable windows with exceedance in this project.
- 2.4.4 Conclusion**
- 2.4.4.1** With all the practicable mitigation measures identified, the road traffic noise impacts would be minimised.

### 3.0 Railway Noise Impact Assessment

#### 3.1 Scope of Assessment

- 3.1.1** The Proposed Development is located at the north of the MTR Kwun Tong Line. In this submission, railway noise impact was assessed with the consideration of development at DA 4 and 5.

#### 3.2 Assessment Criteria

- 3.2.1** The proposed development is located at urban area and is directly affected by a trunk road – Kwun Tong Road which has an annual average daily traffic of more than 30,000 vehicles in accordance with the annual traffic census – 2015 published by Transport Department. According to the “Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites” (IND-TM), the Area Sensitivity Rating (ASR) of the NSRs in the proposed development that are affected by an influencing factor is C. Below is the noise criteria of ASR rating “C”.

**Table 2 Acceptable Noise Levels at NSRs of the Development Having Direct Line of Sight to the Major Road**

| Time Period                        | Acceptable Noise Levels (ANL)<br>for ASR “C”, $L_{eq(30min)}$ , dB(A) |
|------------------------------------|---|
| Day & Evening (0700 to 2300 hours) | 70  |
| Night (2300 to 0700 hours)         | 60  |

Note: The determined ASR and ANL are for assessment purpose only and should not prejudice the Authority's discretion on the enforcement based on the contemporary conditions

- 3.2.2** The HKPSG also provides additional criteria for assessing railway noise. These noise criteria are specified in terms of A-weighted maximum noise level and daily railway noise exposure level, as shown in Table 3 below.

**Table 3 HKPSG Railway Noise Standards**

| Parameter                      | Noise Level, dB(A) |
|--------------------------------|--------------------|
| $L_{max}$ (2300 to 0700 hours) | 85                 |
| $L_{eq}$ (24 hr)               | 65                 |

#### 3.3 Operational Characteristics of MTR

- 3.3.1** According to the information obtained from the MTRCL, as attached in **Annex 9**, the current peak Kwun Tong Line's passenger train frequencies during daytime and night-time shall be 15 and 8 trains per 30 minutes per direction respectively. However, based on the Kwun Tong Line Extension Project EIA Report (AEIAR-154/2010), the future peak train frequencies during daytime and night-time will be 18 and 9 trains per 30 minutes per direction respectively, which are adopted in the assessment as a conservative approach. **Table 4** summarizes the train frequencies adopted for railway noise impact assessment.



**Table 4 Train Frequency adopted for Railway Noise Impact Assessment**

| Period   | Train Frequency                           |
|--|---|
| Daytime (Peak) (07:00 – 10:00 hrs)                                   | 18 trains per 30 minutes (each direction) |
| Night-time (06:00 – 07:00 hours & 20:00 – 01:00 hrs of the next day) | 9 trains per 30 minutes (each direction)  |
| Daily  | 367 trains (each direction)               |

### 3.4 Assessment Methodology

**3.4.1** The assumption used in the submission of the approved planning application (TPB application no. A/K14/576 and A/K14/727) has been adopted in this assessment.

**3.4.2** The sound exposure levels (SEL) of the train noise based on the updated on field noise measurement carried out on 15 Sep 17 is adopted, and are listed in **Table 5** below. The noise measurement was conducted during the period of 1500 to 1800 using B&K Type 1 noise meter (model no. 2250) and was calibrated using the B&K sound level calibrator type 4231 with a calibration signal of 94.0 dB(A) at 1 kHz. During the noise measurement, the weather was sunny and the wind speed was less than 1 m/s. The noise measurement was conducted free field on the roof top of 2-10 Yue Man Square, which is same as that adopted in the approved planning application (TPB application no. A/K14/576, and A/K14/727) and in full view of the eastbound and westbound railway track sections not obstructed by the station structure (**Figure 5**). As a conservative approach, the largest SEL is adopted for the assessment.

**Table 5 Average Sound Exposure Levels**

| Train Movement          | Average SEL, dB(A) | Measurement Distance |
|-------------------------|--------------------|----------------------|
| Near track (East Bound) | 84.7               | 31m                  |
| Far track (West Bound)  | 88.4               | 34m                  |

**3.4.3** Given that the measurement location was located in an urban area with high background due to road traffic on Kwun Tong Road and community activities at Yue Man Square, the measured SEL was employed for prediction of railway noise. SEL is a metric used to describe the amount of noise from a single event and is commonly used for assessing noise from trains.

**3.4.4** For ordinary assessment based on the reference SEL, the Leq (30 min) level during the night-time period can be determined by taking into account the following factors:

- Distance correction [ $DC = 10 \times \log(D_{ref}/D)$ ] where  $D_{ref}$  is the reference distance during measurement, i.e. 31m for near track (i.e. East Bound) and 34m for far track (i.e. West Bound)
- View angle correction [ $VAC = 10 \times \log(\text{view angle at NSR} / \text{view angle at noise measurement microphone})$ ], i.e. view angle at noise measurement microphone is 180 degree
- Poor track correction [+3dB] to account for potential deterioration in train operating conditions such as wheel/rail wearing varying with time.
- Façade correction [+2.5dB]

- Conversion from SEL to Leq (30 min) during night-time [a frequency of trains in 30 minutes per direction based on Table 3 above.], i.e.  $SEL + 10 \log(n/\text{assessment period e.g. 1800 sec})$  where  $n$  = number of trains within the assessment period.
- Cbar is the barrier correction (based on Maekawa's Approach to take into account the barrier effect using path difference) applied for the screening effect of the buildings in between.
- Figure 6** shows the railway track segment. The railway track at far side where the Kwun Tong MTR station covered has not been considered in this assessment. Similarly, the rail tracks along Kwun Tong Station will be screened by the future high-rise office/retail/hotel and the noise tolerant building structure located in the southern portion of the Subject Site. For this reason, certain sections of the rail tracks have not been included in the assessment. The railway segment 5-WB is not considered in the assessment as this segment is totally screened by the Kwun Tong Station.
- The vertical fins proposed for mitigating traffic noise impact shown in **Figure 4** have also been taking into account in this assessment.

**3.4.5** It is envisaged that the most critical time of the day in terms of assessment is the duration between 0600 and 0700 hours in the night-time period, as the specified noise criterion is the most stringent in this period. The noise criteria is 60 dB(A) for night-time while that for the daytime is 70 dB(A).

**3.4.6** To evaluate the predicted noise level of the same noise sensitive receiver against criteria at different time periods (i.e. day and evening period, night-time period and Leq (24 hr)), the only difference is the correction of the conversion of SEL to Leq (i.e.  $10 \log(N/T)$  where  $N$  is the total number of events and  $T$  is the total time in seconds). From general acoustic point of view, doubling the train frequency will have an increment of 3 dB of the noise level. According to **Table 4**, the train frequency in day & evening (18 trains per direction per 30 minutes) is about a double of the train frequency in night-time (9 trains per direction per 30 minutes). The correction of the no. of events for daytime was  $10 \times \log(18/1800) = -20.0$  dB while that for the night-time period was  $10 \times \log(9/1800) = -23.0$  dB. Therefore, the predicted Leq(30mins) of daytime period will be about 3 dB larger than that of the Leq(30mins) of night-time. However, the noise criterion of Leq(30mins) of daytime and evening time periods is 70 dB(A), while that of the night-time period is 60 dB(A), i.e. the difference is 10 dB between the noise criteria of day and evening time periods, and the night-time period. Therefore, if the predicted noise level at the NSR can comply with the night-time criterion, the relevant day and evening noise criterion can also be complied. It is because that the increment of the noise level in the daytime and evening period (+ 3 dB) is less than that of the noise criterion (+ 10 dB).

**3.4.7** For Leq (24hrs), its noise criterion is 5 dB more than that of the night-time as shown in Table 3. Based on the train frequency listed in **Table 4**, the correction of converting the SEL to Leq(30mins) of night-time period was -23.0 dB (i.e.  $10 \times \log(9/(60 \times 30))$ ) while that to Leq(24hrs) was -23.7 dB (i.e.  $10 \times \log(367/(60 \times 60 \times 24))$ ). The correction for Leq(24hrs) was only slightly larger. The increment of the noise level due to the change of the correction for Leq(24hrs) in comparing with the Leq(30mins) of night-time period is 0.7dB. Therefore, the predicted Leq(24hrs) will be 0.7 dB larger than that of the Leq(30mins) of night-time but the noise criterion for Leq(24hrs) is 5 dB more than that of the night-time period. Therefore, the predicted Leq(24hrs) will comply with the relevant standard if the predicted noise level at night-time period can comply with the relevant noise standard.

### 3.5 Noise Sensitive Receiver

**3.5.1** Representative assessment locations were selected and shown in **Figure 7**. Assessment points were taken at 1m away from the openable windows on the façade of the noise sensitive uses (e.g.

living/dining room, study room and bedrooms) of residential dwellings, and at 1.2m above floor slabs.

### 3.6 Results and Discussions

#### 3.6.1 Upon Completion of Podium Construction at DA 4 and 5

The assessment results are shown in **Annex 5**. It indicated that the nearest residential towers (T1 and T5) would be subject to railway noise levels from 31 to 60 dB(A) during night-time, which would comply with the relevant night-time noise limit under the Noise Control Ordinance. Detailed calculations are also shown in **Annex 5**. It is anticipated that the Proposed Development will not be adversely affected by railway noise upon the completion of podium construction at DA 4 and 5.

#### 3.6.2 Before Completion of Building Construction at DA 4 and 5 (For Information Only)

The noise impact on the development before the completion of building construction at DA 4 and 5 has already been assessed in the NIA for the residential development, i.e. the approved planning application A/K14/727.

#### 3.6.3 Conclusion

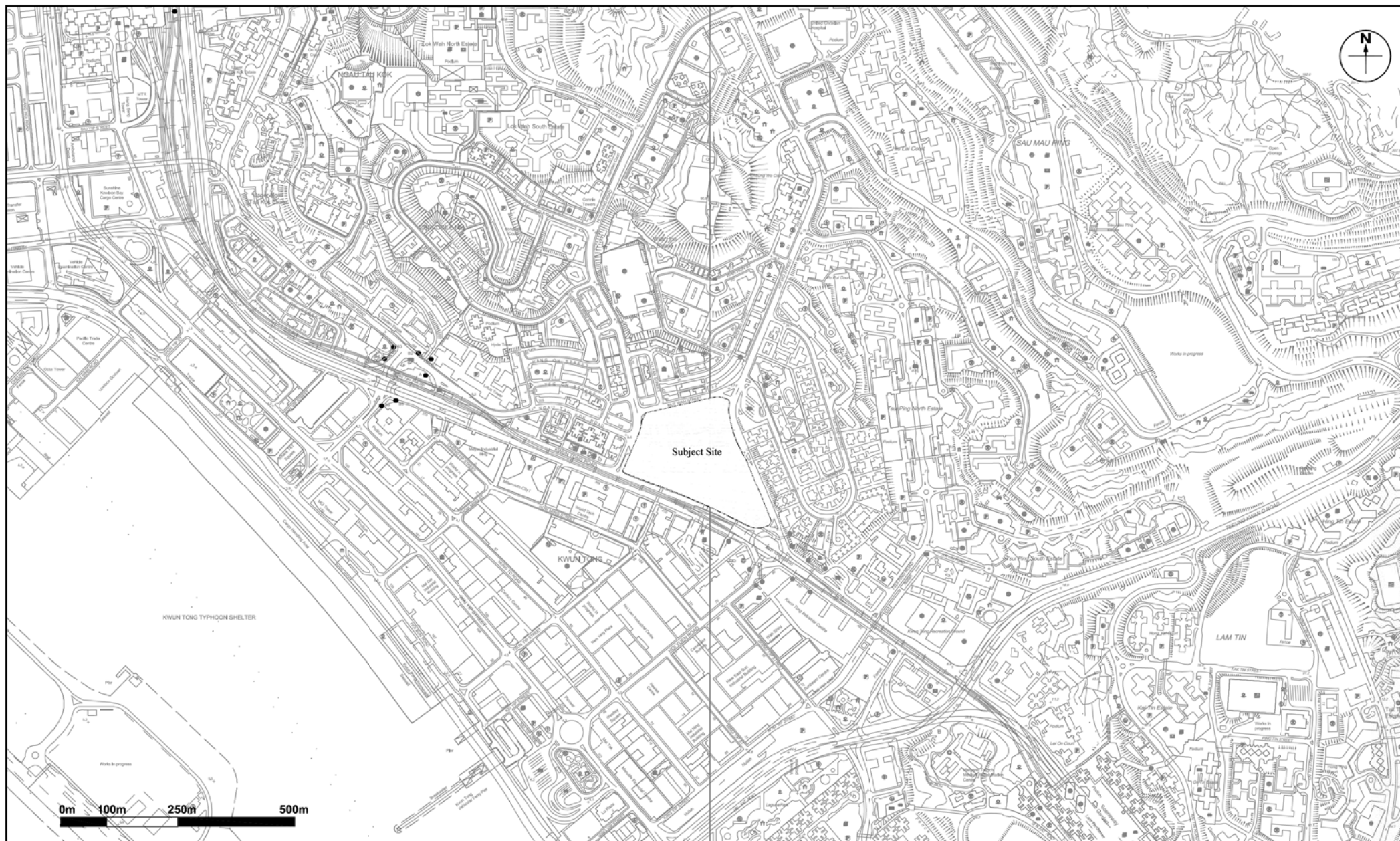
With consideration of the podium building structures at DA 4 and 5, the railway noise level at the Proposed Development would comply with the relevant noise criteria as the podium building structures would provide sufficient shielding effect for the residential units behind.

### 4.0 Overall Conclusions

- 4.1.1 Traffic noise impact and railway noise impact based on the Proposed Scheme has been quantitatively assessed.
- 4.1.2 With the careful layout design, provision of sufficient mitigation measures, the traffic noise compliance rate of the current scheme is about 89%. For providing better living quality, single frame and double pane window and air conditioning system will be provided at those facades with traffic noise exceedance as indirect measures. With all the practicable mitigation measures identified, the road traffic noise impacts would be minimised.
- 4.1.3 With the consideration of the noise mitigating podium structure at DA 4 and 5, the predicted railway noise levels at the residential towers at DA 2 and 3 will comply with the relevant criteria under the HKPSG and the Noise Control Ordinance.







**Figure: 1**

**Title:** The Location of the Subject Site and Its Environs

**Project:** Proposed Redevelopment in Kwun Tong Town Centre Development (DA 4 and 5)

**RAMBOLL** ENVIRON

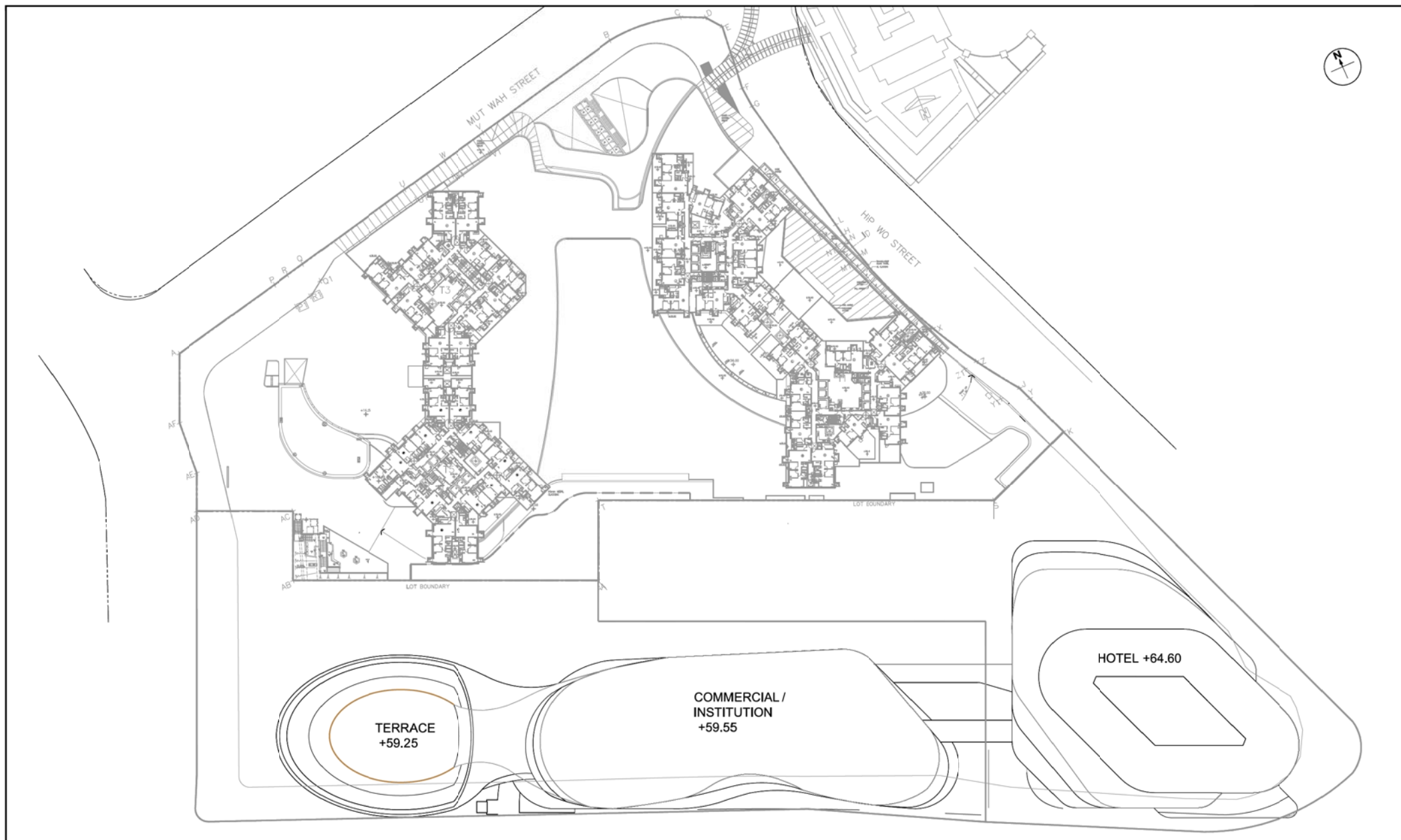
Drawn by: EC

Checked by: TC

Rev.: 1.1

Date: Apr 2017





**Figure: 2**

**Title:** Master Layout Plan for the Proposed Redevelopment

**Project:** Proposed Redevelopment in Kwun Tong Town Centre Development (DAs 4 and 5)

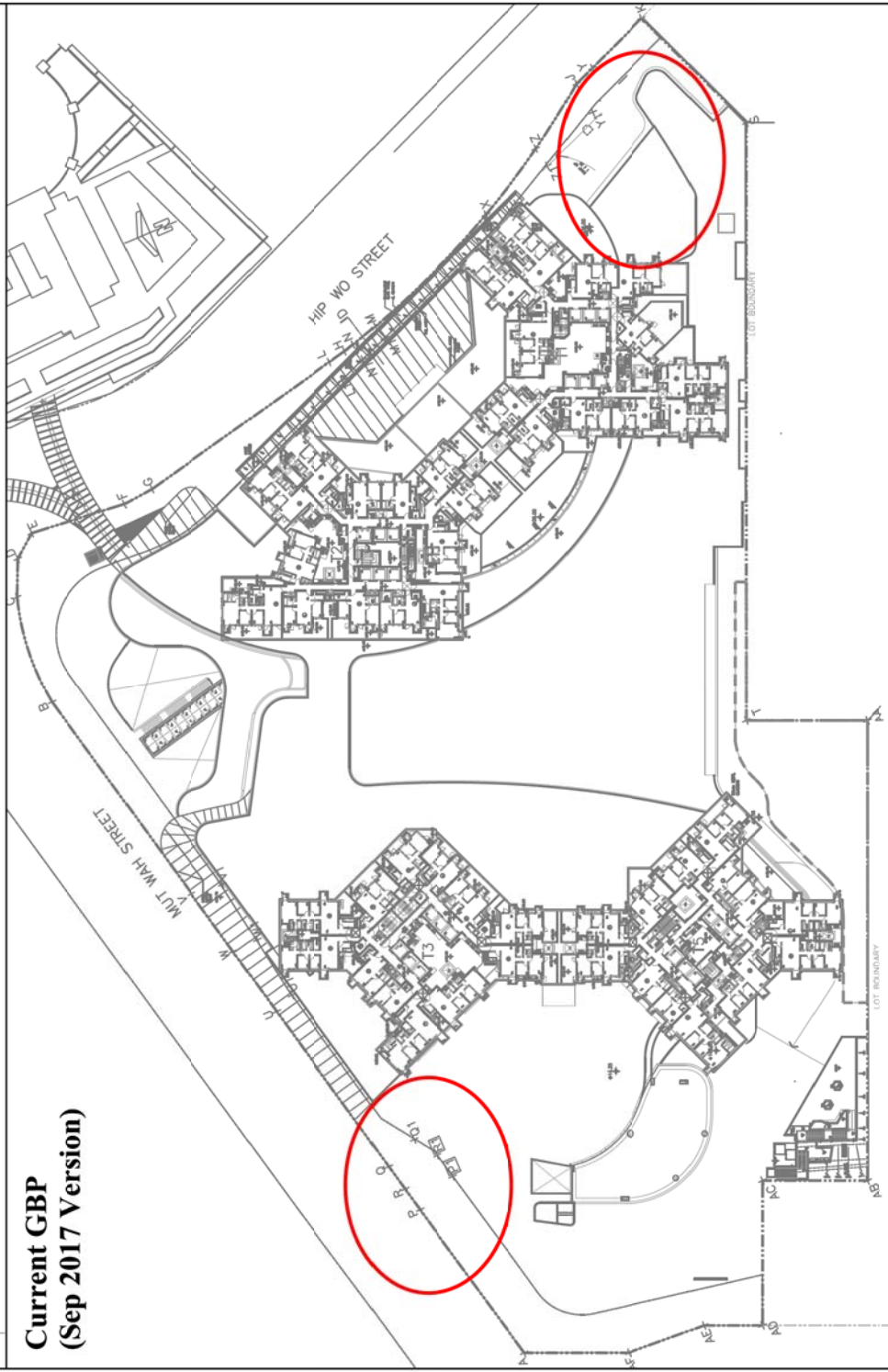
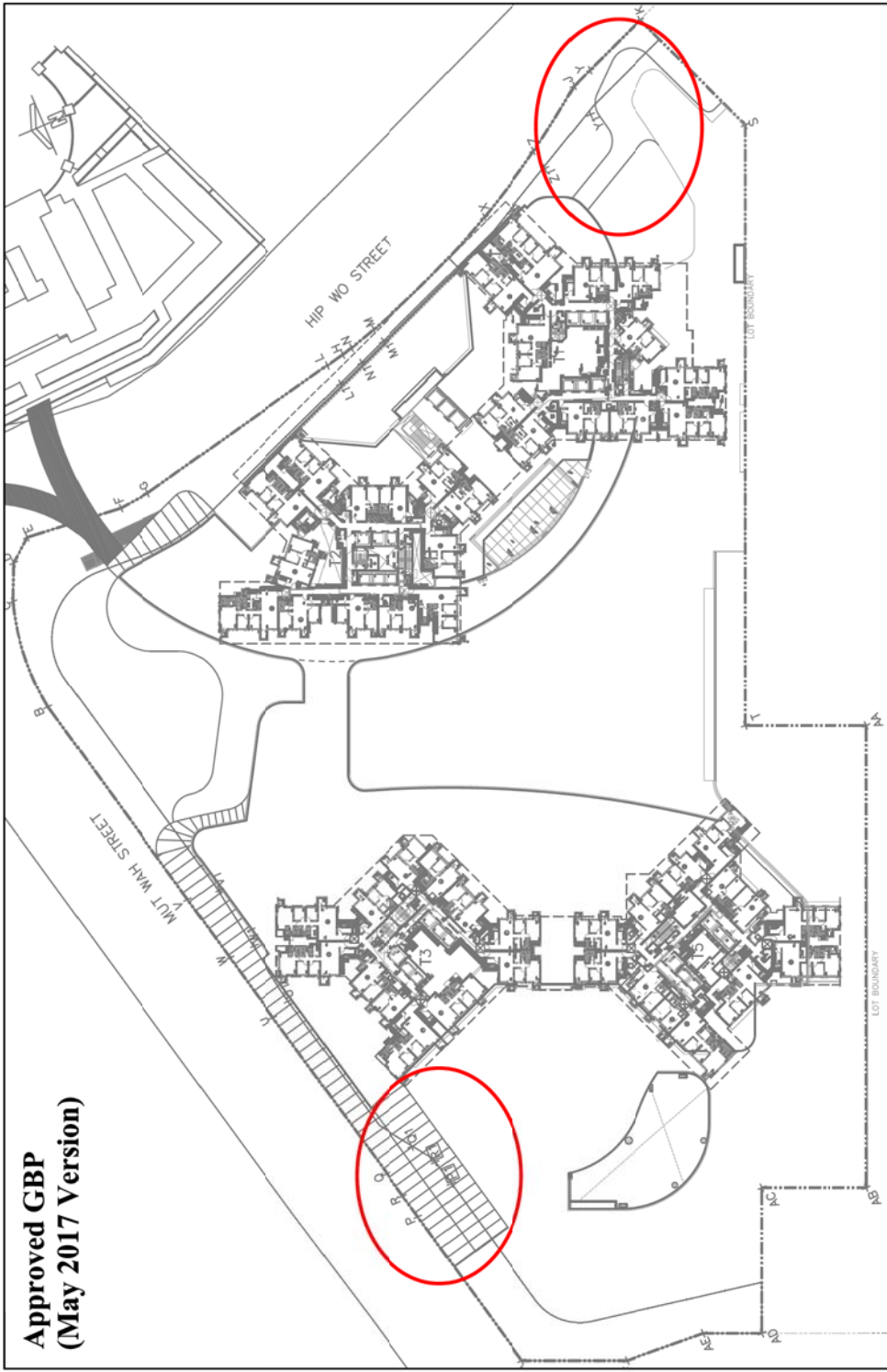
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Drawn by: AS

Checked by: TC

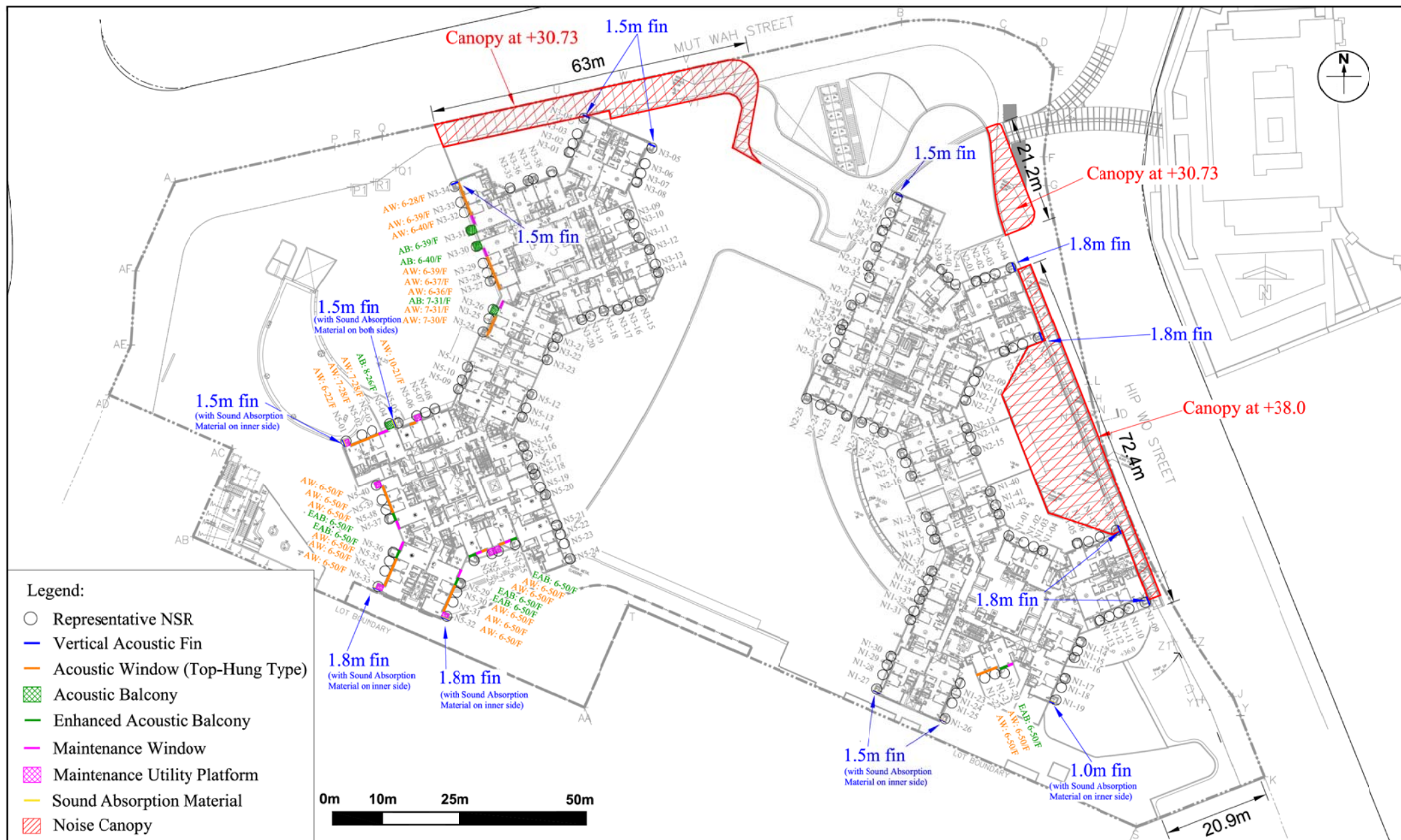
Rev.: 1.0

Date: Dec 2017



|  |                 |          |
|--|-----------------|----------|
| <b>Figure: 3</b>   | RAMBOLL ENVIRON |          |
|  | Drawn by:       | AS       |
|  | Checked by:     | TC       |
|  | Rev.:           | 1.0      |
| <b>Title:</b> Comparison between Previous GBP (May 2017) and Current GBP (Sep 2017)      |                 | Date:    |
| <b>Project:</b> Proposed Redevelopment in Kwun Tong Town Centre Development (DA 4 and 5) |                 | Dec 2017 |





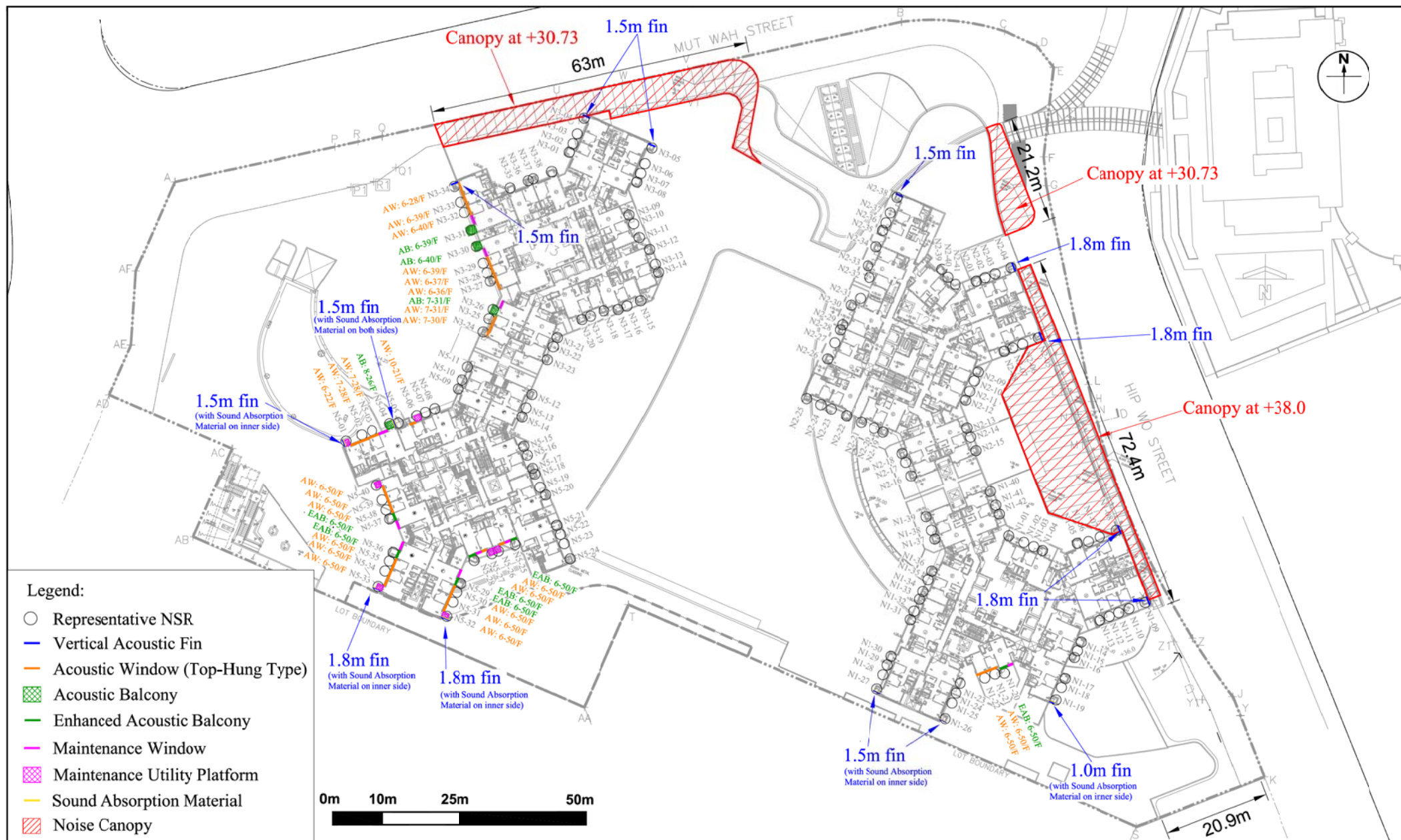
RAMBOLL ENVIRON

Drawn by: AS

Checked by: TC

Rev.: 1.0

Date: Dec 2017



RAMBOLL ENVIRON

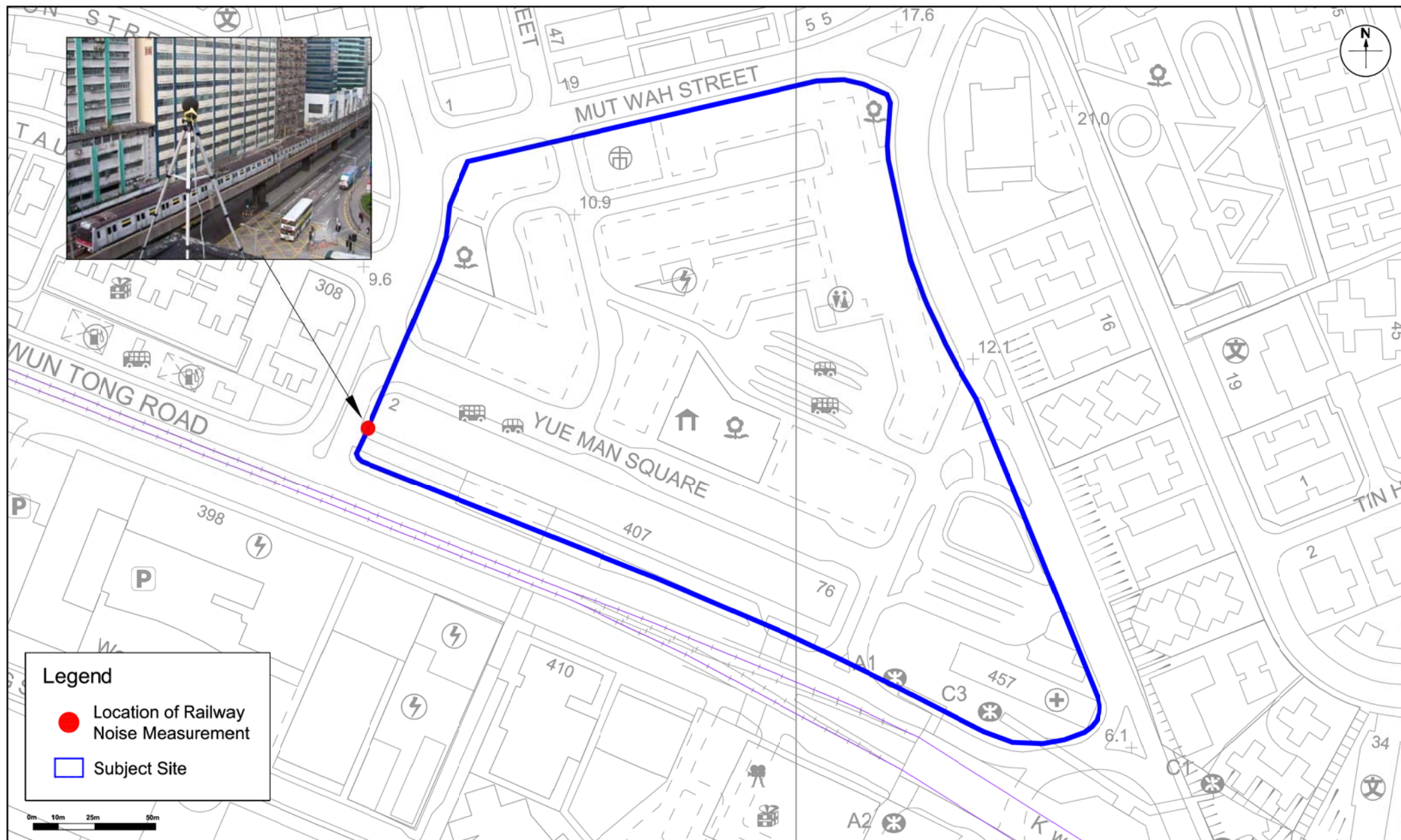
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Checked by: TC

Rev.: 1.0

Date: Dec 2017





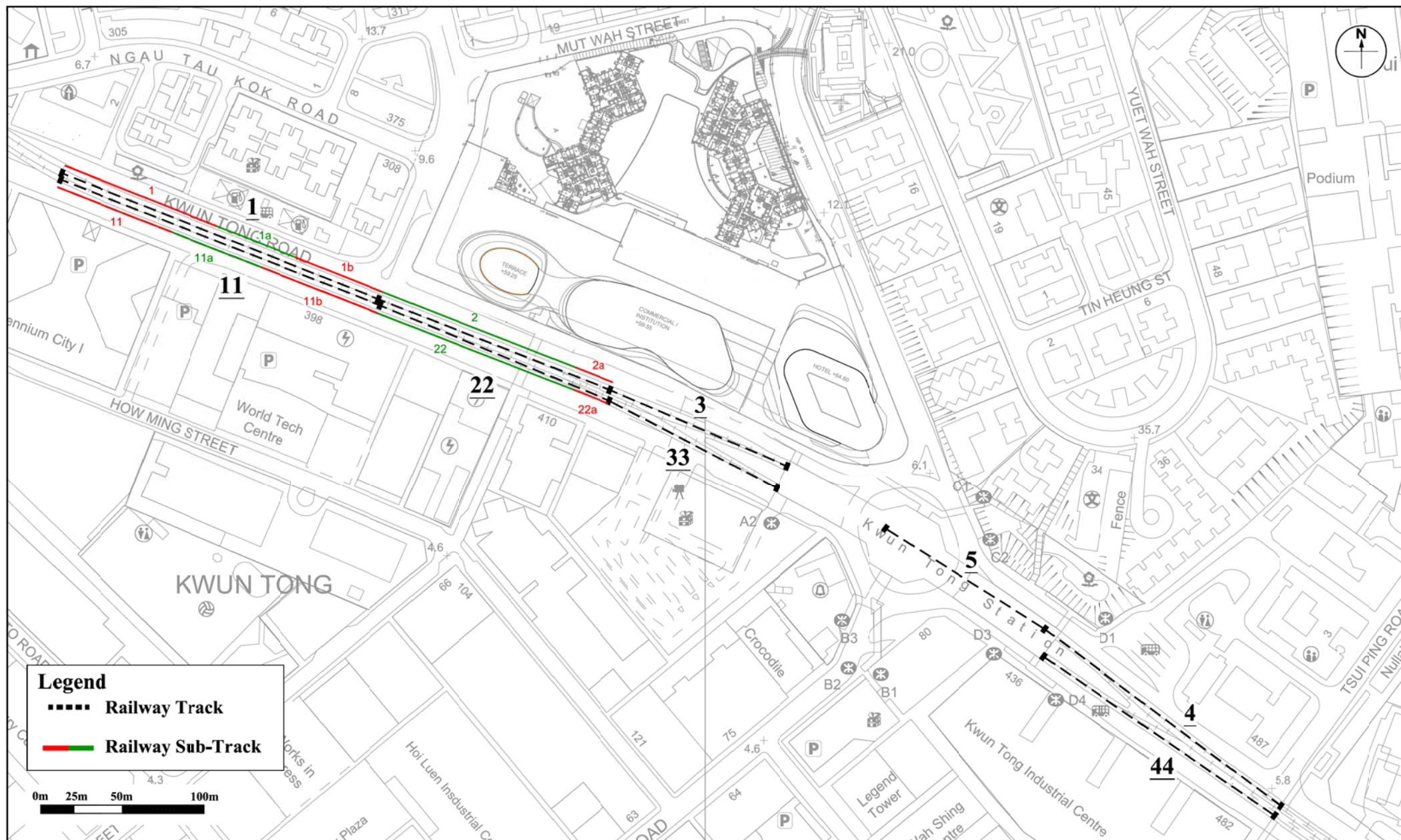
**RAMBOLL** ENVIRON

Drawn by: EC

Checked by: TC

Rev.: 1.1

Date: Apr 2017



**Figure: 6**

**Title:** Identification of Railway Track within 300m from the application site

**Project:** Proposed Redevelopment in Kwun Tong Town Centre Development (DA 4 and 5)

**RAMBOLL ENVIRON**

Drawn by: EC

Checked by: TC

Rev.: 1.0

Date: Dec 2017





**Figure:** 7

**Title:** Locations of the Representative Noise Sensitive Receivers for Railway Noise Impact Assessment

**Project:** Proposed Redevelopment in Kwun Tong Town Centre (DA 4 and 5)

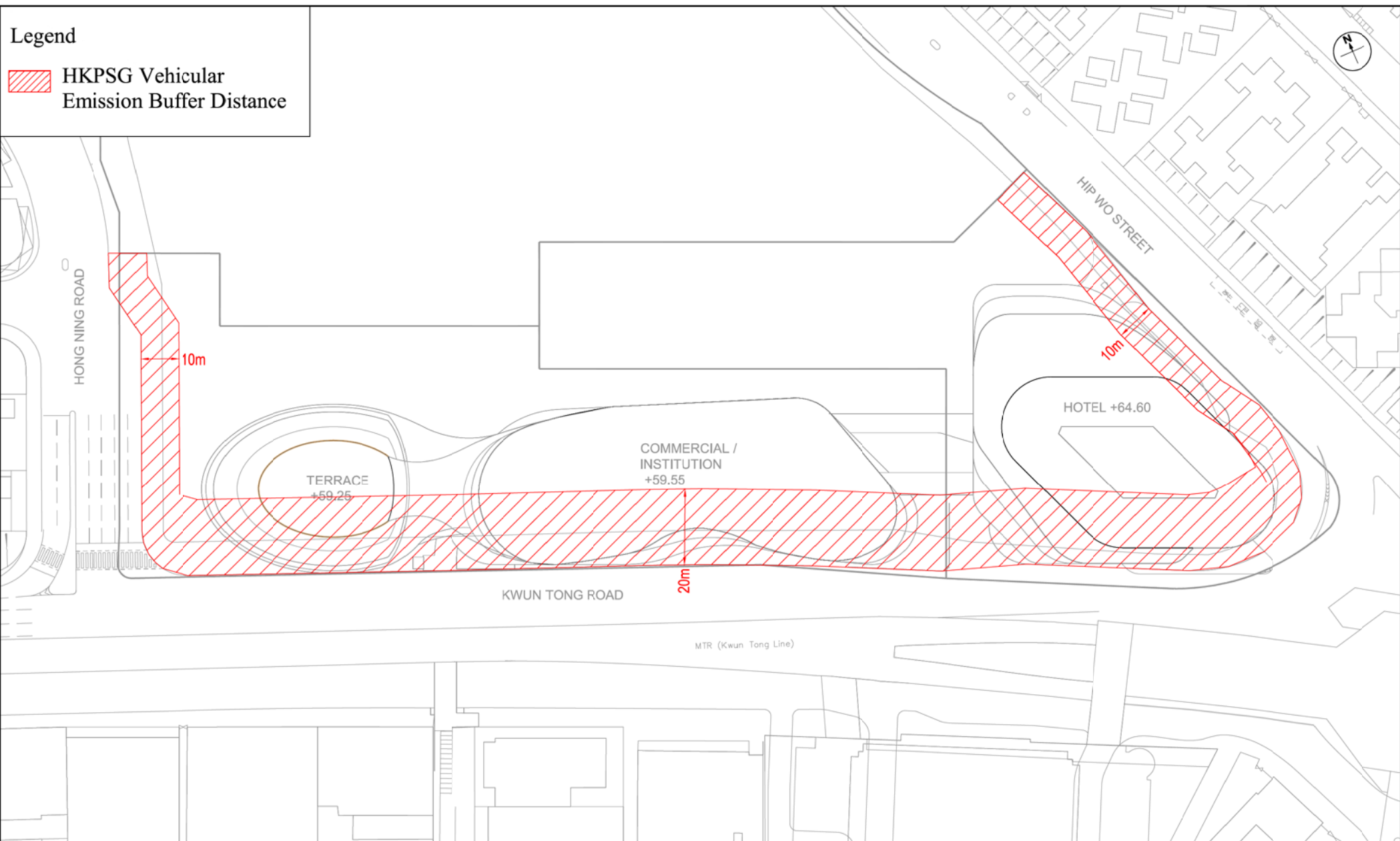
**RAMBOLL** ENVIRON

Drawn by: EC

Checked by: TC

Rev.: 1.0

Date: Dec 2017



**Figure: 8**

**Title:** HKPSG Vehicular Emission Buffer Distance for Nearby Road Network

**Project:** Proposed Redevelopment in Kwun Tong Town Centre Development (DA 4 and 5)

**RAMBOLL ENVIRON**

Drawn by: AS

Checked by: TC

Rev.: 1.0

Date: Dec 2017



Legend:

- Chimney
- × Chimney being demolished or stopped in use

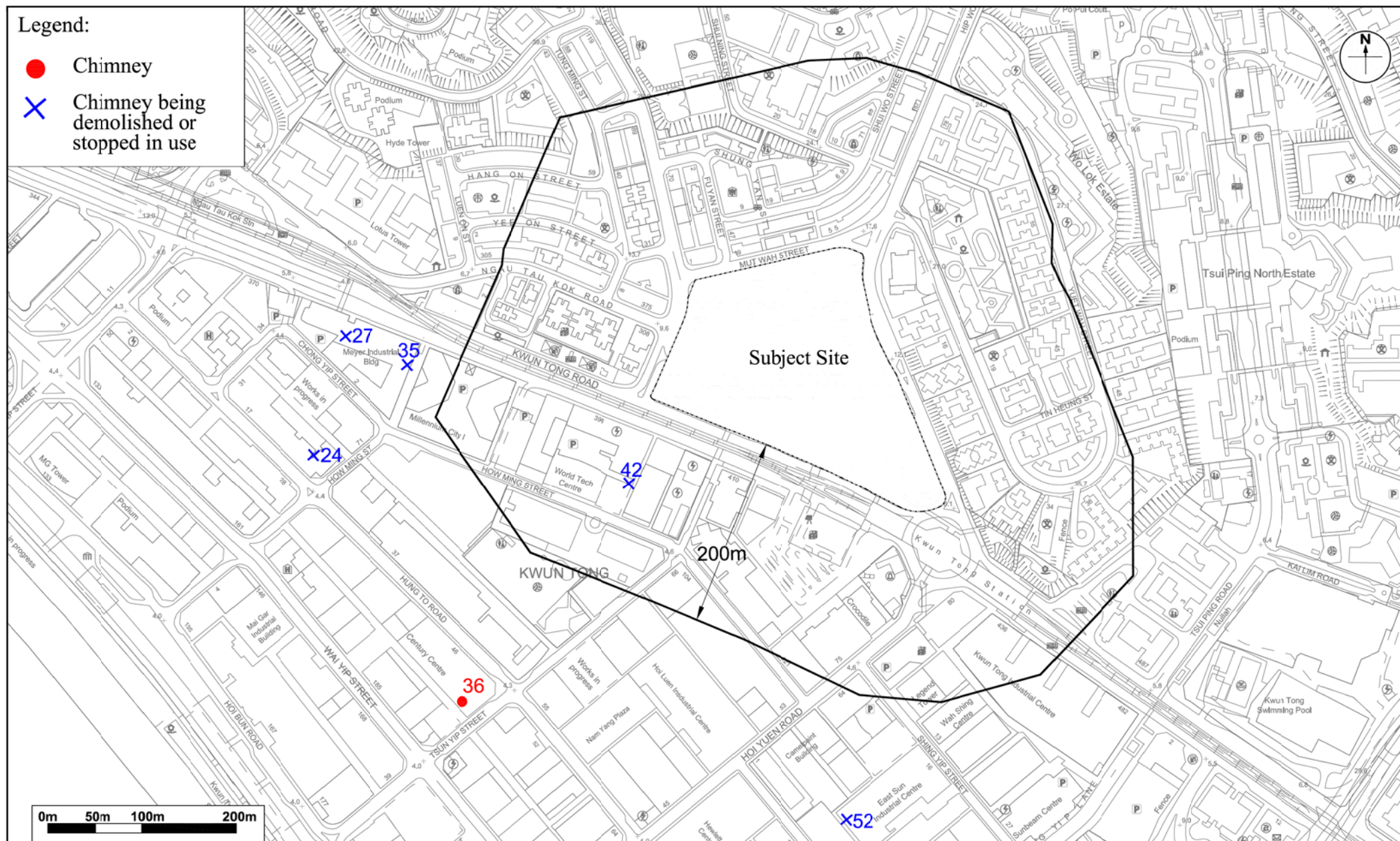


Figure: 9

Title: Locations of Chimneys

Project: Proposed Redevelopment in Kwun Tong Town Centre Development (DA 4 and 5)

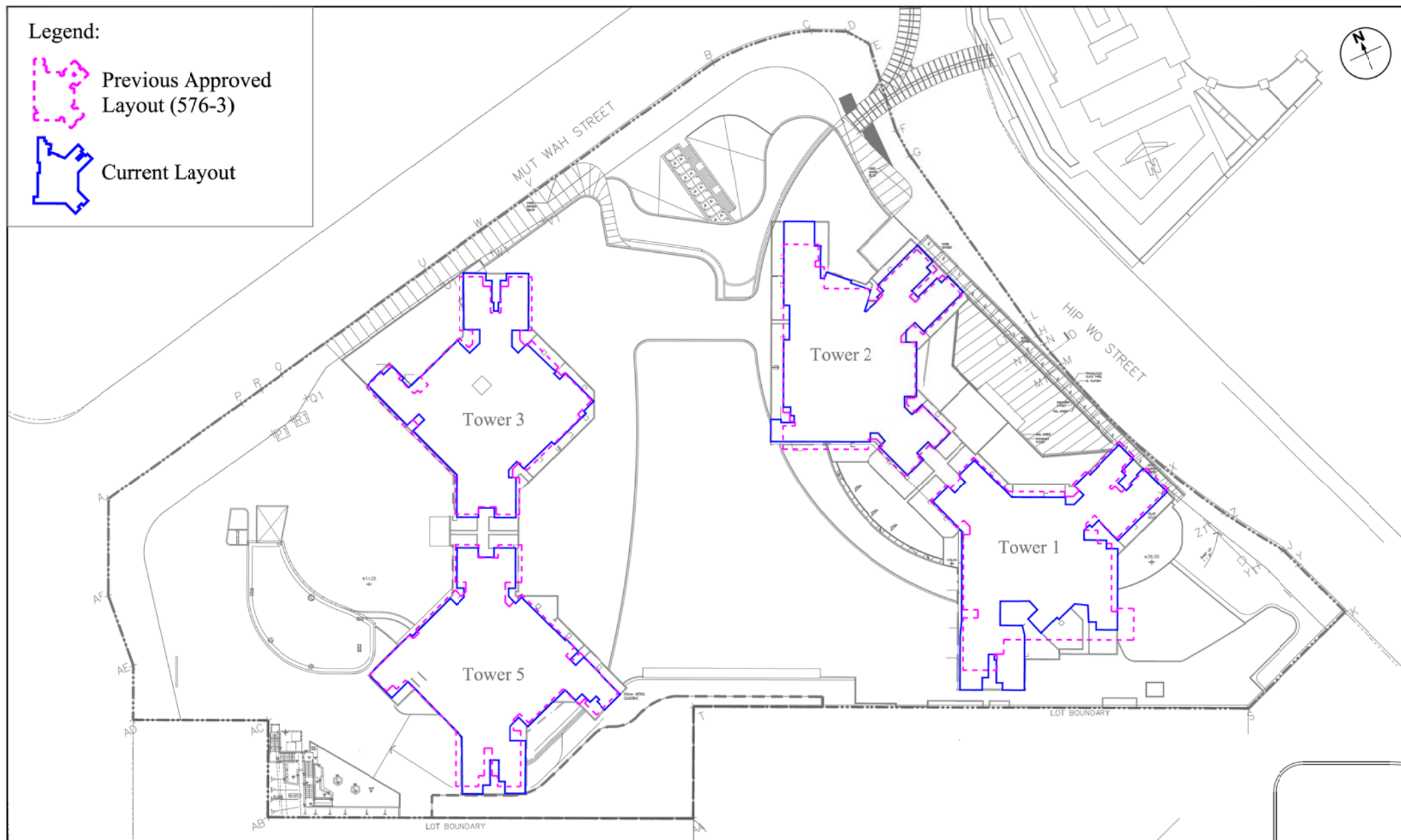
RAMBOLL ENVIRON

Drawn by: AS

Checked by: TC

Rev.: 1.2

Date: Sep 2017



**Figure: 10**

**Title:** Comparison of Change of Tower Disposition

**Project:** Proposed Redevelopment in Kwun Tong Town Centre Development (DA 4 and 5)

**RAMBOLL** ENVIRON

Drawn by: AS

Checked by: TC

Rev.: 1.0

Date: Dec 2017



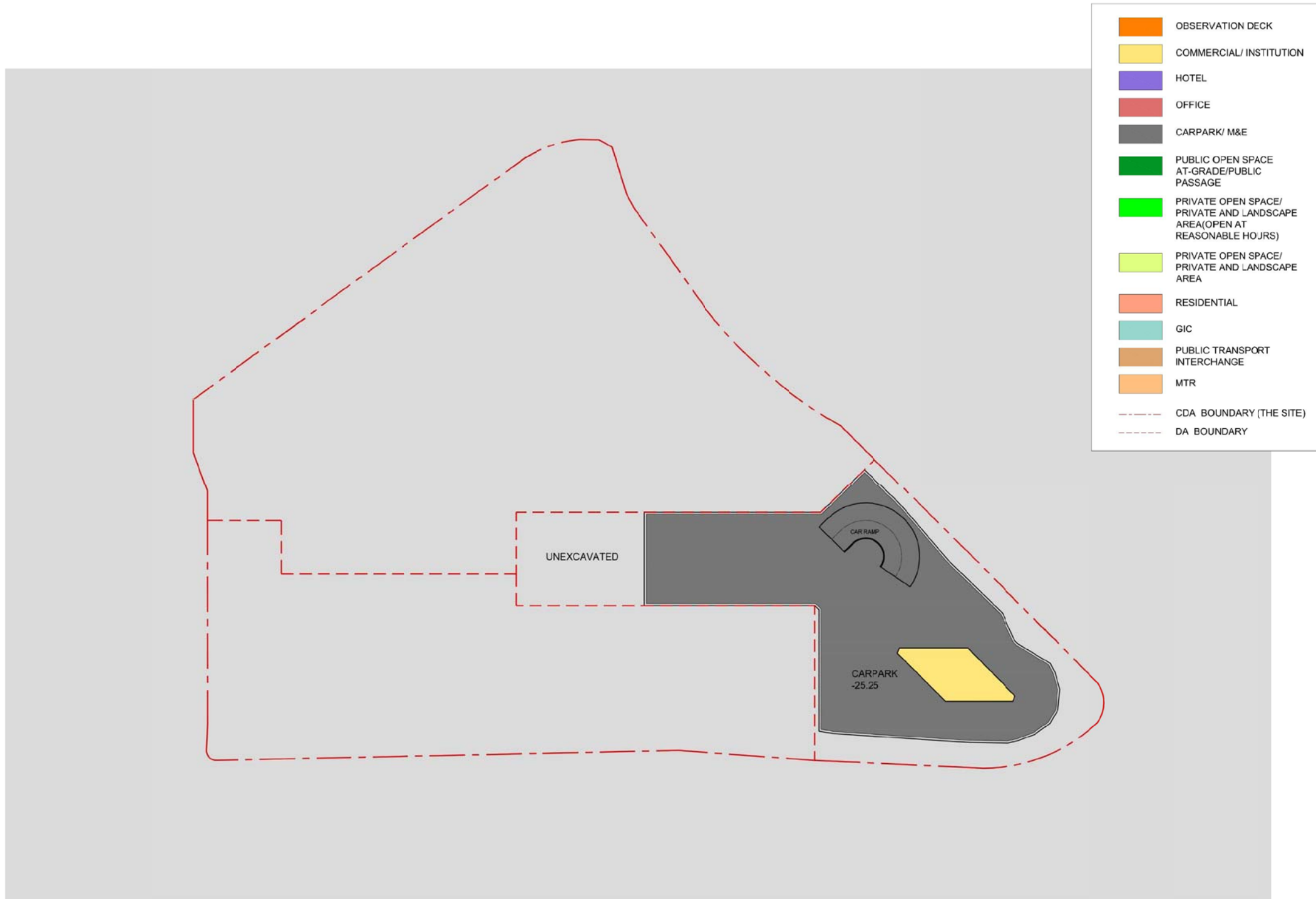
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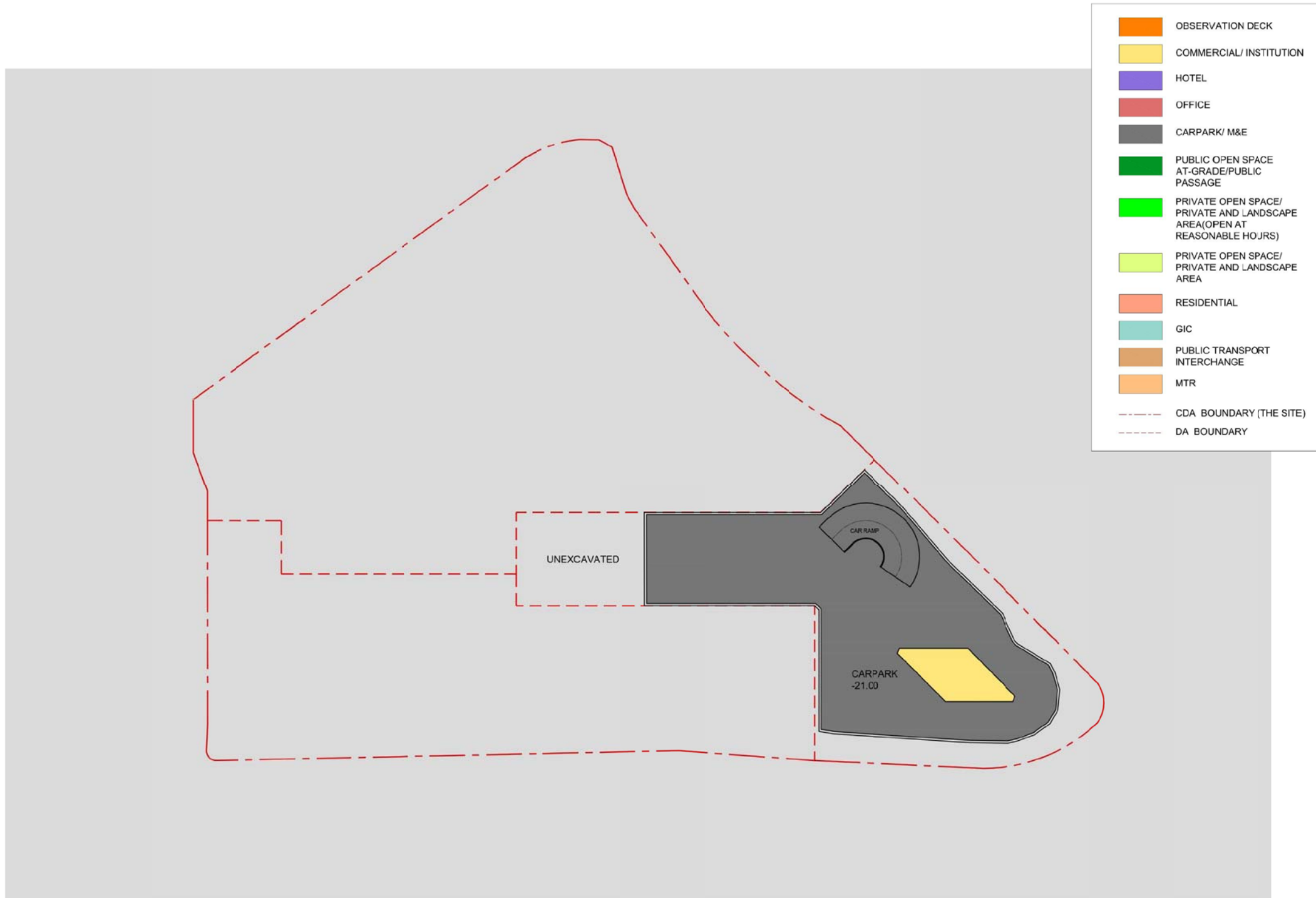
**Annex 1:**  
**Master Layout Plan**

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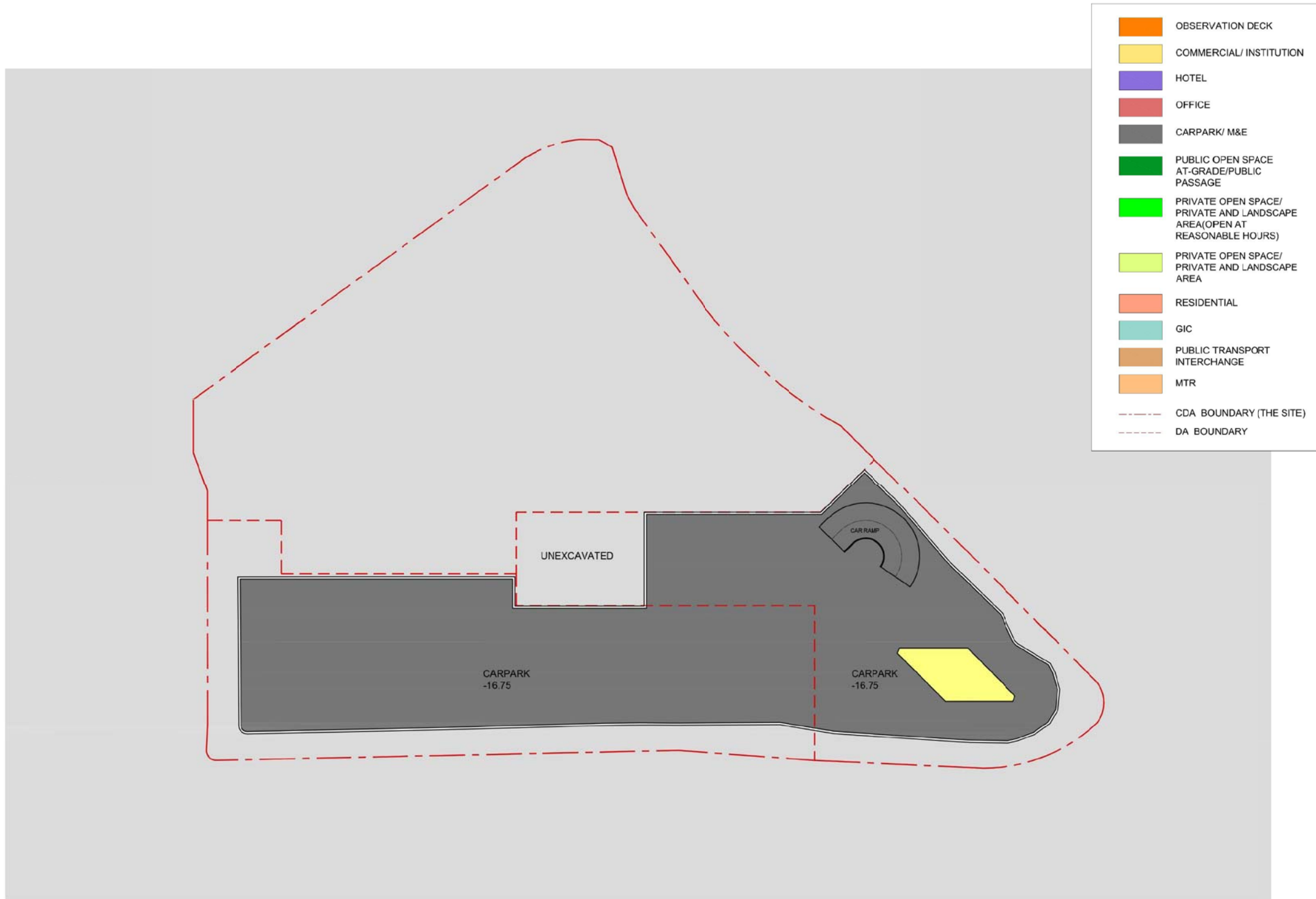


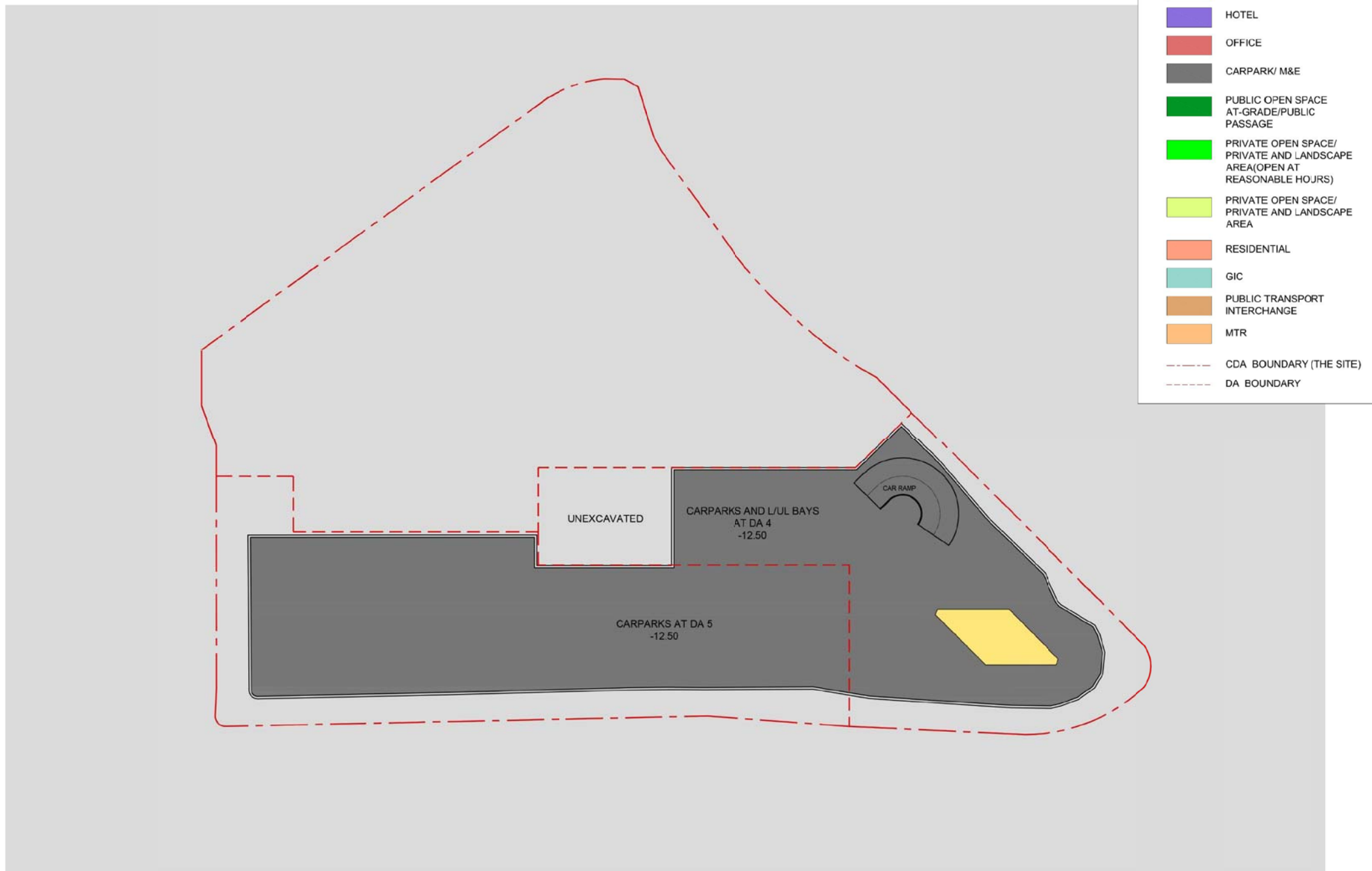




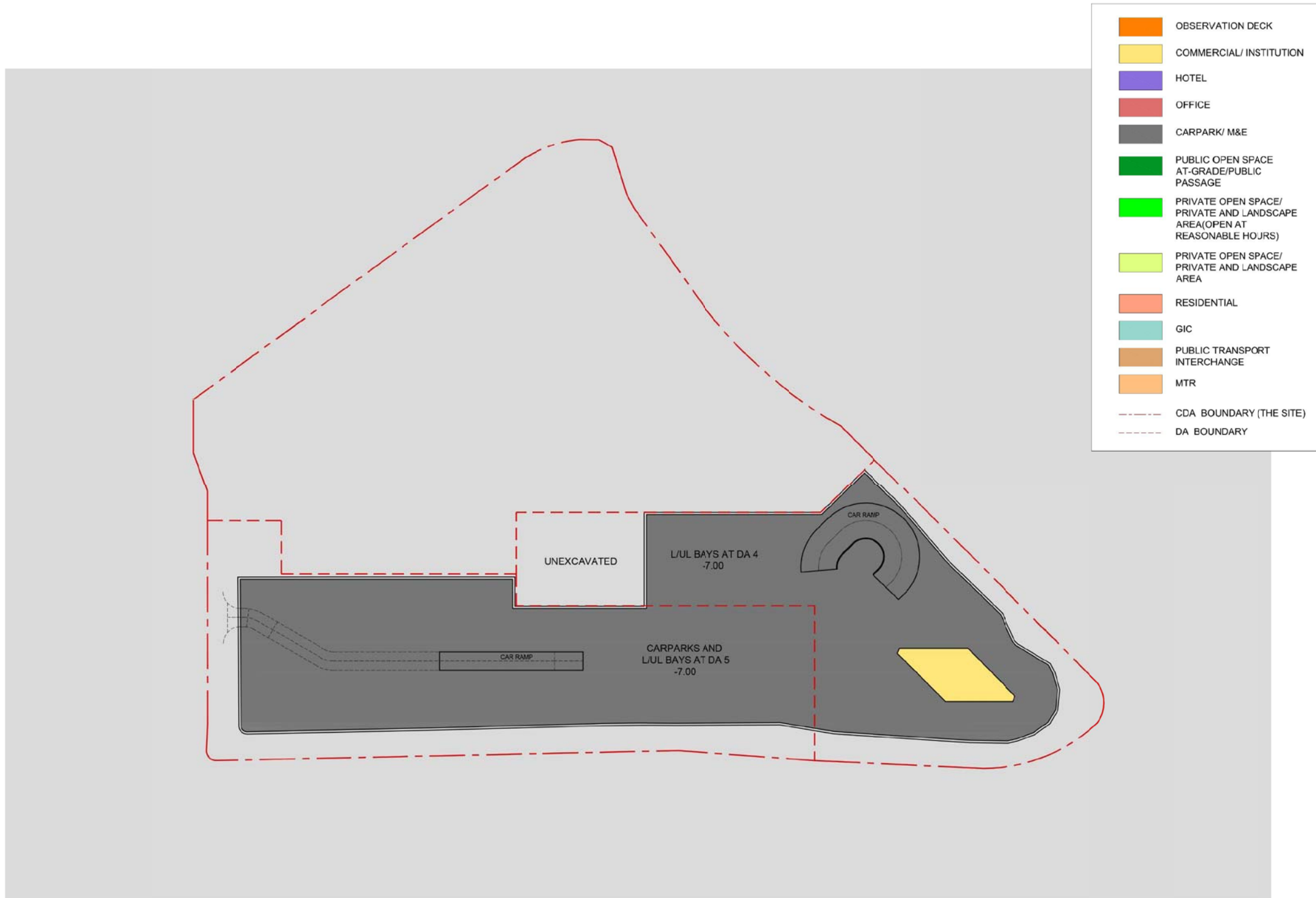
















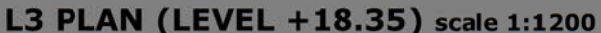




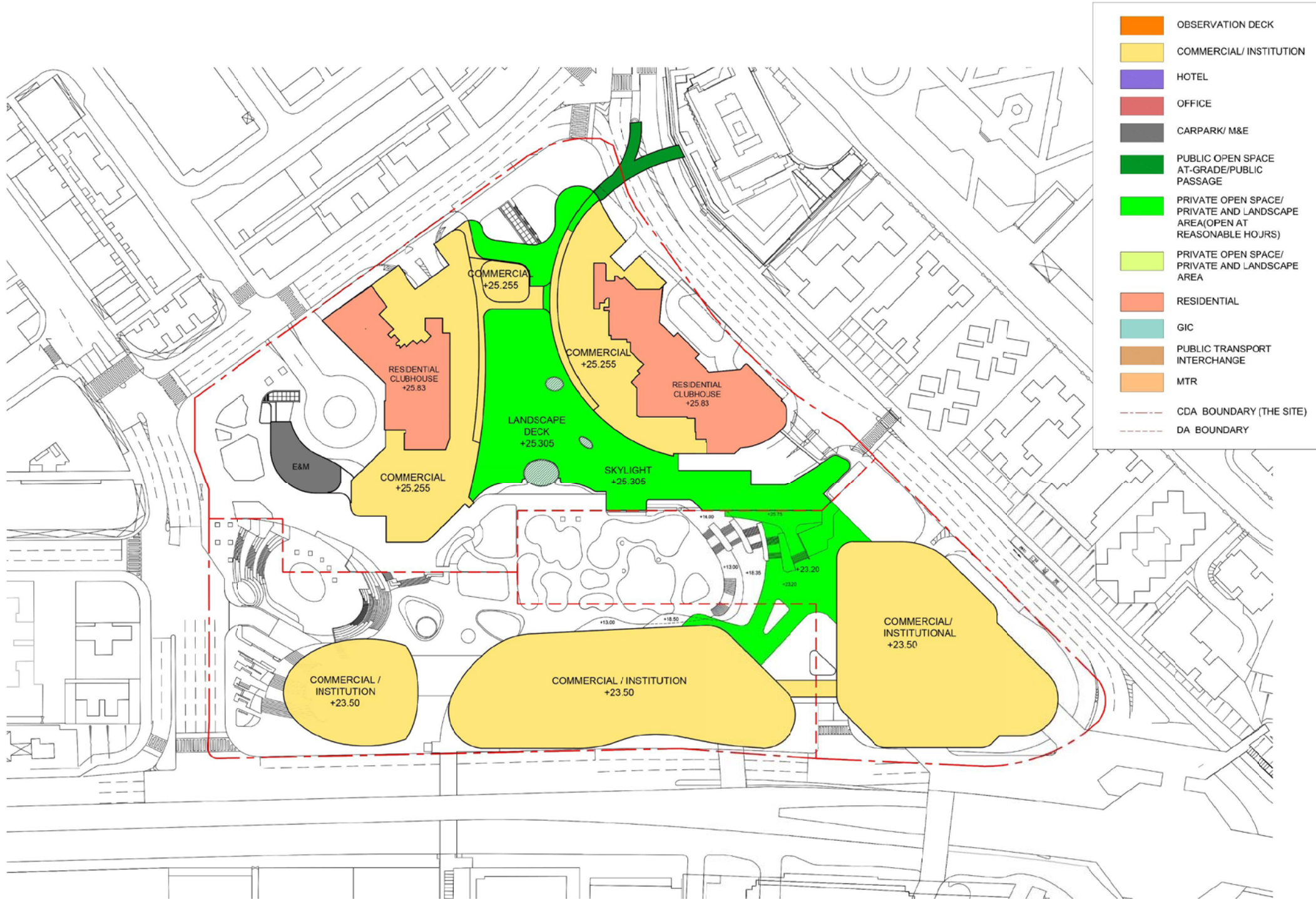








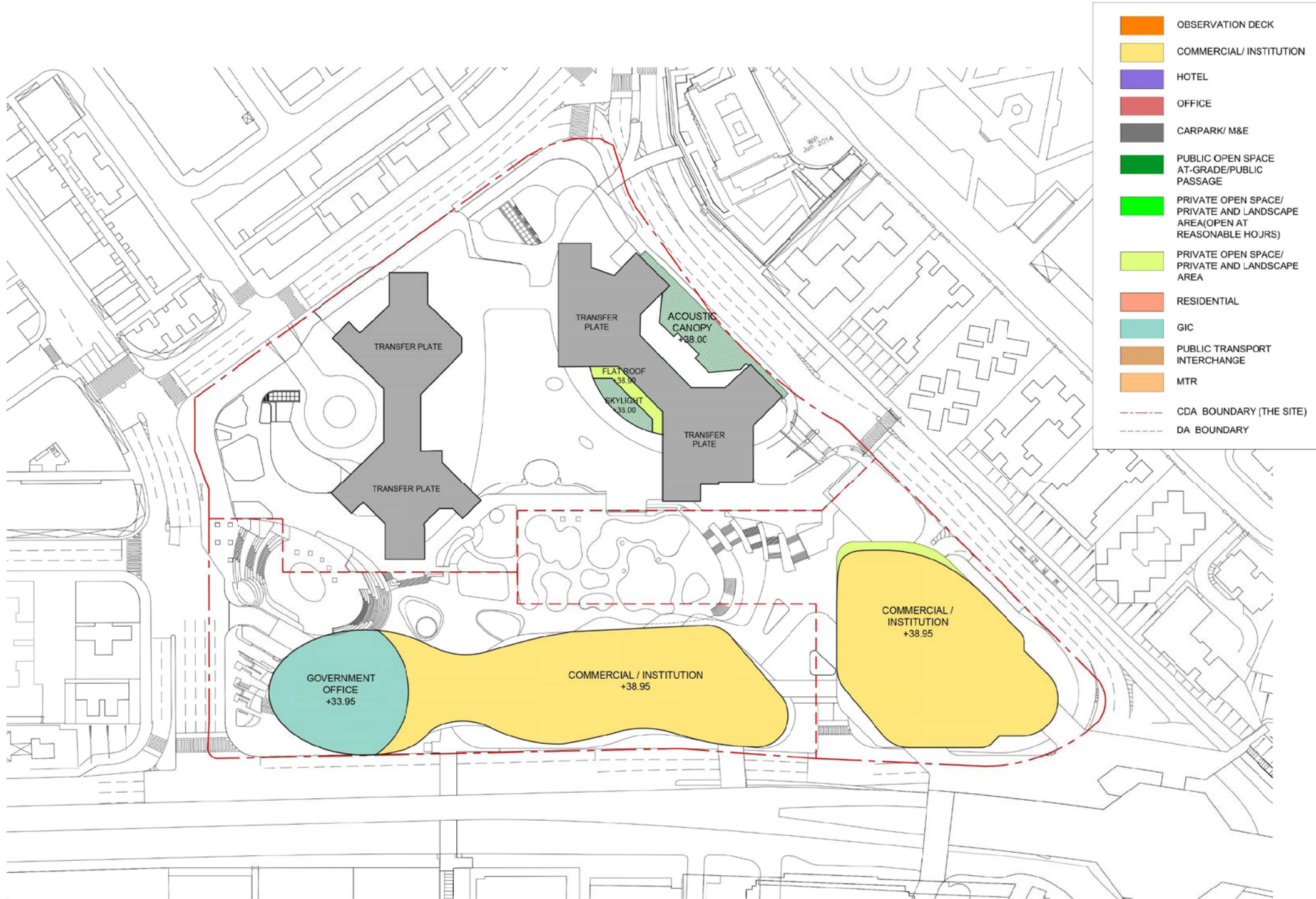




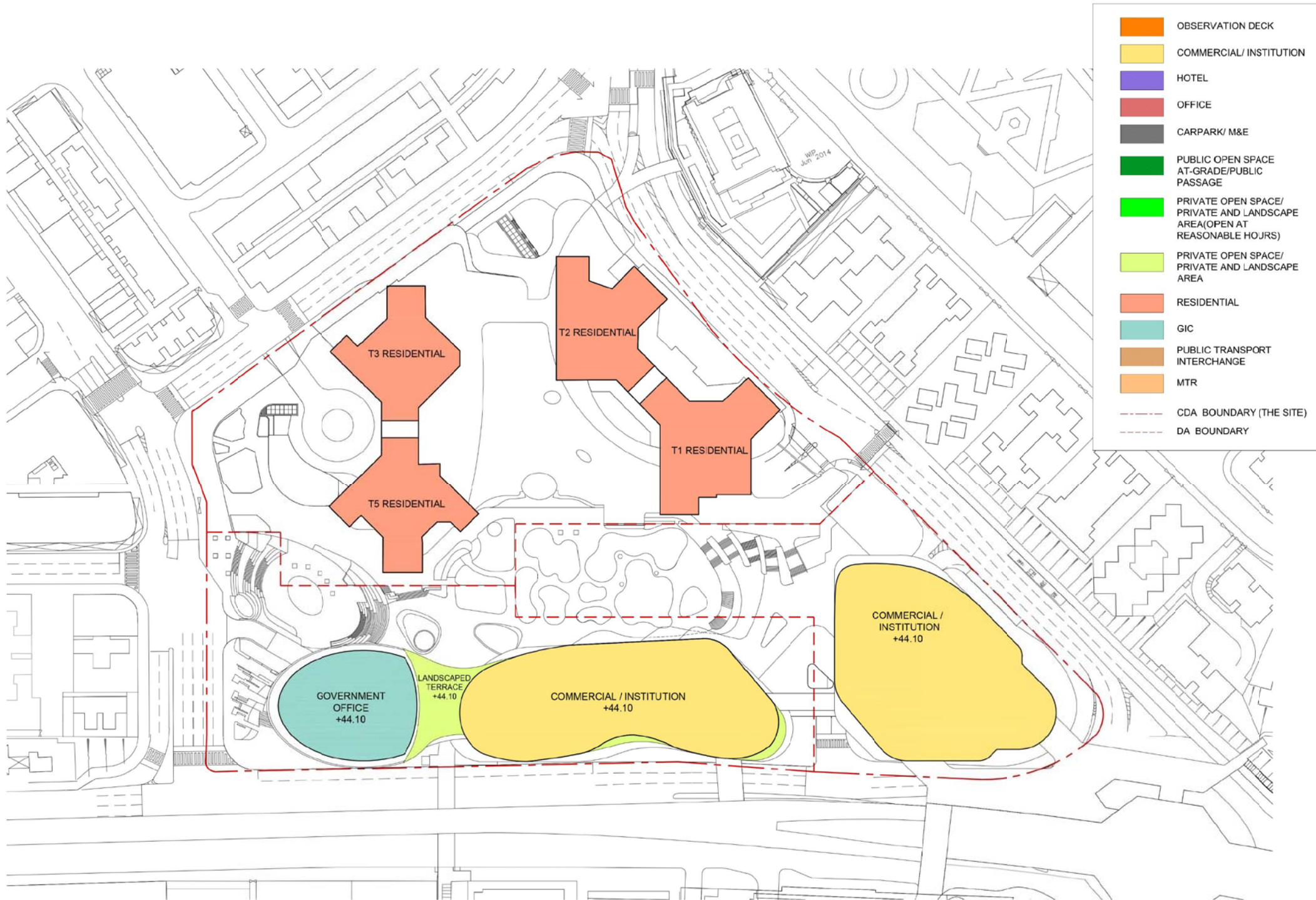


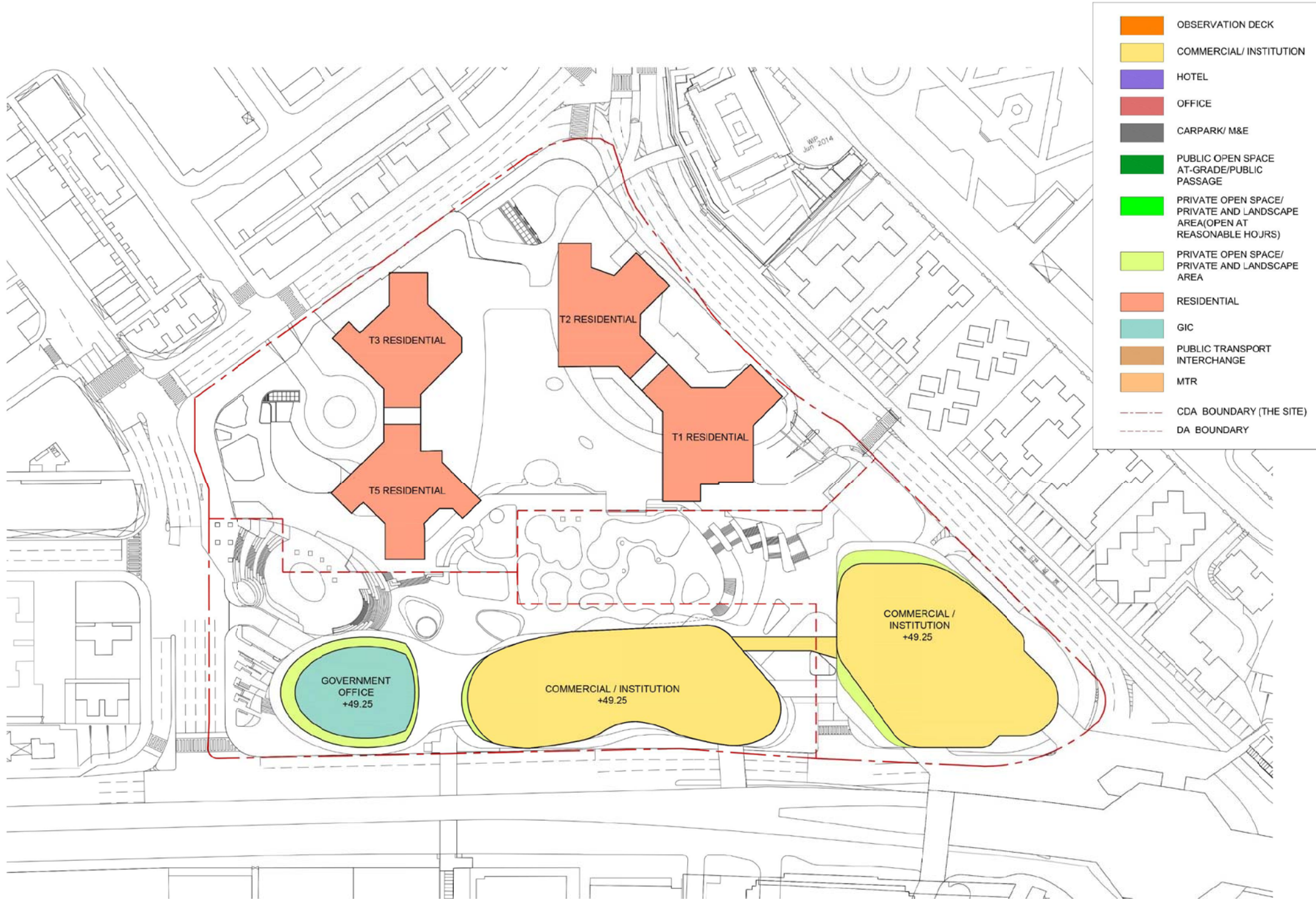




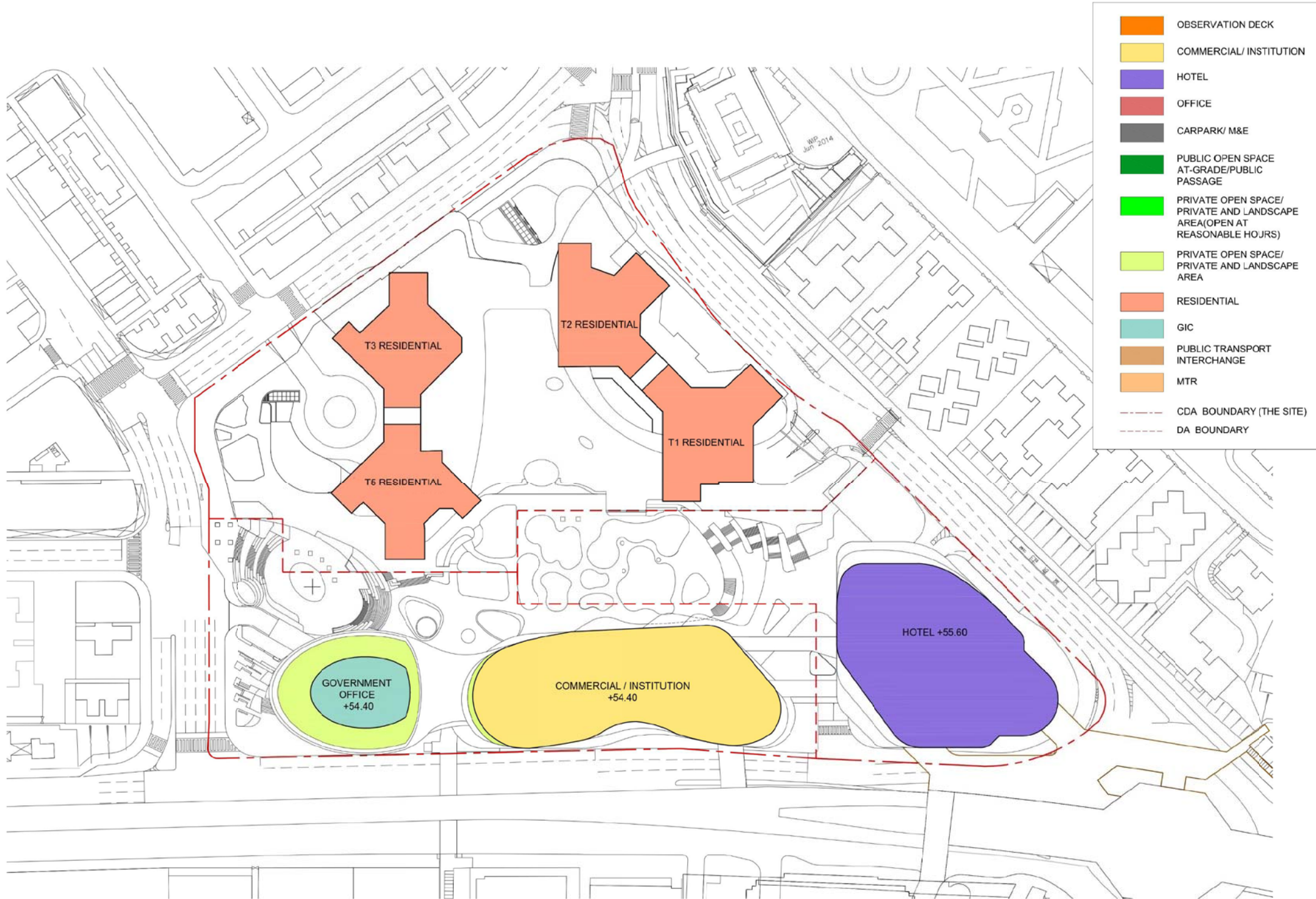


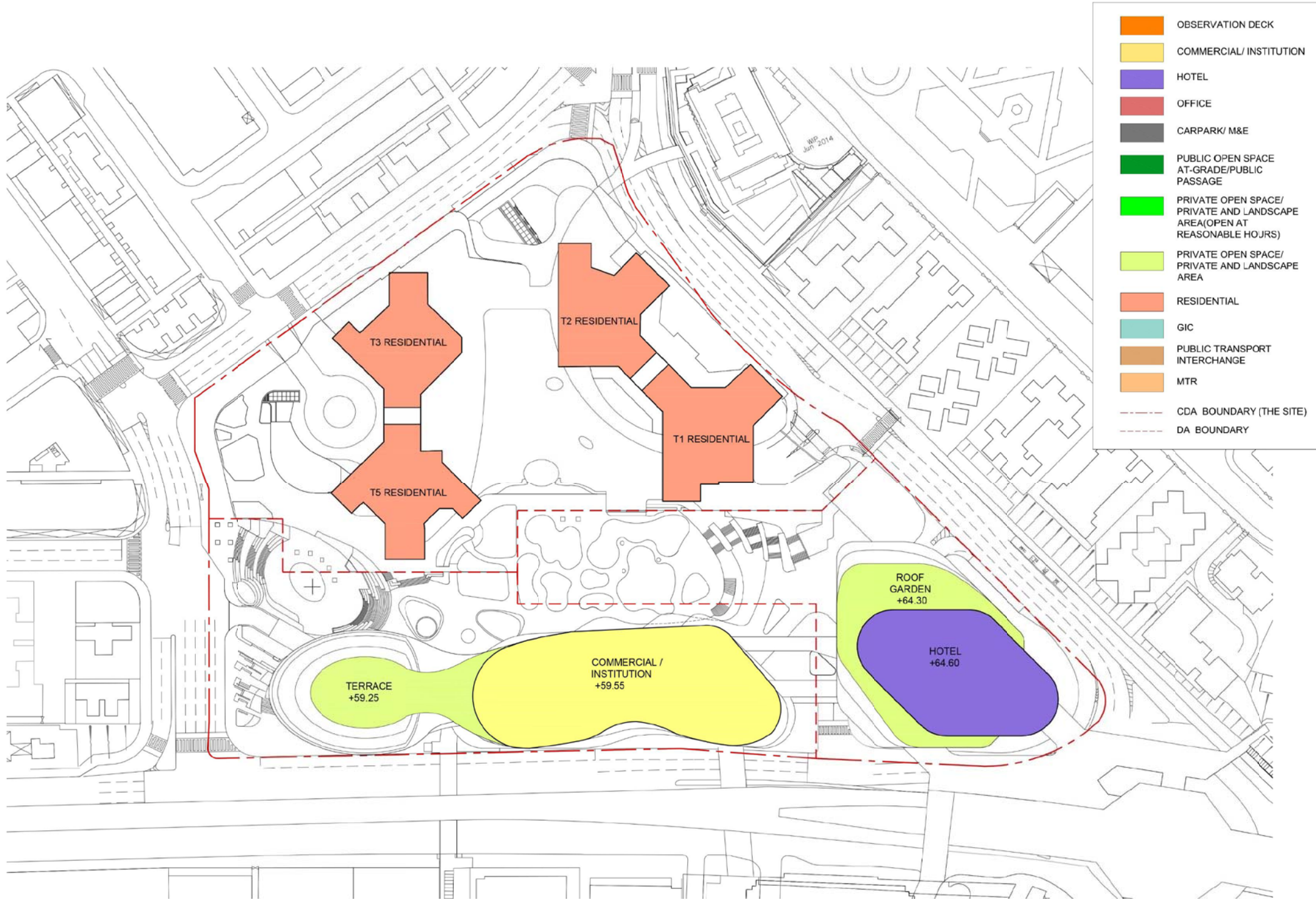




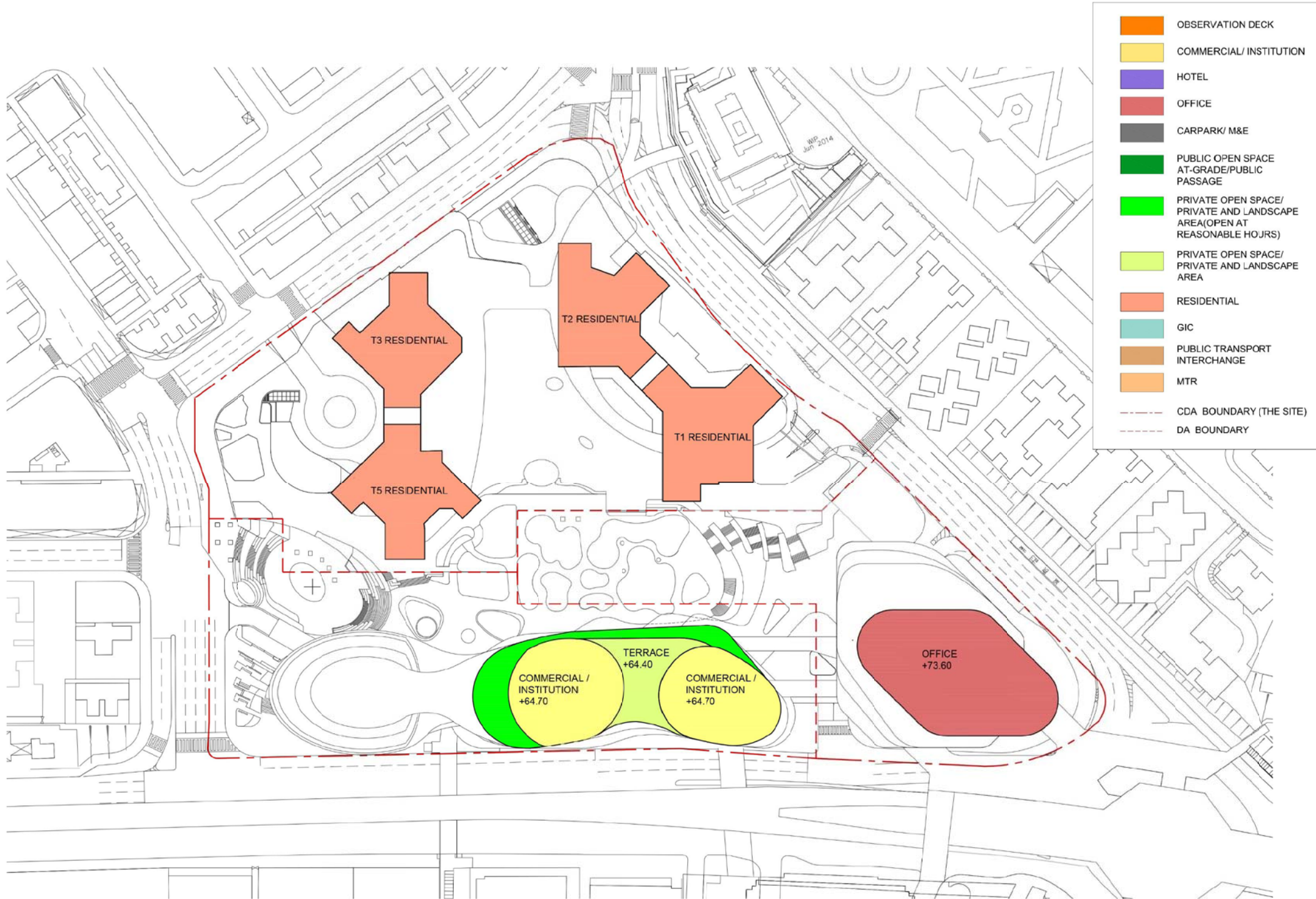


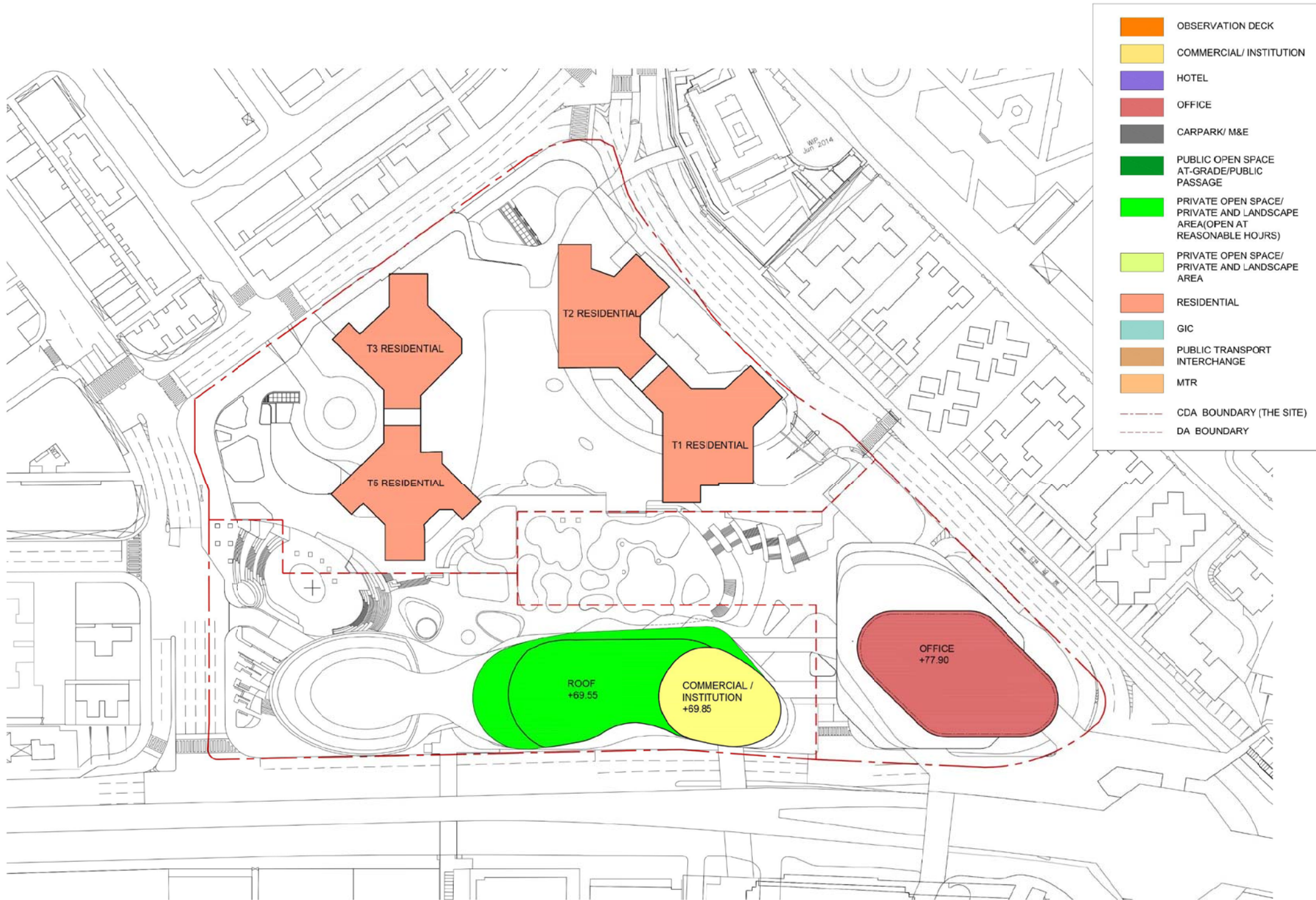




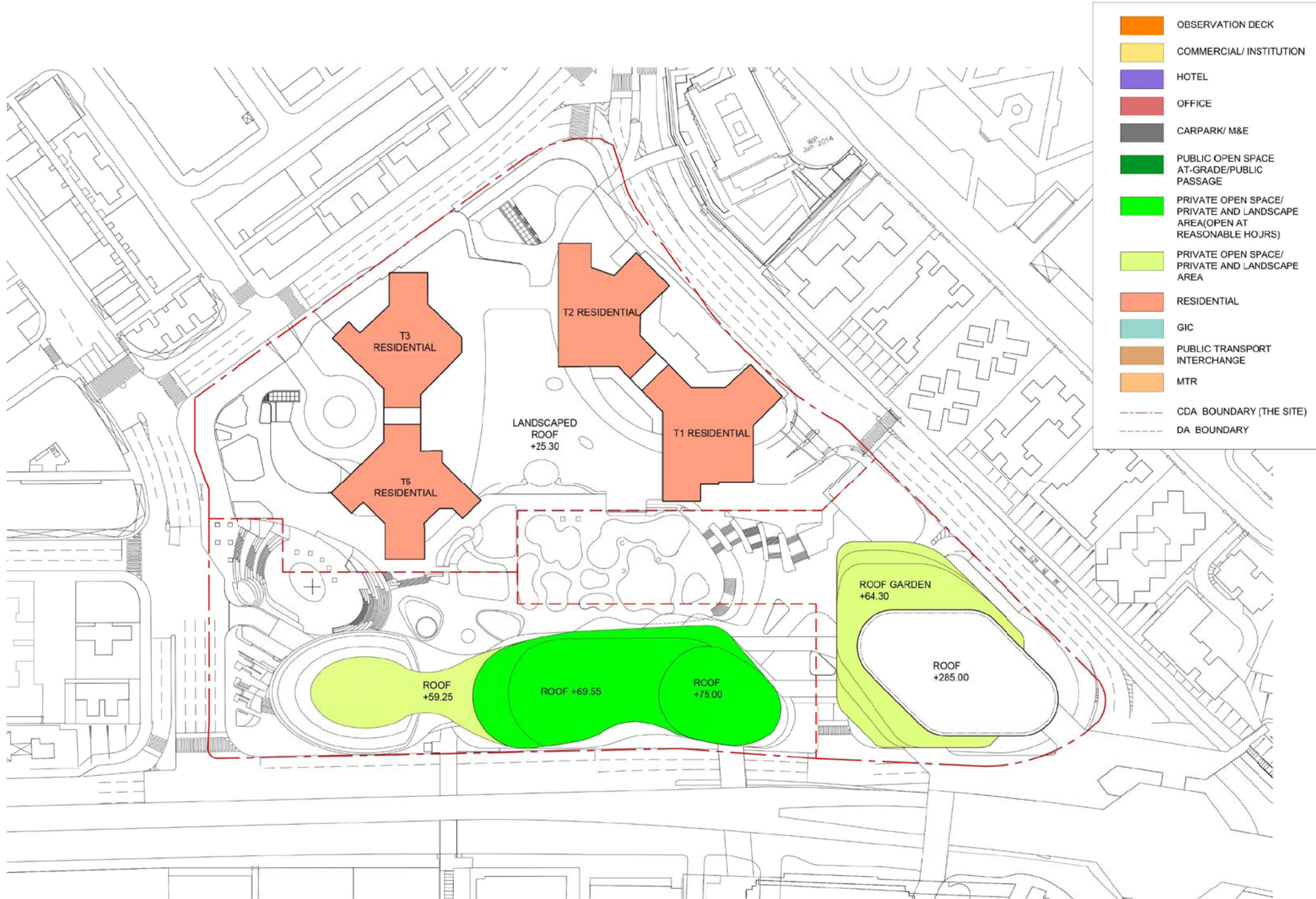


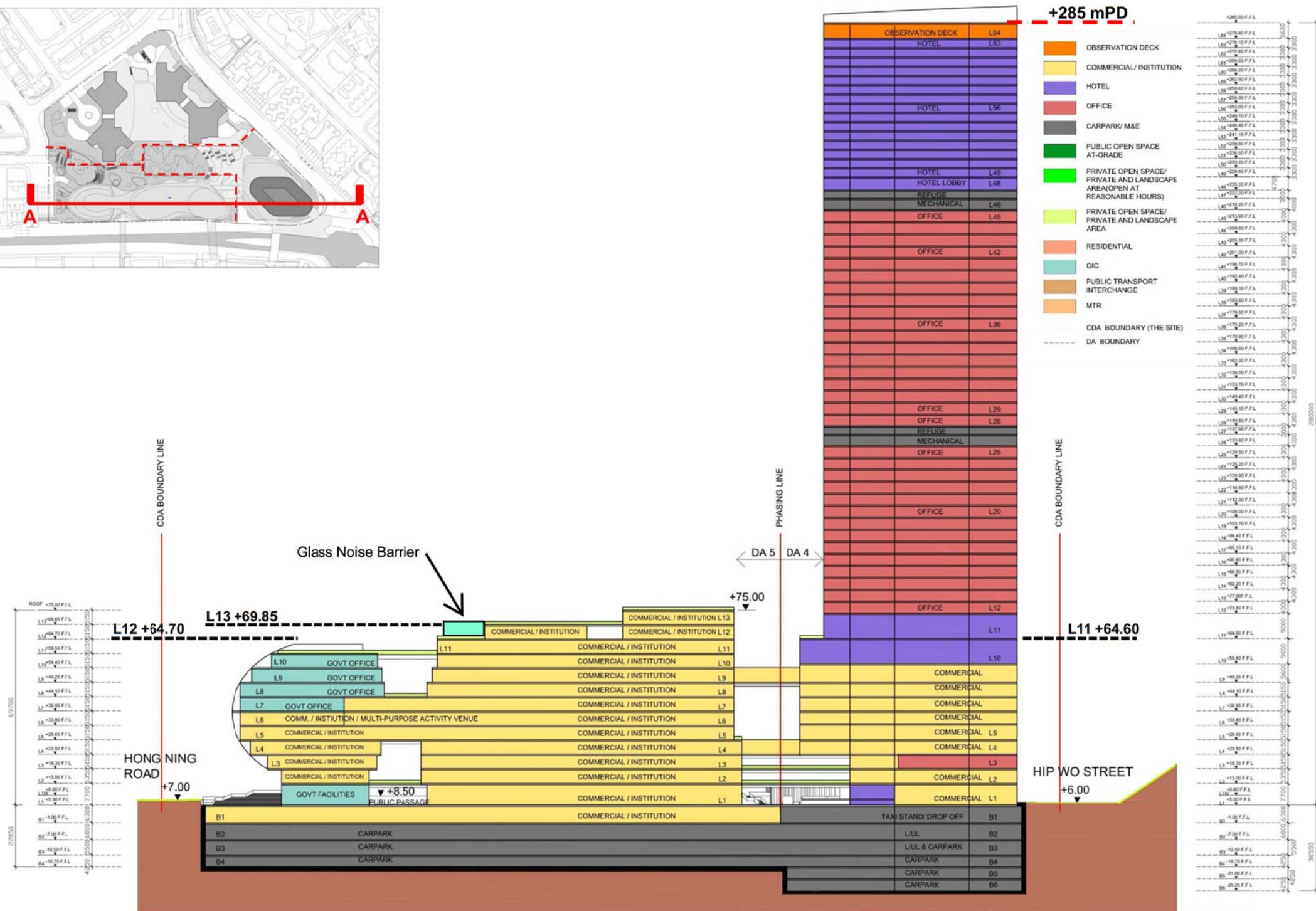




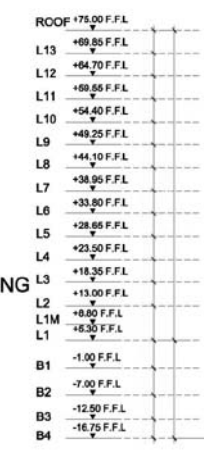
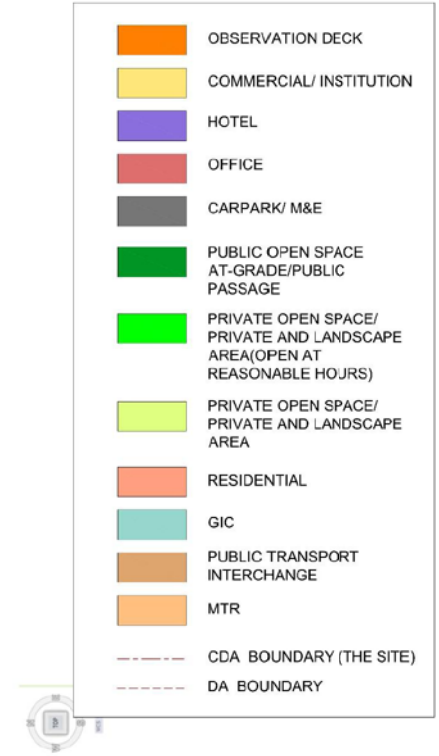
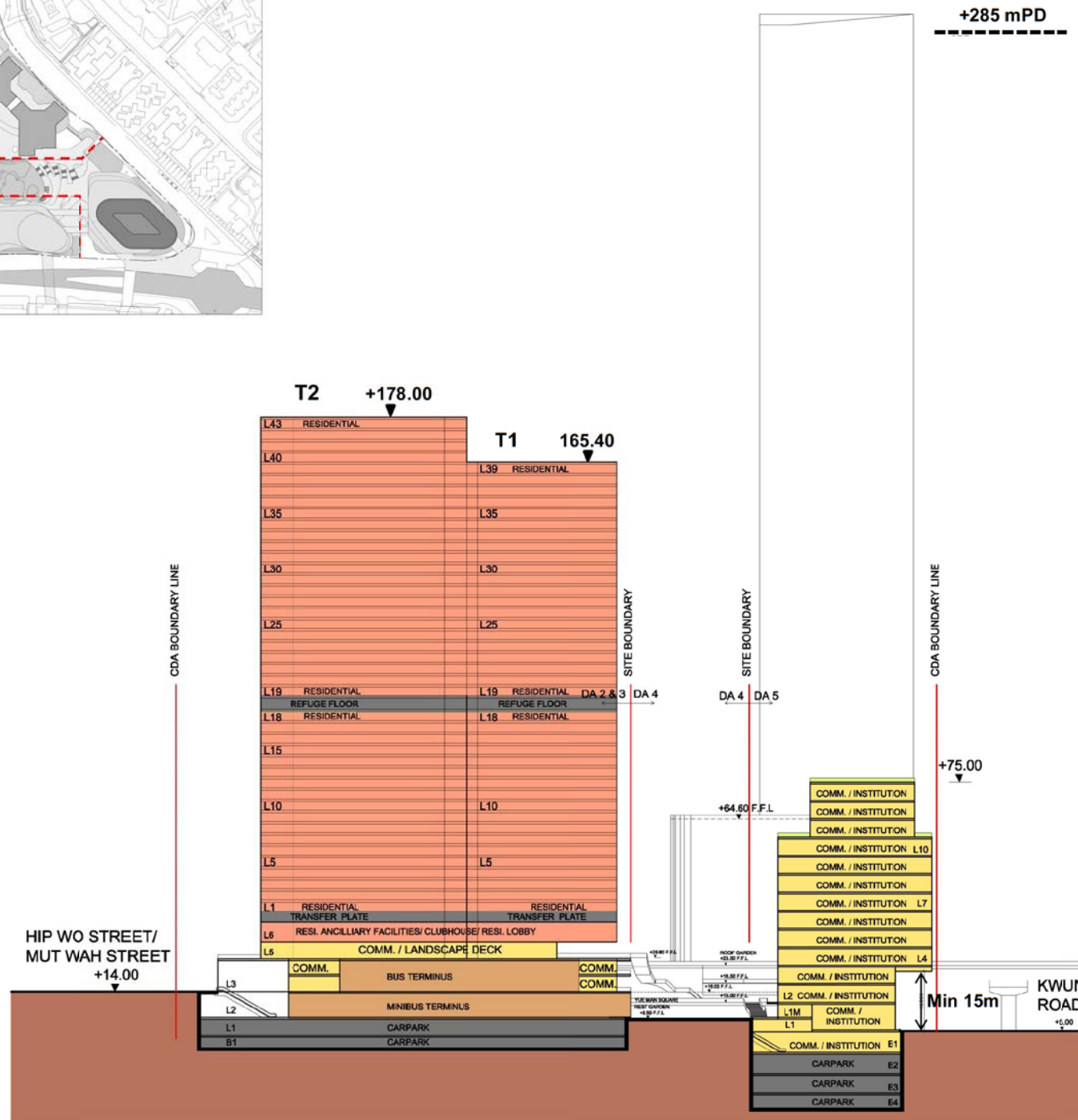
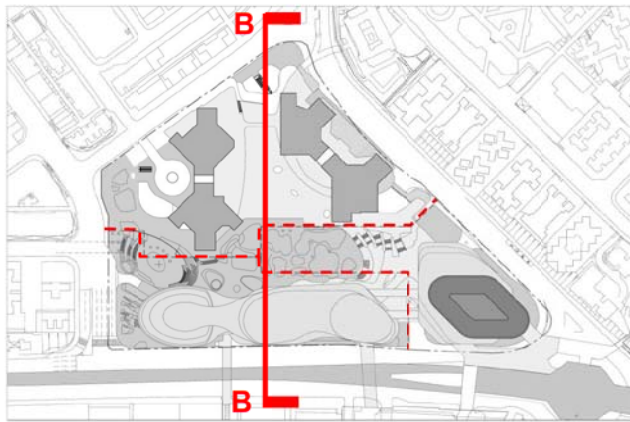


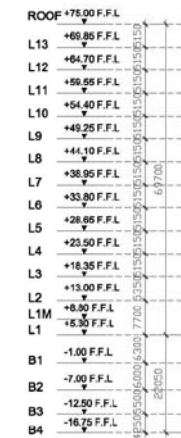
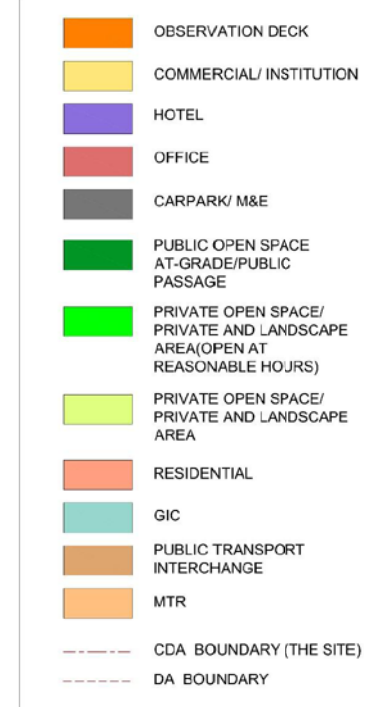
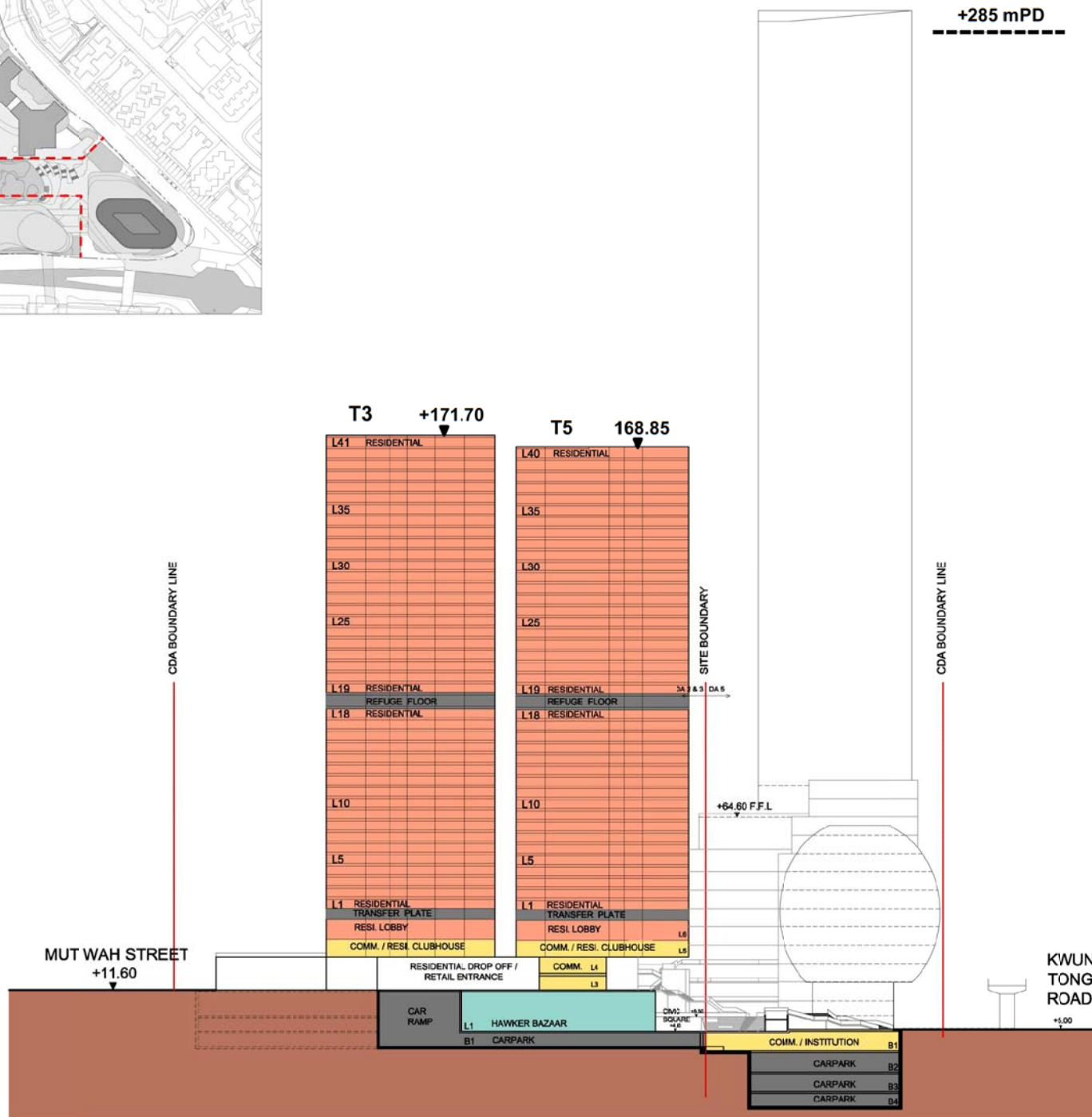
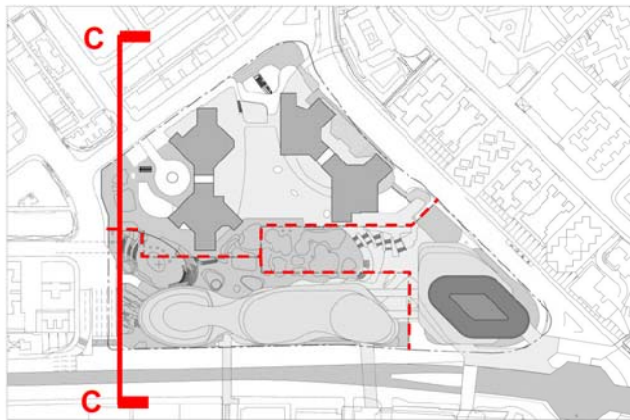












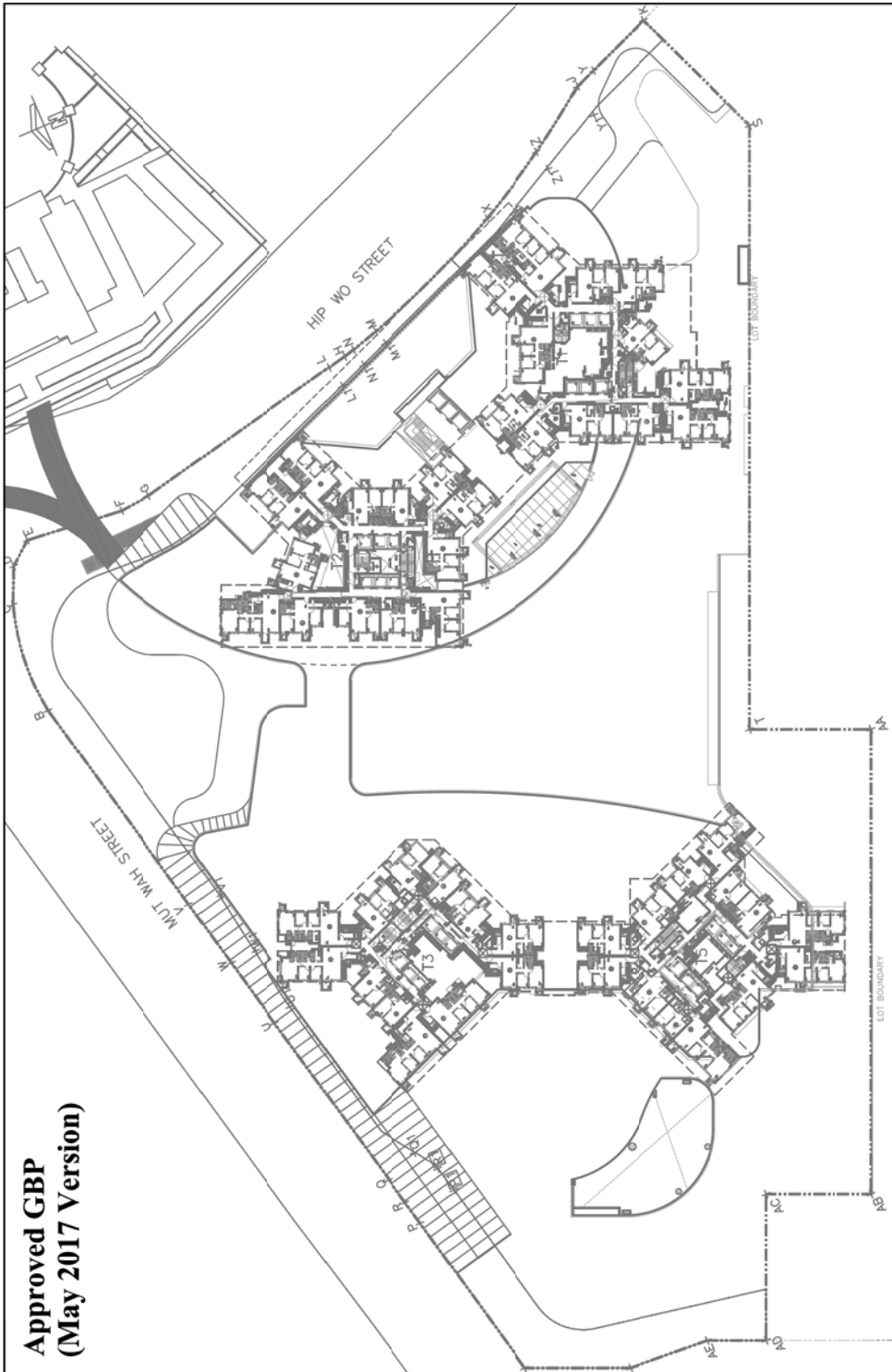


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**Annex 2:**  
**Comparison of Layout Change between**  
**the Approved 727 Scheme and the**  
**Current Scheme within DAs 4 and 5**

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Approved GBP  
(May 2017 Version)



Current GBP  
(Sep 2017 Version)

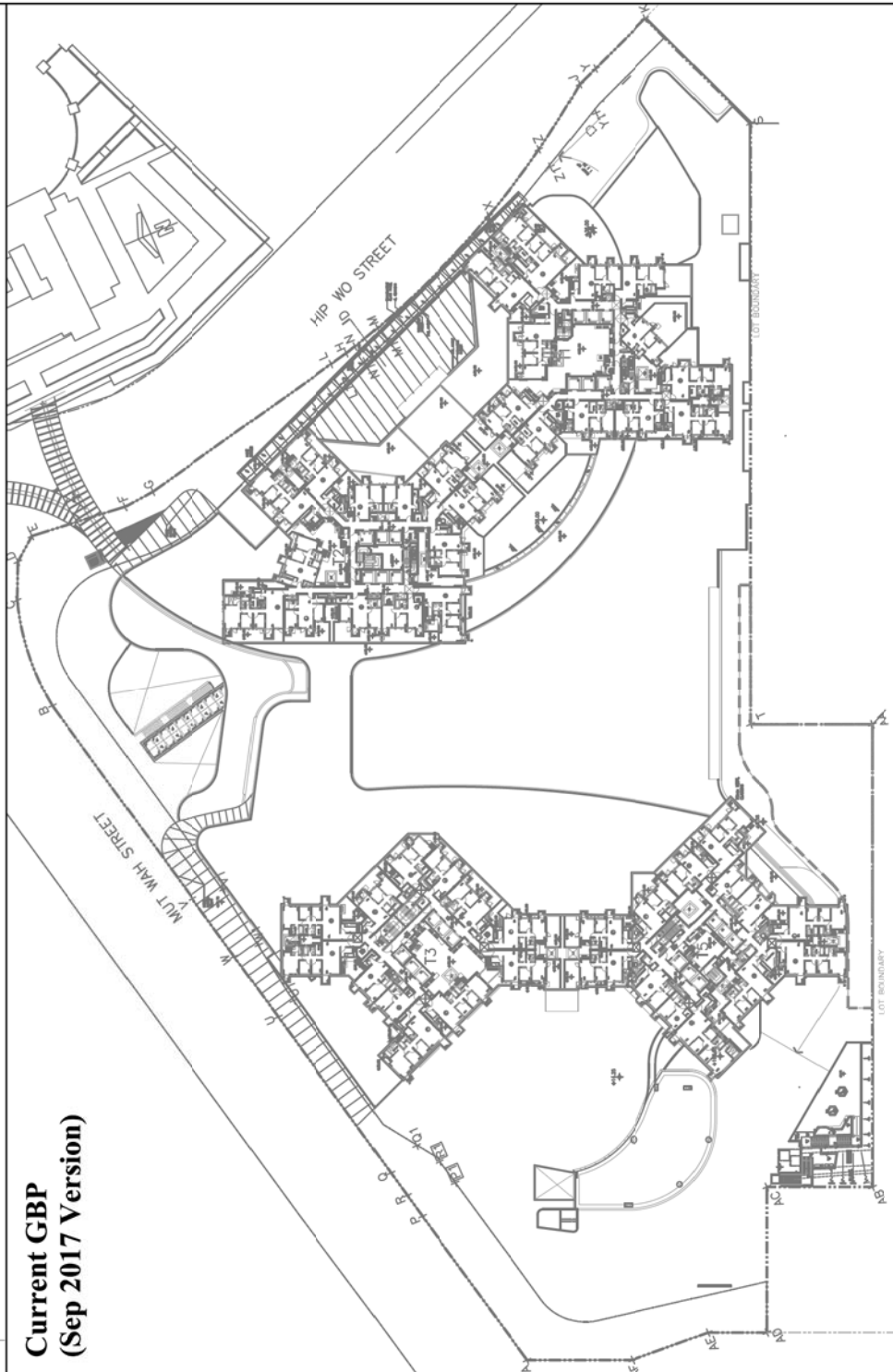



Figure: 3

Title: Comparison between Previous GBP (May 2017) and Current GBP (Sep 2017)

Project: Proposed Redevelopment in Kwun Tong Town Centre Development (DA 4 and 5)

|   |
|---|
|  ENVIRON |
| Drawn by: AS  |
| Checked by: TC  |
| Rev.: 1.0   |
| Date: Dec 2017  |

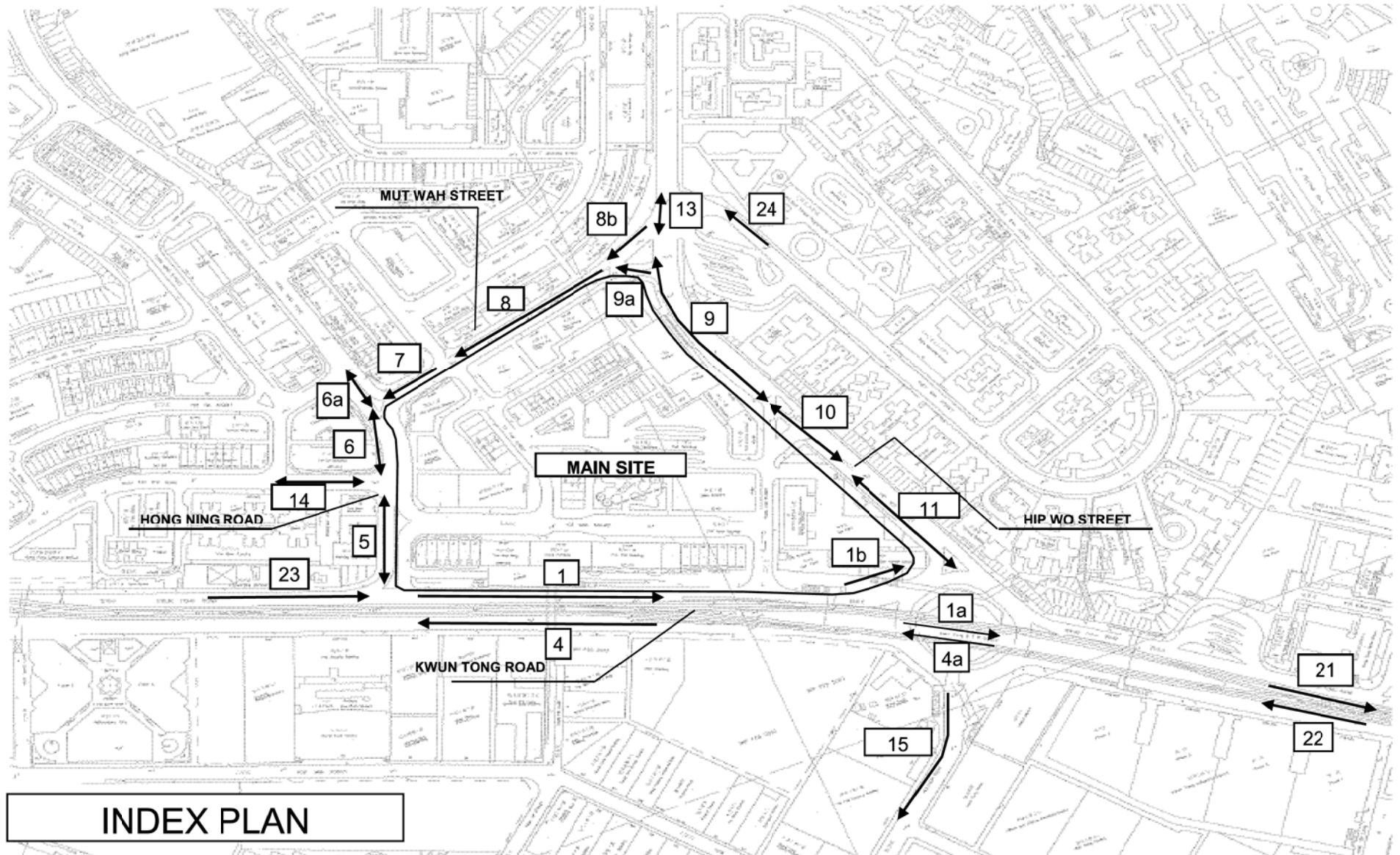


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**Annex 3:**  
**Traffic Forecast and**  
**Transport Department's Reply**

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## Year 2039 Traffic Forecast Index Plan





**Table 1 - Year 2039 PM Peak Hour Traffic Forecast (S16, 1999 Units)**

| Ref. <sup>(1)</sup> | Locations  | Year 2039 Two-way<br>Traffic Flows<br>(Veh / Hour) |     | HV (%) |     | Previous flow |     | Change |  |
|---------------------|--|--|-----|--------|-----|---------------|-----|--------|--|
|                     |  |  |     |        |     |               |     |        |  |
| 1                   | Kwun Tong Road between Hong Ning Road and Hip Wo Street (Eastbound)  | 4660   | 34% | 4495   | 33% | 165           | 1%  |        |  |
| 1a                  | Kwun Tong Road Underpass (Eastbound)   | 2100   | 29% | 2020   | 29% | 80            | 0%  |        |  |
| 1b                  | Kwun Tong Road between Development Egress and Hoi Yuen Road Roundabout - exclusive left turn under pedestrian deck (Eastbound) | 1445   | 36% | 1390   | 35% | 55            | 1%  |        |  |
| 4                   | Kwun Tong Road between Hong Ning Road and Hip Wo Street (Westbound)  | 3680   | 34% | 3595   | 32% | 85            | 2%  |        |  |
| 4a                  | Kwun Tong Road Underpass (Westbound)   | 3330   | 30% | 3235   | 29% | 95            | 1%  |        |  |
| 5                   | Hong Ning Road between Kwun Tong Road and Ngau Tau Kok Road  | 2010   | 21% | 1970   | 23% | 40            | -2% |        |  |
| 6                   | Hong Ning Road between Ngau Tau Kok Road and Mut Wah Street  | 1940   | 29% | 1885   | 29% | 55            | 0%  |        |  |
| 6a                  | Hong Ning Road between Mut Wah Street and Yee On Street  | 1010   | 29% | 940    | 30% | 70            | -1% |        |  |
| 7                   | Mut Wah Street between Hong Ning Road and Fu Yan Street  | 1070   | 35% | 1025   | 37% | 45            | -2% |        |  |
| 8                   | Mut Wah Street between Fu Yan Street and Hip Wo Street   | 1390   | 34% | 1360   | 34% | 30            | 0%  |        |  |
| 8b                  | Mut Wah Street from Yuet Wah Street(WB) and Hip Wo Street (SB)   | 595  | 34% | 560    | 33% | 35            | 1%  |        |  |
| 9                   | Hip Wo Street between Mut Wah Street and PTI Eastern Access  | 1980   | 39% | 1920   | 38% | 60            | 1%  |        |  |
| 9a                  | Hip Wo Street left turn to Mut Wah Street  | 880  | 35% | 850    | 33% | 30            | 2%  |        |  |
| 10                  | Hip Wo Street between PTI Eastern Access and Kwun Tong Road  | 2230   | 39% | 2140   | 37% | 90            | 2%  |        |  |
| 11                  | Hip Wo Street between K7 Eastern Access and Kwun Tong Road   | 2215   | 38% | 2195   | 38% | 20            | 0%  |        |  |
| 13                  | Hip Wo Street between Yuet Wah Street and Mut Wah Street   | 1680   | 26% | 1660   | 29% | 20            | -3% |        |  |
| 14                  | Ngau Tau Kok Road between Luen On Street and Hong Ning Road  | 575  | 44% | 540    | 46% | 35            | -2% |        |  |
| 15                  | Hoi Yuen Road between Hoi Yuen Road Roundabout and Ship Yip Street   | 1185   | 33% | 1155   | 33% | 30            | 0%  |        |  |
| 21                  | Lei Yue Mun Road (Eastbound) to the west of Tsui Ping Road   | 2950   | 31% | 2820   | 30% | 130           | 1%  |        |  |
| 22                  | Lei Yue Mun Road (Westbound) to the west of Tsui Ping Road   | 4010   | 29% | 3915   | 31% | 95            | -2% |        |  |
| 23                  | Kwun Tong Road between Petrol Station and Hong Ning Road (Eastbound)   | 3965   | 33% | 3885   | 35% | 80            | -2% |        |  |
| 24                  | Yuet Wah Street  | 330  | 27% | 320    | 26% | 10            | 1%  |        |  |

Remarks (1): Please refer to the index plan

MEMO

FAX

|          |  |           |                                   |
|----------|--|-----------|-----------------------------------|
| From     | Traffic Engineering (Kln) Division, TD | To        | DPO/K                             |
| Ref.     | ( ) in KR 182/112-16                   | (Attn:    | Ms. Eva CHAN                      |
| Tel. No. | 2399 2502                              | Fax. No.  | 2894-9502                         |
| Fax. No. | 2397 8046                              | Your Ref. | ( ) in A/K14/727                  |
| Date     | 9 October 2015                         | Dated     | 17 September 2015 Total pages : 1 |

Planning Application for Comprehensive Redevelopment with Residential and Commercial Uses including Hotel, Office, Retail with Provision of Public Open Space, Government Institution or Community Facilities in "Comprehensive Development Area (1)" zone  
Kwun Tong Town Centre - Main Site (Area bounded by Kwun Tong Road, Hong Ning Road, Mut Wah Street and Hip Wo Street) Kwun Tong, Kowloon

Application No. A/K14/727

We refer to your memo dated 17.9.2015 regarding the captioned.

2. Please be advised that we have no comment on the parking provision and the traffic forecast for the Environmental Assessment. Please note that our previous comment on the setback proposal is still valid and we shall provide our comments to the proposed junction arrangement at the detailed design stage.
3. By copy of this memo, grateful if CEDD could confirm the programme for the provision of pedestrian subway across Hong Ning Road as mentioned under section 8 of the TIA.

(Viljan W L SUM)  
for Commissioner for Transport

c.c.  
CHE/K, HyD  
KDO/CEDD

Fax: 2758 3394  
Fax: 2301 1277

Internal  
SK/KT  
S/BP



Year 2041 Traffic Forecast

| Link Index <sup>(1)</sup> | Location   | Direction  | Current Traffic Flow (2041)      |                | Previous Traffic Flow (2039)     |                | Change   |      |
|---------------------------|--|------------|----------------------------------|----------------|----------------------------------|----------------|----------|------|
|                           |  |            | Peak Hour Traffic Flows (Veh/hr) | HV Composition | Peak Hour Traffic Flows (Veh/hr) | HV Composition | (Veh/hr) | % HV |
|                           |  |            |                                  |                |                                  |                |          |      |
| 1                         | Kwun Tong Road between Hong Ning Road and Hip Wo Street                      | Eastbound  | 2,940                            | 43%            | 4,660                            | 34%            | -1,720   | 9%   |
| 1a                        | Kwun Tong Road Underpass   | Eastbound  | 1,700                            | 28%            | 2,100                            | 29%            | -400     | -1%  |
| 1b                        | Kwun Tong Road between Development Egress and Hoi Yuen Road Roundabout       | Eastbound  | 1,780                            | 39%            | 1,445                            | 36%            | 335      | 3%   |
| 4                         | Kwun Tong Road between Hong Ning Road and Hip Wo Street                      | Westbound  | 2,695                            | 31%            | 3,680                            | 34%            | -985     | -3%  |
| 4a                        | Kwun Tong Road Underpass   | Westbound  | 1,960                            | 31%            | 3,330                            | 30%            | -1,370   | 1%   |
| 5                         | Hong Ning Road between Kwun Tong Road and Ngau Tau Kok Road                  | 2-Way      | 1,480                            | 38%            | 2,010                            | 21%            | -530     | 17%  |
| 6                         | Hong Ning Road between Ngau Tau Kok Road and Mut Wah Street                  | 2-Way      | 1,235                            | 34%            | 1,940                            | 29%            | -705     | 5%   |
| 6a                        | Hong Ning Road between Mut Wah Street and Yee On Street                      | 2-Way      | 810                              | 43%            | 1,010                            | 29%            | -200     | 14%  |
| 7                         | Mut Wah Street between Hong Ning Road and Fu Yan Street                      | Westbound  | 865                              | 33%            | 1,070                            | 35%            | -205     | -2%  |
| 8                         | Mut Wah Street between Fu Yan Street and Hip Wo Street                       | Westbound  | 855                              | 36%            | 1,390                            | 34%            | -535     | 2%   |
| 8b                        | Mut Wah Street from Yuet Wah Street (WB) and Hip Wo Street (SB)              | Westbound  | 260                              | 33%            | 595                              | 34%            | -335     | -1%  |
| 9                         | Hip Wo Street between Mut Wah Street and PLB & GMB Terminus Access           | 2-Way      | 2,165                            | 37%            | 1,980                            | 39%            | 185      | -2%  |
| 9a                        | Mut Wah Street from Hip Wo Street (NB)                                       | Westbound  | 595                              | 35%            | 880                              | 35%            | -285     | 0%   |
| 10                        | Hip Wo Street between PLB & GMB Terminus Access and K7 Access                | 2-Way      | 2,080                            | 37%            | 2,230                            | 39%            | -150     | -2%  |
| 11                        | Hip Wo Street between K7 Access and Kwun Tong Road                           | 2-Way      | 2,020                            | 36%            | 2,215                            | 38%            | -195     | -2%  |
| 13                        | Hip Wo Street between Yuet Wah Street and Mut Wah Street                     | 2-Way      | 1,275                            | 36%            | 1,680                            | 26%            | -405     | 10%  |
| 14                        | Ngau Tau Kok Road between Luen On Street and Hong Ning Road                  | 2-Way      | 355                              | 51%            | 575                              | 44%            | -220     | 7%   |
| 15                        | Hoi Yuen Road between Hoi Yuen Road Roundabout and Shing Yip Street          | Southbound | 1,120                            | 29%            | 1,185                            | 33%            | -65      | -4%  |
| 21                        | Lei Yue Mun Road between Kwun Tong Railway Station Bus Terminus and Tsui Pir | Eastbound  | 2,395                            | 37%            | 2,950                            | 31%            | -555     | 6%   |
| 22                        | Lei Yue Mun Road between Kwun Tong Railway Station Bus Terminus and Tsui Pir | Westbound  | 2,965                            | 34%            | 4,010                            | 29%            | -1,045   | 5%   |
| 23                        | Kwun Tong Road between Petrol Station and Hong Ning Road                     | Eastbound  | 2,880                            | 38%            | 3,965                            | 33%            | -1,085   | 5%   |
| 24                        | Yuet Wah Street between Hip Wo Street and Tin Heung Street                   | Northbound | 390                              | 29%            | 330                              | 27%            | 60       | 2%   |

Remarks: (1) Refer to Figure 1.

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**Annex 4a:**  
**Traffic Noise Impact Assessment Results**

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| Floor | mPD    | NSR   |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | Lullu (msec, dB(A)) |    |    |  |  |  |  |  |  |  |  |  |  |  |
|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------------------|----|----|--|--|--|--|--|--|--|--|--|--|--|
|       |        | N1-01 | N1-02 | N1-03 | N1-04 | N1-05 | N1-06 | N1-07 | N1-08 | N1-09 | N1-10 | N1-11 | N1-12 | N1-13 | N1-14 | N1-15 | N1-16 | N1-17 | N1-18 | N1-19 | N1-20 | N1-21 | N1-22 | N1-23 | N1-24 | N1-25 | N1-26 | N1-27 | N1-28 | N1-29 | N1-30 | N1-31 | N1-32 | N1-33 | N1-34 | N1-35 | N1-36 | N1-37 | N1-38 | N1-39 | N1-40 | N1-41 | N1-42 |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 6F    | 38.70  | 54    | 56    | 56    | 56    | 57    | 58    | 60    | 63    | 72    | 70    | 69    | 68    | 68    | 69    | 69    | 70    | 73    | 73    | 73    | 62    | 63    | 63    | 66    | 67    | 68    | 67    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 60    | 59    | 52    | 53                  | 53 |    |  |  |  |  |  |  |  |  |  |  |  |
| 7F    | 41.85  | 58    | 59    | 60    | 60    | 62    | 63    | 65    | 67    | 73    | 72    | 71    | 70    | 70    | 70    | 71    | 71    | 73    | 73    | 73    | 62    | 63    | 63    | 66    | 67    | 68    | 67    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 60    | 55    | 56                  | 57 |    |  |  |  |  |  |  |  |  |  |  |  |
| 8F    | 45.00  | 60    | 61    | 61    | 62    | 64    | 65    | 67    | 68    | 73    | 74    | 72    | 72    | 71    | 71    | 72    | 72    | 73    | 73    | 73    | 62    | 63    | 64    | 67    | 68    | 68    | 67    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 60    | 57    | 59                  | 59 |    |  |  |  |  |  |  |  |  |  |  |  |
| 9F    | 48.15  | 61    | 62    | 62    | 63    | 65    | 67    | 68    | 69    | 73    | 74    | 73    | 72    | 72    | 72    | 72    | 73    | 73    | 73    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 68    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 60    | 58                  | 59 | 60 |  |  |  |  |  |  |  |  |  |  |  |
| 10F   | 51.30  | 62    | 63    | 64    | 64    | 66    | 67    | 68    | 70    | 73    | 74    | 74    | 73    | 72    | 72    | 72    | 73    | 73    | 73    | 71    | 62    | 63    | 64    | 67    | 68    | 69    | 68    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 58    | 60                  | 61 |    |  |  |  |  |  |  |  |  |  |  |  |
| 11F   | 54.45  | 63    | 64    | 64    | 64    | 67    | 67    | 68    | 71    | 73    | 74    | 74    | 73    | 73    | 72    | 72    | 73    | 73    | 73    | 71    | 62    | 64    | 65    | 68    | 68    | 69    | 68    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 59    | 60                  | 61 |    |  |  |  |  |  |  |  |  |  |  |  |
| 12F   | 57.60  | 63    | 64    | 64    | 65    | 67    | 67    | 68    | 69    | 71    | 73    | 74    | 74    | 73    | 73    | 72    | 73    | 73    | 73    | 71    | 62    | 64    | 65    | 68    | 68    | 69    | 68    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 59    | 60    | 61                  |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 15F   | 60.75  | 63    | 64    | 65    | 65    | 67    | 68    | 69    | 72    | 73    | 74    | 74    | 73    | 73    | 71    | 73    | 73    | 73    | 73    | 71    | 62    | 64    | 65    | 68    | 68    | 69    | 68    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 59    | 60    | 61                  |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 16F   | 63.90  | 63    | 64    | 65    | 65    | 67    | 68    | 70    | 72    | 73    | 73    | 73    | 73    | 71    | 73    | 73    | 73    | 73    | 73    | 71    | 62    | 64    | 64    | 68    | 68    | 69    | 68    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 59    | 61    | 62                  |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 17F   | 67.05  | 63    | 64    | 65    | 65    | 68    | 68    | 70    | 72    | 72    | 73    | 73    | 73    | 71    | 73    | 73    | 73    | 73    | 73    | 71    | 62    | 63    | 64    | 68    | 68    | 69    | 68    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 60    | 61    | 62                  |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 18F   | 70.20  | 63    | 64    | 65    | 65    | 68    | 69    | 70    | 71    | 72    | 73    | 73    | 73    | 71    | 73    | 73    | 73    | 73    | 73    | 71    | 62    | 63    | 64    | 68    | 68    | 69    | 68    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 60    | 61    | 62                  |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 19F   | 73.35  | 63    | 64    | 65    | 65    | 68    | 69    | 71    | 71    | 72    | 73    | 73    | 73    | 71    | 73    | 73    | 73    | 73    | 73    | 71    | 62    | 63    | 64    | 67    | 68    | 69    | 68    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 60    | 61    | 62                  |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 20F   | 76.50  | 64    | 65    | 65    | 66    | 68    | 69    | 71    | 71    | 72    | 73    | 73    | 73    | 71    | 73    | 73    | 73    | 73    | 73    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 68    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 61    | 62    | 62                  |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 21F   | 79.65  | 64    | 65    | 65    | 66    | 69    | 70    | 71    | 71    | 72    | 73    | 73    | 73    | 71    | 73    | 73    | 73    | 73    | 73    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 68    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 61    | 62    | 62                  |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 22F   | 82.80  | 64    | 65    | 65    | 66    | 69    | 70    | 71    | 71    | 72    | 72    | 72    | 73    | 72    | 72    | 72    | 72    | 72    | 72    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 68    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 61    | 62    | 63                  |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 23F   | 85.95  | 64    | 65    | 65    | 66    | 69    | 70    | 71    | 71    | 71    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 68    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 62    | 63    | 63                  |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 24F   | 89.10  | 64    | 65    | 66    | 66    | 69    | 70    | 71    | 71    | 71    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 67    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 62    | 63    | 63    |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 26F   | 92.25  | 64    | 65    | 66    | 66    | 69    | 70    | 71    | 71    | 71    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 67    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 63    | 63    | 63    |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 28F   | 99.25  | 65    | 66    | 66    | 67    | 70    | 70    | 71    | 71    | 71    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 67    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 63    | 64    | 64    |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 29F   | 102.40 | 65    | 66    | 66    | 67    | 70    | 70    | 70    | 70    | 71    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 67    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 64    | 64    | 64    |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 30F   | 105.55 | 65    | 66    | 66    | 67    | 70    | 70    | 70    | 70    | 71    | 71    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 67    | 62    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 64    | 64    | 64    |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 31F   | 108.70 | 65    | 66    | 67    | 67    | 70    | 70    | 70    | 70    | 71    | 71    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 72    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 67    | 62    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 64    | 64    | 65    |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 32F   | 111.85 | 65    | 66    | 67    | 67    | 70    | 70    | 70    | 70    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 67    | 62    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 64    | 65    | 65    |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 33F   | 115.00 | 65    | 66    | 67    | 67    | 70    | 70    | 70    | 70    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 67    | 62    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 65    | 65    | 65    |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 35F   | 118.15 | 66    | 67    | 67    | 67    | 70    | 70    | 70    | 70    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 62    | 63    | 64    | 67    | 68    | 68    | 67    | 62    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 65    | 65    | 65    |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 36F   | 121.30 | 66    | 67    | 67    | 67    | 70    | 70    | 70    | 70    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 62    | 63    | 64    | 67    | 68    | 67    | 62    | 62    | 62    | 62    | 62    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 65    | 65    | 66    |       |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 37F   | 124.45 | 66    | 67    | 67    | 68    | 69    | 70    | 70    | 69    | 70    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 62    | 63    | 64    | 67    | 68    | 67    | 62    | 62    | 62    | 62    | 62    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 66    | 66    | 66    |       |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 38F   | 127.60 | 66    | 67    | 67    | 68    | 69    | 70    | 70    | 69    | 70    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 62    | 63    | 64    | 67    | 68    | 67    | 62    | 62    | 62    | 62    | 62    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 66    | 66    | 66    |       |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 39F   | 130.75 | 66    | 67    | 67    | 68    | 69    | 69    | 69    | 69    | 70    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 62    | 63    | 64    | 67    | 68    | 67    | 62    | 62    | 62    | 62    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 66    | 66    | 66    |       |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 40F   | 133.90 | 66    | 67    | 68    | 68    | 69    | 69    | 69    | 69    | 70    | 70    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 62    | 63    | 64    | 67    | 68    | 66    | 63    | 62    | 62    | 62    | 62    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 66    | 66    | 66    |       |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 41F   | 137.05 | 66    | 67    | 68    | 68    | 69    | 69    | 69    | 69    | 70    | 70    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 62    | 63    | 64    | 67    | 68    | 66    | 63    | 63    | 63    | 63    | 62    | 61    | 61    | 61    | 61    | 61    | 61    | 61    | 60    | 66    | 66    | 66    |       |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 42F   | 140.20 | 66    | 67    | 68    | 68    | 69    | 69    | 69    | 69    | 70    | 70    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 71    | 62    | 63    | 64    | 67    | 68    | 66    | 63    | 63    | 63    | 63    | 62    | 62    | 62    | 62    | 61    | 61    | 61    | 61    | 60    | 66    | 66    | 66    |       |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 43F   | 143.35 | 67    | 67    | 68    | 68    | 69    | 69    | 69    | 69    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 62    | 63    | 64    | 66    | 67    | 67    | 66    | 63    | 63    | 63    | 63    | 62    | 62    | 62    | 62    | 61    | 61    | 61    | 60    | 67    | 67    | 67    |       |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 45F   | 146.50 | 67    | 67    | 68    | 68    | 69    | 69    | 69    | 69    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 62    | 63    | 64    | 66    | 67    | 67    | 66    | 63    | 63    | 63    | 63    | 62    | 62    | 62    | 62    | 61    | 61    | 61    | 60    | 67    | 67    | 67    |       |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 46F   | 149.65 | 67    | 67    | 68    | 68    | 69    | 69    | 69    | 69    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 62    | 63    | 64    | 66    | 67    | 67    | 66    | 64    | 64    | 63    | 63    | 62    | 62    | 62    | 62    | 61    | 61    | 61    | 60    | 67    | 67    | 67    |       |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 47F   | 152.80 | 67    | 68    | 68    | 68    | 69    | 69    | 69    | 69    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 70    | 62    | 63    | 64    | 66    | 67    | 67    | 66    | 64    | 64    | 64    | 63    | 62    | 62    | 62    | 62    | 61    | 61    | 61    | 60    | 67    | 67    | 67    |       |                     |    |    |  |  |  |  |  |  |  |  |  |  |  |

| Floor | mPD    | NSR | N3-01 | N3-02 | N3-03 | N3-04 | N3-05 | N3-06 | N3-07 | N3-08 | N3-09 | N3-10 | N3-11 | N3-12 | N3-13 | N3-14 | N3-15 | N3-16 | N3-17 | N3-18 | L301 (avg. dBA) |    |    |    |    |    |    |    |    |    | N3-21 | N3-22 | N3-23 | N3-24 | N3-25 | N3-26 | N3-27 | N3-28 | N3-29 | N3-30 | N3-31 | N3-32 | N3-33 | N3-34 | N3-35 | N3-36 | N3-37 | N3-38 | N3-39 |
|-------|--------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------|----|----|----|----|----|----|----|----|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 6F    | 38.70  | 64  | 65    | 65    | 66    | 66    | 66    | 68    | 68    | 67    | 66    | 66    | 66    | 67    | 67    | 66    | 64    | 61    | 58    | 53    | 50              | 49 | 49 | 51 | 54 | 70 | 70 | 70 | 68 | 68 | 68    | 70    | 70    | 70    | 68    | 57    | 59    | 60    | 62    |       |       |       |       |       |       |       |       |       |       |
| 7F    | 41.85  | 65  | 66    | 66    | 66    | 66    | 68    | 68    | 68    | 68    | 67    | 67    | 67    | 68    | 68    | 68    | 65    | 62    | 59    | 53    | 50              | 50 | 50 | 54 | 57 | 68 | 68 | 68 | 69 | 68 | 68    | 69    | 70    | 70    | 70    | 68    | 58    | 62    | 62    | 63    |       |       |       |       |       |       |       |       |       |
| 8F    | 45.00  | 66  | 66    | 67    | 69    | 66    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 65    | 63    | 60    | 53    | 50              | 49 | 51 | 56 | 59 | 68 | 68 | 69 | 69 | 69 | 69    | 70    | 70    | 70    | 68    | 60    | 63    | 63    | 64    |       |       |       |       |       |       |       |       |       |       |
| 9F    | 48.15  | 66  | 67    | 68    | 70    | 66    | 69    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 65    | 63    | 60    | 53    | 50              | 49 | 51 | 57 | 60 | 68 | 68 | 69 | 69 | 69 | 69    | 70    | 70    | 70    | 68    | 61    | 63    | 64    | 65    |       |       |       |       |       |       |       |       |       |       |
| 10F   | 51.30  | 66  | 67    | 68    | 70    | 66    | 69    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 65    | 63    | 60    | 53    | 50              | 49 | 51 | 57 | 60 | 68 | 68 | 69 | 69 | 69 | 69    | 70    | 70    | 70    | 68    | 62    | 64    | 64    | 65    |       |       |       |       |       |       |       |       |       |       |
| 11F   | 54.45  | 67  | 67    | 69    | 70    | 66    | 69    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 65    | 63    | 60    | 53    | 50              | 49 | 52 | 57 | 60 | 68 | 68 | 70 | 69 | 69 | 69    | 71    | 71    | 70    | 70    | 69    | 63    | 65    | 65    | 65    |       |       |       |       |       |       |       |       |       |
| 12F   | 57.60  | 67  | 68    | 69    | 70    | 66    | 69    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 65    | 63    | 60    | 53    | 50              | 49 | 52 | 57 | 60 | 69 | 69 | 70 | 69 | 69 | 69    | 71    | 71    | 70    | 70    | 69    | 64    | 65    | 65    | 66    |       |       |       |       |       |       |       |       |       |
| 15F   | 60.75  | 67  | 68    | 70    | 71    | 66    | 69    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 65    | 63    | 60    | 53    | 50              | 49 | 52 | 57 | 60 | 69 | 69 | 70 | 69 | 69 | 69    | 71    | 71    | 70    | 70    | 68    | 64    | 66    | 66    | 66    |       |       |       |       |       |       |       |       |       |
| 16F   | 63.90  | 68  | 69    | 70    | 71    | 66    | 69    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 65    | 62    | 60    | 52    | 50              | 49 | 52 | 57 | 60 | 69 | 69 | 70 | 69 | 69 | 69    | 71    | 71    | 70    | 70    | 68    | 64    | 66    | 66    | 66    |       |       |       |       |       |       |       |       |       |
| 17F   | 67.05  | 68  | 69    | 70    | 71    | 67    | 69    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 65    | 62    | 60    | 52    | 50              | 48 | 52 | 57 | 60 | 69 | 69 | 70 | 69 | 69 | 69    | 71    | 71    | 70    | 70    | 68    | 64    | 66    | 66    | 66    |       |       |       |       |       |       |       |       |       |
| 18F   | 70.20  | 68  | 69    | 70    | 71    | 67    | 69    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 65    | 62    | 60    | 52    | 50              | 48 | 52 | 57 | 60 | 69 | 69 | 70 | 69 | 69 | 69    | 71    | 71    | 70    | 70    | 68    | 64    | 66    | 66    | 66    |       |       |       |       |       |       |       |       |       |
| 19F   | 73.35  | 69  | 69    | 70    | 71    | 67    | 69    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 65    | 62    | 60    | 52    | 50              | 48 | 52 | 57 | 60 | 69 | 69 | 70 | 69 | 69 | 69    | 71    | 71    | 70    | 69    | 69    | 68    | 65    | 67    | 67    | 67    |       |       |       |       |       |       |       |       |
| 20F   | 76.50  | 68  | 69    | 70    | 71    | 67    | 69    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 64    | 62    | 60    | 52    | 50              | 48 | 52 | 57 | 60 | 68 | 68 | 70 | 69 | 69 | 69    | 71    | 71    | 70    | 69    | 68    | 65    | 67    | 67    | 67    |       |       |       |       |       |       |       |       |       |
| 21F   | 79.65  | 69  | 70    | 70    | 70    | 67    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 64    | 62    | 60    | 52    | 50              | 48 | 52 | 57 | 60 | 68 | 68 | 69 | 69 | 69 | 69    | 71    | 71    | 70    | 69    | 68    | 65    | 67    | 67    | 67    |       |       |       |       |       |       |       |       |       |
| 22F   | 82.80  | 69  | 70    | 71    | 70    | 67    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 64    | 62    | 60    | 52    | 50              | 48 | 52 | 57 | 60 | 68 | 68 | 69 | 69 | 69 | 69    | 71    | 71    | 70    | 69    | 68    | 66    | 67    | 67    | 67    |       |       |       |       |       |       |       |       |       |
| 23F   | 85.95  | 69  | 70    | 71    | 70    | 67    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 68    | 64    | 62    | 60    | 52    | 50              | 48 | 52 | 57 | 60 | 68 | 68 | 69 | 69 | 69 | 69    | 71    | 71    | 70    | 69    | 68    | 66    | 68    | 68    | 68    |       |       |       |       |       |       |       |       |       |
| 25F   | 89.10  | 69  | 70    | 70    | 70    | 67    | 68    | 68    | 68    | 67    | 68    | 68    | 68    | 68    | 68    | 68    | 64    | 62    | 60    | 52    | 50              | 48 | 52 | 57 | 60 | 68 | 68 | 69 | 68 | 68 | 69    | 70    | 70    | 69    | 67    | 66    | 68    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |
| 26F   | 92.25  | 69  | 70    | 70    | 70    | 67    | 68    | 68    | 68    | 67    | 68    | 68    | 68    | 68    | 68    | 68    | 64    | 62    | 60    | 52    | 50              | 48 | 53 | 57 | 60 | 68 | 68 | 69 | 68 | 68 | 68    | 69    | 70    | 70    | 69    | 67    | 66    | 68    | 68    | 68    |       |       |       |       |       |       |       |       |       |
| 28F   | 99.25  | 69  | 70    | 70    | 70    | 67    | 68    | 68    | 68    | 67    | 67    | 67    | 68    | 68    | 68    | 68    | 64    | 62    | 60    | 52    | 50              | 48 | 53 | 57 | 60 | 68 | 68 | 69 | 68 | 68 | 68    | 69    | 68    | 68    | 67    | 66    | 68    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |
| 29F   | 102.40 | 69  | 70    | 70    | 70    | 67    | 68    | 68    | 68    | 67    | 67    | 67    | 68    | 68    | 67    | 64    | 62    | 60    | 52    | 50    | 49              | 53 | 57 | 59 | 68 | 68 | 69 | 68 | 68 | 68 | 69    | 68    | 68    | 69    | 68    | 70    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |
| 30F   | 105.55 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 68    | 67    | 64    | 62    | 60    | 52    | 50    | 49              | 54 | 57 | 59 | 68 | 68 | 69 | 68 | 68 | 68 | 69    | 68    | 68    | 69    | 68    | 70    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |
| 31F   | 108.70 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 67    | 67    | 64    | 62    | 60    | 53    | 51    | 49              | 54 | 57 | 59 | 70 | 67 | 68 | 68 | 68 | 69 | 68    | 68    | 69    | 68    | 70    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |
| 32F   | 111.85 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 67    | 67    | 64    | 62    | 60    | 53    | 51    | 49              | 54 | 57 | 59 | 70 | 70 | 68 | 68 | 68 | 69 | 68    | 68    | 69    | 68    | 70    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |
| 33F   | 115.00 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 67    | 67    | 64    | 62    | 60    | 53    | 51    | 49              | 54 | 57 | 59 | 70 | 70 | 68 | 68 | 68 | 69 | 68    | 68    | 69    | 68    | 70    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |
| 35F   | 118.15 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 67    | 67    | 64    | 62    | 60    | 53    | 51    | 49              | 54 | 57 | 59 | 70 | 70 | 68 | 68 | 68 | 69 | 68    | 68    | 69    | 68    | 70    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |
| 36F   | 121.30 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 67    | 67    | 64    | 62    | 60    | 53    | 51    | 49              | 54 | 57 | 59 | 70 | 70 | 68 | 68 | 68 | 69 | 68    | 68    | 69    | 68    | 70    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |
| 37F   | 124.45 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 67    | 67    | 64    | 62    | 60    | 53    | 52    | 50              | 55 | 57 | 59 | 70 | 70 | 68 | 68 | 69 | 68 | 68    | 69    | 68    | 70    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |       |
| 38F   | 127.60 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 67    | 67    | 64    | 62    | 60    | 53    | 52    | 50              | 55 | 57 | 59 | 70 | 70 | 68 | 69 | 68 | 68 | 69    | 68    | 68    | 69    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |       |
| 39F   | 130.75 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 67    | 67    | 64    | 62    | 60    | 53    | 52    | 51              | 55 | 57 | 59 | 70 | 70 | 68 | 69 | 68 | 68 | 69    | 68    | 68    | 69    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |       |
| 40F   | 133.90 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 67    | 67    | 64    | 62    | 60    | 54    | 52    | 51              | 55 | 57 | 59 | 70 | 70 | 68 | 69 | 68 | 68 | 69    | 68    | 68    | 69    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |       |
| 41F   | 137.05 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 67    | 67    | 64    | 62    | 60    | 54    | 53    | 51              | 55 | 57 | 59 | 70 | 70 | 68 | 69 | 68 | 68 | 69    | 68    | 68    | 69    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |       |
| 42F   | 140.20 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 67    | 67    | 64    | 62    | 60    | 54    | 53    | 52              | 55 | 57 | 59 | 70 | 70 | 68 | 69 | 68 | 68 | 69    | 68    | 68    | 69    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |       |
| 43F   | 143.35 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 67    | 67    | 64    | 62    | 60    | 54    | 53    | 52              | 56 | 58 | 59 | 70 | 70 | 68 | 69 | 68 | 68 | 69    | 68    | 68    | 69    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |       |
| 45F   | 146.50 | 69  | 70    | 70    | 70    | 69    | 67    | 68    | 68    | 68    | 67    | 67    | 68    | 67    | 67    | 64    | 62    | 60    | 54    | 53    | 52              | 56 | 58 | 59 | 70 | 70 | 68 | 69 | 68 | 68 | 69    | 68    | 68    | 69    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |       |
| 46F   | 149.65 | 68  | 69    | 69    | 69    | 68    | 66    | 67    | 67    | 67    | 67    | 67    | 67    | 67    | 67    | 63    | 61    | 60    | 54    | 53    | 52              | 56 | 58 | 59 | 70 | 70 | 68 | 69 | 68 | 68 | 69    | 68    | 68    | 69    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |       |
| 47F   | 152.80 | 68  | 69    | 69    | 69    | 68    | 66    | 67    | 67    | 67    | 67    | 67    | 67    | 67    | 67    | 63    | 61    | 60    | 54    | 53    | 52              | 56 | 58 | 59 | 69 | 70 | 68 | 69 | 68 | 68 | 69    | 68    | 68    | 69    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |       |
| 48F   | 155.95 | 68  | 69    | 69    | 69    | 68    | 66    | 67    | 67    | 67    | 67    | 67    | 67    | 67    | 67    | 63    | 61    | 60    | 54    | 53    | 52              | 56 | 58 | 59 | 69 | 69 | 68 | 69 | 68 | 68 | 69    | 68    | 68    | 69    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |       |
| 49F   | 159.10 | 68  | 69    | 69    | 69    | 68    | 66    | 67    | 67    | 67    | 67    | 67    | 67    | 67    | 67    | 63    | 61    | 60    | 55    | 54    | 53              | 56 | 58 | 59 | 69 | 69 | 68 | 69 | 68 | 68 | 69    | 68    | 68    | 69    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |       |
| 50F   | 162.25 | 68  | 69    | 69    | 69    | 68    | 66    | 67    | 67    | 67    | 67    | 67    | 67    | 67    | 67    | 63    | 61    | 60    | 55    | 54    | 53              | 56 | 58 | 59 | 69 | 69 | 68 | 69 | 68 | 68 | 69    | 68    | 68    | 69    | 67    | 68    | 68    |       |       |       |       |       |       |       |       |       |       |       |       |
| 51F   | 165.40 |     |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |                 |    |    |    |    |    |    |    |    |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |

| Floor | mPD | NSR | N5-01 | N5-02 | N5-03 | N5-04 | N5-05 | N5-06 | N5-07 | N5-08 | N5-09 | N5-10 | N5-11 | N5-12 | N5-13 | N5-14 | N5-15 | N5-16 | N5-17 | N5-18 | N5-19 | N5-20 |
|-------|-----|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|-------|-----|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|



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**Annex 4b:**  
**Traffic Noise Impact Assessment Results of**  
**Previous Submission in Jun 2014**

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Annex C2-1 Predicted Road Traffic Noise Levels (upon completion of building construction at DA 4 & 5)

| Floor        | Tower 2 |      |      |      |      |      |      |      |      |      | Tower 3 |      |      |      |      |      |      |      | Tower 4 |      |      |      |      |      |      |      | Tower 5 |      |      |      |      |      |      |        |      |      |      |      |      |
|--------------|---------|------|------|------|------|------|------|------|------|------|---------|------|------|------|------|------|------|------|---------|------|------|------|------|------|------|------|---------|------|------|------|------|------|------|--------|------|------|------|------|------|
|              | 20      | 21   | 22   | 221  | 222  | 23   | 24   | 25   | 26   | 27   | 31      | 32   | 321  | 322  | 33   | 34   | 35   | 36   | 37      | 38   | 41   | 42   | 43   | 44   | 45   | 46   | 47      | 48   | 49   | 51   | 52   | 53   | 54   | 541    | 55   | 56   | 57   | 58   | 59   |
| 7            | 55.7    | 58.0 | 65.4 | 61.6 | 64.1 | 68.4 | 68.0 | 65.9 | 65.1 | 61.6 | 66.3    | 61.2 | 58.2 | 59.7 | 58.3 | 53.0 | 58.5 | 66.6 | 67.2    | 68.9 | 64.8 | 61.9 | 71.5 | 70.7 | 69.2 | 52.3 | 57.2    | 66.8 | 65.4 | 68.1 | 69.1 | 69.8 | 70.8 | 70.4   | 71.5 | 66.2 | 65.8 | 63.7 | 60.6 |
| 8            | 58.5    | 61.7 | 68.3 | 66.0 | 67.6 | 72.0 | 68.8 | 67.1 | 65.3 | 61.7 | 68.4    | 68.4 | 64.0 | 65.8 | 62.6 | 54.9 | 58.6 | 66.7 | 67.2    | 68.7 | 65.5 | 63.1 | 71.6 | 71.1 | 69.6 | 52.4 | 57.2    | 67.8 | 67.3 | 68.7 | 69.7 | 70.3 | 70.8 | 70.5   | 71.7 | 66.2 | 65.8 | 64.2 | 61.7 |
| 9            | 60.1    | 65.0 | 70.0 | 68.1 | 69.2 | 74.0 | 69.3 | 67.6 | 65.5 | 61.8 | 70.0    | 68.0 | 66.8 | 68.0 | 66.6 | 56.8 | 58.8 | 66.7 | 67.2    | 68.7 | 66.2 | 64.3 | 71.8 | 71.4 | 70.0 | 52.5 | 57.1    | 68.0 | 67.9 | 69.2 | 70.1 | 70.7 | 70.8 | 70.5   | 71.7 | 66.3 | 65.9 | 64.5 | 62.3 |
| 10           | 61.2    | 67.3 | 71.2 | 69.0 | 70.4 | 74.4 | 69.4 | 67.8 | 65.9 | 61.9 | 71.8    | 68.3 | 67.7 | 68.8 | 68.4 | 58.4 | 58.9 | 66.7 | 67.2    | 68.6 | 67.0 | 65.7 | 71.9 | 71.6 | 70.4 | 52.5 | 57.1    | 68.1 | 68.0 | 69.6 | 70.3 | 70.9 | 70.8 | 70.4   | 71.8 | 66.3 | 65.8 | 64.7 | 62.7 |
| 11           | 62.4    | 69.0 | 71.8 | 70.1 | 71.7 | 74.5 | 69.3 | 68.1 | 66.4 | 61.9 | 72.3    | 68.5 | 68.2 | 69.3 | 69.3 | 59.8 | 59.0 | 66.6 | 67.1    | 68.5 | 67.6 | 66.5 | 71.9 | 71.7 | 70.6 | 52.5 | 57.1    | 68.2 | 68.2 | 69.8 | 70.5 | 71.0 | 70.7 | 70.3   | 71.8 | 66.3 | 66.0 | 64.8 | 62.9 |
| 12           | 63.5    | 69.4 | 71.9 | 71.2 | 72.1 | 74.6 | 69.3 | 68.2 | 66.5 | 61.9 | 72.5    | 68.7 | 68.6 | 69.8 | 69.8 | 61.1 | 59.0 | 66.6 | 67.1    | 68.5 | 67.9 | 67.0 | 72.0 | 71.7 | 70.7 | 52.6 | 57.1    | 68.5 | 68.3 | 69.8 | 70.5 | 71.0 | 70.7 | 70.2   | 71.7 | 66.4 | 65.9 | 64.9 | 63.0 |
| 13           | 64.4    | 69.7 | 71.9 | 71.8 | 72.3 | 74.6 | 69.2 | 68.2 | 66.8 | 62.0 | 72.4    | 68.9 | 69.3 | 70.4 | 70.0 | 62.4 | 59.1 | 66.6 | 67.1    | 68.5 | 68.2 | 67.5 | 71.9 | 71.7 | 70.7 | 52.5 | 57.1    | 68.6 | 68.4 | 69.9 | 70.5 | 70.9 | 70.6 | 70.1   | 71.7 | 66.4 | 65.9 | 65.0 | 63.1 |
| 14           | 65.4    | 69.8 | 71.8 | 72.1 | 72.4 | 74.5 | 69.1 | 68.2 | 66.8 | 62.1 | 72.3    | 69.1 | 69.7 | 70.8 | 70.1 | 63.5 | 59.2 | 66.6 | 67.1    | 68.5 | 68.7 | 67.9 | 71.8 | 71.7 | 70.8 | 52.5 | 57.1    | 68.6 | 68.5 | 69.9 | 70.5 | 70.8 | 70.6 | 70.1   | 71.6 | 66.4 | 65.9 | 65.1 | 63.1 |
| 15           | 66.3    | 69.8 | 71.7 | 72.1 | 72.3 | 74.4 | 68.9 | 68.2 | 67.0 | 62.4 | 72.2    | 69.3 | 70.2 | 70.9 | 70.1 | 64.6 | 59.2 | 66.6 | 67.1    | 68.5 | 68.6 | 68.4 | 71.7 | 71.6 | 70.7 | 52.5 | 57.0    | 68.6 | 68.5 | 69.9 | 70.5 | 70.7 | 70.5 | 70.0   | 71.5 | 66.4 | 65.8 | 65.1 | 63.1 |
| 16           | 67.0    | 69.8 | 71.5 | 72.1 | 72.2 | 74.3 | 68.8 | 68.0 | 66.9 | 62.5 | 72.1    | 69.5 | 70.5 | 71.0 | 70.1 | 66.1 | 59.2 | 66.6 | 67.1    | 68.4 | 68.9 | 68.4 | 71.6 | 71.5 | 70.7 | 52.5 | 57.0    | 68.5 | 68.5 | 69.9 | 70.4 | 70.6 | 70.5 | 69.9   | 71.4 | 66.4 | 65.9 | 65.1 | 63.1 |
| 17           | 67.7    | 69.8 | 71.4 | 72.1 | 72.2 | 74.1 | 68.7 | 67.9 | 67.0 | 62.6 | 72.0    | 69.6 | 70.5 | 71.0 | 70.1 | 66.9 | 59.3 | 66.5 | 67.0    | 68.3 | 69.2 | 68.6 | 71.5 | 71.4 | 70.6 | 52.4 | 57.1    | 68.5 | 68.5 | 69.8 | 70.3 | 70.5 | 70.4 | 69.8   | 71.3 | 66.3 | 65.9 | 65.1 | 63.1 |
| 18           | 68.4    | 69.7 | 71.2 | 72.0 | 72.1 | 73.9 | 68.5 | 67.8 | 67.0 | 62.8 | 71.9    | 69.6 | 70.6 | 71.1 | 70.1 | 67.6 | 59.3 | 66.5 | 67.0    | 68.2 | 69.3 | 68.9 | 71.4 | 71.3 | 70.5 | 52.4 | 57.0    | 68.5 | 68.4 | 69.7 | 70.2 | 70.5 | 70.3 | 69.7   | 71.3 | 66.4 | 65.9 | 65.1 | 63.1 |
| 19           | 68.9    | 69.6 | 71.1 | 71.8 | 72.0 | 73.8 | 68.5 | 67.7 | 67.0 | 62.9 | 71.8    | 69.6 | 70.6 | 71.1 | 70.0 | 68.4 | 59.5 | 66.4 | 66.9    | 68.1 | 69.4 | 69.1 | 71.3 | 71.2 | 70.4 | 52.4 | 57.0    | 68.5 | 68.4 | 69.7 | 70.1 | 70.4 | 70.3 | 69.6   | 71.2 | 66.4 | 65.9 | 65.1 | 63.1 |
| 20           | 69.3    | 69.5 | 70.9 | 71.8 | 71.9 | 73.6 | 68.3 | 67.6 | 66.9 | 62.9 | 71.7    | 69.5 | 70.6 | 71.0 | 69.9 | 68.8 | 59.5 | 66.3 | 66.8    | 68.0 | 69.5 | 69.3 | 71.2 | 71.2 | 70.3 | 52.5 | 57.1    | 68.4 | 68.3 | 69.6 | 70.1 | 70.3 | 70.3 | 69.6   | 71.1 | 66.4 | 66.0 | 65.1 | 63.1 |
| 21           | 69.4    | 69.5 | 70.8 | 71.7 | 71.7 | 73.5 | 68.2 | 67.5 | 66.8 | 63.1 | 71.6    | 69.4 | 70.6 | 70.9 | 69.9 | 69.0 | 59.6 | 66.3 | 66.7    | 67.9 | 69.5 | 69.3 | 71.1 | 71.1 | 70.3 | 52.5 | 57.0    | 68.4 | 68.2 | 69.5 | 70.0 | 70.2 | 70.2 | 69.5   | 71.0 | 66.5 | 66.1 | 65.1 | 63.1 |
| 22           | 69.5    | 69.4 | 70.6 | 71.6 | 71.6 | 73.3 | 68.1 | 67.5 | 66.8 | 63.1 | 71.5    | 69.4 | 70.6 | 70.9 | 69.7 | 69.2 | 59.7 | 66.2 | 66.7    | 67.8 | 69.4 | 69.2 | 71.0 | 71.0 | 70.2 | 52.6 | 57.1    | 68.4 | 68.2 | 69.4 | 69.9 | 70.1 | 70.1 | 69.4   | 70.9 | 66.5 | 66.1 | 65.1 | 63.1 |
| 23           | 69.7    | 69.3 | 70.6 | 71.5 | 71.5 | 73.2 | 68.0 | 67.3 | 66.7 | 63.2 | 71.5    | 69.3 | 70.5 | 70.8 | 69.7 | 69.3 | 59.9 | 66.2 | 66.6    | 67.7 | 69.3 | 69.3 | 70.9 | 70.9 | 70.1 | 52.8 | 57.1    | 68.4 | 68.1 | 69.3 | 69.8 | 70.0 | 70.1 | 69.4   | 70.8 | 66.4 | 66.1 | 65.2 | 63.1 |
| 24           | 69.8    | 69.2 | 70.4 | 71.4 | 71.4 | 73.1 | 67.9 | 67.3 | 66.7 | 63.3 | 71.3    | 69.2 | 70.4 | 70.7 | 69.6 | 69.4 | 60.0 | 66.2 | 66.6    | 67.6 | 69.3 | 69.2 | 70.8 | 70.8 | 70.0 | 53.0 | 57.1    | 68.4 | 68.1 | 69.2 | 69.7 | 69.9 | 70.1 | 69.3   | 70.7 | 66.5 | 66.2 | 65.2 | 63.1 |
| 25           | 69.8    | 69.2 | 70.3 | 71.4 | 71.2 | 72.9 | 67.9 | 67.3 | 66.7 | 63.3 | 71.2    | 69.1 | 70.3 | 70.5 | 69.5 | 69.5 | 60.0 | 66.1 | 66.5    | 67.6 | 69.2 | 69.3 | 70.7 | 70.7 | 69.9 | 53.5 | 57.3    | 68.4 | 68.0 | 69.2 | 69.6 | 69.9 | 70.1 | 69.2   | 70.7 | 66.5 | 66.3 | 65.2 | 63.0 |
| 26           | 69.9    | 69.2 | 70.2 | 71.2 | 71.1 | 72.8 | 67.8 | 67.2 | 66.7 | 63.4 | 71.1    | 69.0 | 70.2 | 70.4 | 69.4 | 69.6 | 60.2 | 66.0 | 66.4    | 67.4 | 69.1 | 69.2 | 70.6 | 70.6 | 69.8 | 53.7 | 57.5    | 68.4 | 68.0 | 69.1 | 69.5 | 70.0 | 70.0 | 69.1   | 70.6 | 66.6 | 66.4 | 65.3 | 63.1 |
| 27           | 69.9    | 69.2 | 70.0 | 71.2 | 71.0 | 72.7 | 67.7 | 67.1 | 66.6 | 63.6 | 71.0    | 68.9 | 70.1 | 70.3 | 69.2 | 69.5 | 60.3 | 66.0 | 66.3    | 67.3 | 69.1 | 69.1 | 70.5 | 70.5 | 69.7 | 54.0 | 57.6    | 68.4 | 68.0 | 69.0 | 69.5 | 70.0 | 70.0 | 69.1   | 70.5 | 66.5 | 66.3 | 65.3 | 63.1 |
| 28           | 69.8    | 69.1 | 69.9 | 71.0 | 70.9 | 72.6 | 67.7 | 67.1 | 66.6 | 63.6 | 70.8    | 68.7 | 70.0 | 70.2 | 69.2 | 69.5 | 60.4 | 65.9 | 66.3    | 67.3 | 69.0 | 69.0 | 70.4 | 70.4 | 69.7 | 54.3 | 57.8    | 68.4 | 68.0 | 68.9 | 69.4 | 70.0 | 69.9 | 69.0   | 70.5 | 66.5 | 66.5 | 65.3 | 63.1 |
| Refuge floor |         |      |      |      |      |      |      |      |      |      |         |      |      |      |      |      |      |      |         |      |      |      |      |      |      |      |         |      |      |      |      |      |      |        |      |      |      |      |      |
|              | 29      | 69.8 | 69.2 | 69.8 | 70.9 | 70.7 | 72.4 | 67.5 | 67.0 | 66.6 | 63.7    | 70.7 | 68.5 | 69.8 | 70.0 | 69.0 | 69.4 | 60.7 | 65.9    | 66.2 | 67.1 | 68.9 | 68.8 | 70.3 | 70.3 | 69.6 | 54.5    | 58.0 | 68.3 | 67.9 | 68.8 | 69.4 | 69.9 | 69.9   | 69.0 | 70.4 | 66.6 | 66.5 | 65.3 |
| 30           | 69.8    | 69.1 | 69.7 | 70.8 | 70.6 | 72.3 | 67.5 | 67.0 | 66.6 | 63.8 | 70.6    | 68.5 | 69.7 | 69.9 | 69.0 | 69.4 | 60.7 | 65.8 | 66.1    | 67.0 | 68.8 | 68.7 | 70.2 | 70.2 | 69.6 | 54.6 | 58.2    | 68.3 | 67.9 | 68.8 | 69.4 | 69.9 | 69.9 | 68.9   | 70.4 | 66.6 | 66.6 | 65.3 | 63.0 |
| 31           | 69.9    | 69.1 | 69.6 | 70.7 | 70.6 | 72.2 | 67.5 | 66.9 | 66.6 | 63.9 | 70.5    | 68.5 | 69.6 | 69.8 | 69.1 | 69.4 | 60.8 | 65.8 | 66.1    | 67.0 | 68.7 | 68.7 | 70.1 | 70.2 | 69.6 | 54.7 | 58.3    | 68.2 | 67.9 | 68.7 | 69.3 | 69.8 | 69.9 | 69.0   | 70.3 | 66.6 | 66.6 | 65.3 | 63.0 |
| 32           | 69.8    | 69.2 | 69.5 | 70.6 | 70.5 | 72.1 | 67.4 | 66.9 | 66.6 | 64.0 | 70.4    | 68.7 | 69.5 | 69.6 | 69.0 | 69.4 | 61.0 | 65.7 | 66.0    | 66.9 | 68.6 | 68.6 | 70.0 | 70.1 | 69.5 | 54.8 | 58.4    | 68.2 | 67.8 | 68.7 | 69.3 | 69.8 | 69.9 | 69.0   | 70.3 | 66.7 | 66.7 | 65.3 | 63.0 |
| 33           | 69.7    | 69.1 | 69.5 | 70.5 | 70.4 | 72.0 | 67.4 | 66.9 | 66.6 | 64.0 | 70.3    | 68.9 | 69.4 | 69.6 | 69.0 | 69.3 | 61.1 | 65.7 | 66.0    | 66.9 | 68.6 | 68.5 | 70.0 | 70.0 | 69.5 | 54.9 | 58.4    | 68.2 | 67.7 | 68.7 | 69.3 | 69.7 | 69.8 | 69.1   | 70.2 | 66.7 | 66.7 | 65.3 | 62.9 |
| 34           | 69.7    | 69.1 | 69.4 | 70.5 | 70.3 | 71.9 | 67.3 | 66.9 | 66.6 | 64.1 | 70.2    | 69.0 | 69.3 | 69.5 | 69.1 | 69.3 | 61.2 | 65.7 | 66.0    | 66.8 | 68.4 | 68.5 | 69.9 | 70.0 | 69.4 | 55.1 | 58.7    | 68.2 | 67.7 | 68.7 | 69.2 | 69.6 | 69.8 | 69.2   | 70.2 | 66.8 | 66.8 | 65.3 | 62.9 |
| 35           | 69.7    | 69.1 | 69.3 | 70.4 | 70.2 | 71.8 | 67.3 | 66.8 | 66.6 | 64.2 | 70.1    | 69.0 | 69.1 | 69.4 | 69.0 | 69.3 | 61.2 | 65.6 | 65.9    | 66.8 | 68.4 | 68.4 | 69.9 | 69.9 | 69.4 | 55.4 | 58.8    | 68.1 | 67.7 | 68.6 | 69.2 | 69.5 | 69.8 | 69.2</ |      |      |      |      |      |

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**Annex 5:**  
**Railway Noise Impact Assessment and sample**  
**calculation – After Completion of the Podium**  
**Structure in DA 4 and 5**

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Table 2 : Summary of Railway Noise Impact Assessment of Representative NSRs with consideration of DA 4 &amp; 5

|            | Living Room                     |     | Bedroom   |     | Living Room |     | Living Room |     | Living Room |     | Bedroom   |     | Bedroom   |     | Living Room |     | Living Room |     | Bedroom   |     |
|------------|---------------------------------|-----|-----------|-----|-------------|-----|-------------|-----|-------------|-----|-----------|-----|-----------|-----|-------------|-----|-------------|-----|-----------|-----|
| NSR        | N1-20                           |     | N1-22     |     | N5-25       |     | N5-28       |     | N5-29       |     | N5-32     |     | N5-33     |     | N5-36       |     | N5-37       |     | N5-40     |     |
| Scenario   | Base Case                       | VAF | Base Case | VAF | Base Case   | VAF | Base Case   | VAF | Base Case   | VAF | Base Case | VAF | Base Case | VAF | Base Case   | VAF | Base Case   | VAF | Base Case | VAF |
| Floor      | L <sub>eq</sub> (30 min), dB(A) |     |           |     |             |     |             |     |             |     |           |     |           |     |             |     |             |     |           |     |
| 6/F        | 54                              | 54  | 54        | 54  | 43          | 42  | 42          | 42  | 42          | 42  | 44        | 35  | 57        | 51  | 58          | 58  | 58          | 58  | 59        | 59  |
| 7/F        | 54                              | 54  | 54        | 54  | 43          | 42  | 42          | 42  | 42          | 42  | 44        | 35  | 57        | 51  | 58          | 58  | 58          | 58  | 59        | 59  |
| 8/F        | 54                              | 54  | 54        | 54  | 43          | 42  | 42          | 42  | 42          | 41  | 44        | 35  | 57        | 51  | 58          | 58  | 58          | 58  | 59        | 59  |
| 9/F        | 54                              | 54  | 54        | 54  | 43          | 42  | 42          | 42  | 42          | 41  | 44        | 35  | 57        | 51  | 58          | 58  | 58          | 58  | 59        | 59  |
| 10/F       | 54                              | 54  | 54        | 54  | 43          | 42  | 42          | 42  | 42          | 41  | 44        | 35  | 58        | 51  | 58          | 58  | 58          | 58  | 59        | 59  |
| 11/F       | 54                              | 54  | 54        | 54  | 43          | 42  | 42          | 42  | 42          | 41  | 44        | 50  | 58        | 51  | 58          | 58  | 58          | 58  | 59        | 59  |
| 12/F       | 54                              | 54  | 54        | 54  | 42          | 42  | 42          | 41  | 50          | 50  | 44        | 49  | 60        | 51  | 58          | 58  | 58          | 58  | 59        | 59  |
| 15/F       | 54                              | 54  | 54        | 54  | 42          | 42  | 50          | 50  | 50          | 50  | 44        | 49  | 60        | 51  | 58          | 58  | 58          | 58  | 59        | 59  |
| 16/F       | 54                              | 54  | 54        | 54  | 50          | 50  | 50          | 50  | 50          | 50  | 44        | 49  | 60        | 51  | 60          | 60  | 59          | 59  | 59        | 59  |
| 17/F       | 54                              | 54  | 54        | 53  | 50          | 50  | 50          | 50  | 50          | 50  | 45        | 49  | 60        | 51  | 60          | 60  | 60          | 60  | 60        | 60  |
| 18/F       | 54                              | 54  | 54        | 53  | 50          | 50  | 50          | 50  | 50          | 50  | 45        | 49  | 59        | 51  | 60          | 59  | 60          | 60  | 60        | 60  |
| 19/F       | 54                              | 54  | 54        | 53  | 50          | 50  | 50          | 50  | 50          | 50  | 46        | 49  | 59        | 51  | 59          | 59  | 60          | 60  | 60        | 60  |
| 20/F       | 54                              | 54  | 54        | 54  | 50          | 50  | 50          | 50  | 50          | 50  | 47        | 49  | 59        | 51  | 59          | 59  | 60          | 60  | 60        | 60  |
| 21/F       | 56                              | 55  | 54        | 54  | 50          | 50  | 50          | 50  | 51          | 50  | 49        | 49  | 59        | 51  | 59          | 59  | 60          | 60  | 60        | 60  |
| 22/F       | 56                              | 55  | 56        | 56  | 50          | 50  | 51          | 50  | 51          | 50  | 51        | 49  | 59        | 51  | 59          | 59  | 60          | 60  | 60        | 60  |
| 23/F       | 56                              | 55  | 56        | 56  | 51          | 51  | 51          | 50  | 52          | 50  | 52        | 48  | 59        | 51  | 59          | 59  | 60          | 60  | 60        | 60  |
| 25/F       | 56                              | 55  | 56        | 56  | 51          | 51  | 52          | 51  | 53          | 51  | 56        | 48  | 59        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 26/F       | 56                              | 55  | 56        | 56  | 52          | 52  | 53          | 52  | 57          | 54  | 57        | 48  | 60        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 28/F       | 56                              | 55  | 56        | 56  | 56          | 56  | 57          | 55  | 58          | 54  | 57        | 48  | 61        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 29/F       | 56                              | 55  | 56        | 56  | 56          | 56  | 57          | 56  | 58          | 54  | 57        | 48  | 61        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 30/F       | 56                              | 55  | 56        | 56  | 56          | 56  | 57          | 56  | 58          | 54  | 57        | 48  | 61        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 31/F       | 56                              | 55  | 56        | 55  | 56          | 56  | 57          | 56  | 58          | 54  | 57        | 48  | 61        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 32/F       | 56                              | 55  | 55        | 55  | 56          | 56  | 57          | 56  | 57          | 54  | 57        | 48  | 61        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 33/F       | 56                              | 55  | 55        | 55  | 56          | 56  | 57          | 56  | 57          | 54  | 58        | 47  | 61        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 35/F       | 56                              | 55  | 55        | 55  | 56          | 56  | 57          | 55  | 57          | 54  | 58        | 47  | 61        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 36/F       | 56                              | 55  | 55        | 55  | 56          | 56  | 57          | 55  | 57          | 54  | 60        | 47  | 61        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 37/F       | 56                              | 55  | 55        | 55  | 56          | 56  | 57          | 55  | 57          | 54  | 60        | 47  | 61        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 38/F       | 56                              | 55  | 55        | 55  | 56          | 56  | 57          | 55  | 57          | 54  | 61        | 47  | 61        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 39/F       | 56                              | 55  | 55        | 55  | 56          | 56  | 57          | 55  | 57          | 54  | 61        | 47  | 61        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 40/F       | 56                              | 55  | 55        | 55  | 56          | 56  | 57          | 55  | 57          | 53  | 61        | 47  | 62        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 41/F       | 55                              | 55  | 55        | 55  | 56          | 56  | 57          | 55  | 57          | 53  | 61        | 47  | 62        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 42/F       | 55                              | 55  | 55        | 55  | 56          | 56  | 57          | 55  | 57          | 53  | 61        | 47  | 62        | 50  | 59          | 59  | 59          | 59  | 60        | 60  |
| 43/F       | 55                              | 55  | 55        | 55  | 58          | 57  | 57          | 55  | 57          | 53  | 60        | 47  | 63        | 50  | 61          | 60  | 59          | 59  | 60        | 60  |
| 45/F       | 55                              | 55  | 55        | 55  | 58          | 57  | 57          | 55  | 57          | 53  | 60        | 47  | 63        | 51  | 61          | 60  | 59          | 59  | 60        | 60  |
| 46/F       | 55                              | 55  | 55        | 55  | 58          | 57  | 56          | 55  | 57          | 53  | 60        | 47  | 63        | 51  | 60          | 60  | 59          | 59  | 60        | 60  |
| 47/F       | 56                              | 55  | 56        | 55  | 58          | 57  | 56          | 55  | 57          | 53  | 60        | 47  | 63        | 53  | 61          | 60  | 59          | 59  | 60        | 60  |
| 48/F       | 56                              | 55  | 56        | 55  | 58          | 57  | 56          | 55  | 57          | 53  | 60        | 47  | 63        | 53  | 61          | 60  | 59          | 59  | 60        | 60  |
| 49/F       | 56                              | 55  | 56        | 55  | 58          | 57  | 56          | 55  | 57          | 53  | 60        | 47  | 63        | 54  | 61          | 60  | 59          | 59  | 60        | 60  |
| 50/F       | 56                              | 55  | 57        | 55  | 58          | 57  | 56          | 55  | 57          | 53  | 60        | 47  | 63        | 54  | 61          | 60  | 60          | 60  | 60        | 60  |
| Maximum    | 56                              | 55  | 57        | 56  | 58          | 57  | 57          | 56  | 58          | 54  | 61        | 50  | 63        | 54  | 61          | 60  | 60          | 60  | 60        | 60  |
| Criteria   | 60                              | 60  | 60        | 60  | 60          | 60  | 60          | 60  | 60          | 60  | 60        | 60  | 60        | 60  | 60          | 60  | 60          | 60  | 60        | 60  |
| Exceedance | N                               | N   | N         | N   | N           | N   | N           | N   | N           | N   | Y         | N   | Y         | N   | Y           | N   | N           | N   | N         | N   |

Abbreviations:

VAF            Vertical Acoustic Fin

1.5m and 1.8m vertical acoustic fins proposed have been considered to reduce angle of view in the calculation

Location of the vertical acoustic fins are shown on Figure 4a, 4b &amp; 7





| Track   | SEL       |          | Perpendicular |          | Vertical | Slant    |                 | Blocked | C <sub>av</sub>         |                 | C <sub>poor</sub> | C <sub>barrier</sub> | C <sub>dist</sub> | Train<br>Freq. / 30<br>mins | Train<br>Freq.<br>dB(A)<br>Corr. | C <sub>fac</sub> | PNL      |
|---|-----------|----------|---------------|----------|----------|----------|-----------------|---------|-------------------------|-----------------|-------------------|----------------------|-------------------|-----------------------------|----------------------------------|------------------|----------|
|   | Train SEL | Distance | Distance      | Distance |          | Distance | By<br>Building? |         | Angle<br>Corr.<br>dB(A) | Track,<br>dB(A) |                   | Corr.<br>dB(A)       |                   |                             |                                  |                  |          |
| 1<br>Seg<br>ment<br>of<br>Rail  | 84.7      | 121.3    | 21.4          | 123.2    | Y        | 0.0      | Y               | 0.0     | 0.0                     | +3              | 0.0               | 0.0                  | 6.0               | 9                           | -23.0                            | +2.5             | 0.0      |
|   |           |          |               |          |          |          |                 |         |                         |                 |                   |                      |                   |                             |                                  |                  |          |
| 2<br>Seg<br>ment<br>of<br>Rail  | 84.7      | 120.5    | 21.4          | 122.4    | Y        | 0.0      | Y               | 0.0     | 0.0                     | +3              | -21.0             | 6.0                  | 9                 | -23.0                       | +2.5                             | 0.0              | 1        |
| 3<br>Seg<br>ment<br>of<br>Rail  | 84.7      | 121.9    | 21.4          | 123.8    | N        | 34.7     | N               | 34.7    | -7.1                    | +3              | -21.0             | 6.1                  | 9                 | -23.0                       | +2.5                             | 33.0             | 1984.337 |
| 3a<br>Seg<br>ment<br>of<br>Rail   | 84.7      | 122.1    | 21.4          | 123.9    | N        | 10.9     | N               | 10.9    | -12.2                   | +3              | 0.0               | 6.1                  | 9                 | -23.0                       | +2.5                             | 35.0             | 78365.23 |
| 4<br>Seg<br>ment<br>of<br>Rail  | 84.7      | 86.0     | 21.4          | 88.7     | N        | 6.2      | N               | 6.2     | -14.6                   | +3              | -21.0             | 4.6                  | 9                 | -23.0                       | +2.5                             | 26.9             | 493.1733 |
| 4a<br>Seg<br>ment<br>of<br>Rail   | 84.7      | 108.3    | 21.4          | 110.4    | N        | 12.0     | N               | 12.0    | -11.8                   | +3              | -21.0             | 5.6                  | 9                 | -23.0                       | +2.5                             | 28.8             | 767.1606 |
| 4b<br>Seg<br>ment<br>of<br>Rail   | 84.7      | 108.3    | 21.4          | 110.4    | N        | 12.0     | N               | 12.0    | -11.8                   | +3              | -21.0             | 5.6                  | 9                 | -23.0                       | +2.5                             | 28.8             | 767.1606 |
| Rail Near Side Sub-total Noise Level  |           |          |               |          |          |          |                 |         |                         |                 |                   |                      |                   |                             |                                  |                  |          |
| 11<br>Seg<br>ment<br>of<br>Rail   | 88.4      | 126.2    | 21.4          | 128.0    | Y        | 0.0      | Y               | 0.0     | 0.0                     | +3              | 0.0               | 5.8                  | 9                 | -23.0                       | +2.5                             | 0.0              | 1        |
| 22<br>Seg<br>ment<br>of<br>Rail   | 88.4      | 127.4    | 21.4          | 129.2    | Y        | 0.0      | Y               | 0.0     | 0.0                     | +3              | -21.0             | 5.8                  | 9                 | -23.0                       | +2.5                             | 0.0              | 1        |
| 33<br>Seg<br>ment<br>of<br>Rail   | 88.4      | 130.6    | 21.4          | 132.3    | N        | 35.0     | N               | 35.0    | -7.1                    | +3              | -21.0             | 5.9                  | 9                 | -23.0                       | +2.5                             | 36.9             | 4867.115 |
| 33a<br>Seg<br>ment<br>of<br>Rail  | 88.4      | 130.8    | 21.4          | 132.5    | N        | 8.4      | N               | 8.4     | -13.3                   | +3              | 0.0               | 5.9                  | 9                 | -23.0                       | +2.5                             | 51.7             | 147469.5 |
| 44<br>Seg<br>ment<br>of<br>Rail   | 88.4      | 111.7    | 21.4          | 113.7    | N        | 7.3      | N               | 7.3     | -13.9                   | +3              | -21.0             | 5.2                  | 9                 | -23.0                       | +2.5                             | 30.7             | 1179.283 |
| 44a<br>Seg<br>ment<br>of<br>Rail  | 88.4      | 111.7    | 21.4          | 113.7    | N        | 7.3      | N               | 7.3     | -13.9                   | +3              | -21.0             | 5.2                  | 9                 | -23.0                       | +2.5                             | 30.7             | 1179.283 |
| Rail Far Side Sub-total Noise Level   |           |          |               |          |          |          |                 |         |                         |                 |                   |                      |                   |                             |                                  |                  |          |
| Rail total Noise Level  |           |          |               |          |          |          |                 |         |                         |                 |                   |                      |                   |                             |                                  |                  |          |
| Note :  |           |          |               |          |          |          |                 |         |                         |                 |                   |                      |                   |                             |                                  |                  |          |
| PNL (Leq (30 min) dB(A)) = SEL + C <sub>dist</sub> + C <sub>av</sub> + C <sub>poor</sub> + C <sub>barrier</sub> + 10 log (N/T) + C <sub>fac</sub> |           |          |               |          |          |          |                 |         |                         |                 |                   |                      |                   |                             |                                  |                  |          |

N1-22\_mi\_171123

1 of 1

6

Sample Calculation of Railway Noise at N1-22 -

6 F

| Track   | SEL       |          | Perpendicular |          | Vertical | Slant    |                 | Blocked | C <sub>av</sub>         |                 | C <sub>poor</sub> | C <sub>barrier</sub> | C <sub>dist</sub> | Train<br>Freq. / 30<br>mins | Train<br>Freq.<br>dB(A)<br>Corr. | C <sub>fac</sub> | PNL      |
|---|-----------|----------|---------------|----------|----------|----------|-----------------|---------|-------------------------|-----------------|-------------------|----------------------|-------------------|-----------------------------|----------------------------------|------------------|----------|
|   | Train SEL | Distance | Distance      | Distance |          | Distance | By<br>Building? |         | Angle<br>Corr.<br>dB(A) | Track,<br>dB(A) |                   | Corr.<br>dB(A)       |                   |                             |                                  |                  |          |
| 1<br>Seg<br>ment<br>of<br>Rail  | 84.7      | 121.3    | 21.4          | 123.2    | Y        | 0.0      | Y               | 0.0     | 0.0                     | +3              | 0.0               | 0.0                  | 6.0               | 9                           | -23.0                            | +2.5             | 0.0      |
|   |           |          |               |          |          |          |                 |         |                         |                 |                   |                      |                   |                             |                                  |                  |          |
| 2<br>Seg<br>ment<br>of<br>Rail  | 84.7      | 120.5    | 21.4          | 122.4    | N        | 7.0      | N               | 7.0     | -14.1                   | +3              | -21.0             | 6.0                  | 9                 | -23.0                       | +2.5                             | 26.1             | 404.6321 |
| 3<br>Seg<br>ment<br>of<br>Rail  | 84.7      | 121.9    | 21.4          | 123.8    | N        | 34.7     | N               | 34.7    | -7.1                    | +3              | -21.0             | 6.1                  | 9                 | -23.0                       | +2.5                             | 33.0             | 1984.337 |
| 3a<br>Seg<br>ment<br>of<br>Rail   | 84.7      | 122.1    | 21.4          | 123.9    | N        | 10.9     | N               | 10.9    | -12.2                   | +3              | 0.0               | 6.1                  | 9                 | -23.0                       | +2.5                             | 35.0             | 78365.23 |
| 4<br>Seg<br>ment<br>of<br>Rail  | 84.7      | 86.0     | 21.4          | 88.7     | N        | 6.2      | N               | 6.2     | -14.6                   | +3              | -21.0             | 4.6                  | 9                 | -23.0                       | +2.5                             | 26.9             | 493.1733 |
| 4a<br>Seg<br>ment<br>of<br>Rail   | 84.7      | 108.3    | 21.4          | 110.4    | N        | 12.0     | N               | 12.0    | -11.8                   | +3              | -21.0             | 5.6                  | 9                 | -23.0                       | +2.5                             | 28.8             | 767.1606 |
| 4b<br>Seg<br>ment<br>of<br>Rail   | 84.7      | 108.3    | 21.4          | 110.4    | N        | 12.0     | N               | 12.0    | -11.8                   | +3              | -21.0             | 5.6                  | 9                 | -23.0                       | +2.5                             | 28.8             | 767.1606 |
| Rail Near Side Sub-total Noise Level  |           |          |               |          |          |          |                 |         |                         |                 |                   |                      |                   |                             |                                  |                  |          |
| 11<br>Seg<br>ment<br>of<br>Rail   | 88.4      | 126.2    | 21.4          | 128.0    | Y        | 0.0      | Y               | 0.0     | 0.0                     | +3              | 0.0               | 5.8                  | 9                 | -23.0                       | +2.5                             | 0.0              | 1        |
| 22<br>Seg<br>ment<br>of<br>Rail   | 88.4      | 127.4    | 21.4          | 129.2    | N        | 36.6     | N               | 36.6    | -6.7                    | +3              | -21.0             | 5.8                  | 9                 | -23.0                       | +2.5                             | 37.4             | 5496.846 |
| 33<br>Seg<br>ment<br>of<br>Rail   | 88.4      | 130.6    | 21.4          | 132.3    | N        | 35.0     | N               | 35.0    | -7.1                    | +3              | -21.0             | 5.9                  | 9                 | -23.0                       | +2.5                             | 36.9             | 4867.115 |
| 33a<br>Seg<br>ment<br>of<br>Rail  | 88.4      | 130.8    | 21.4          | 132.5    | N        | 8.4      | N               | 8.4     | -13.3                   | +3              | 0.0               | 5.9                  | 9                 | -23.0                       | +2.5                             | 51.7             | 147469.5 |
| 44<br>Seg<br>ment<br>of<br>Rail   | 88.4      | 111.7    | 21.4          | 113.7    | N        | 7.3      | N               | 7.3     | -13.9                   | +3              | -21.0             | 5.2                  | 9                 | -23.0                       | +2.5                             | 30.7             | 1179.283 |
| 44a<br>Seg<br>ment<br>of<br>Rail  | 88.4      | 111.7    | 21.4          | 113.7    | N        | 7.3      | N               | 7.3     | -13.9                   | +3              | -21.0             | 5.2                  | 9                 | -23.0                       | +2.5                             | 30.7             | 1179.283 |
| Rail Far Side Sub-total Noise Level   |           |          |               |          |          |          |                 |         |                         |                 |                   |                      |                   |                             |                                  |                  |          |
| Rail total Noise Level  |           |          |               |          |          |          |                 |         |                         |                 |                   |                      |                   |                             |                                  |                  |          |
| Note :  |           |          |               |          |          |          |                 |         |                         |                 |                   |                      |                   |                             |                                  |                  |          |
| PNL (Leq (30 min) dB(A)) = SEL + C <sub>dist</sub> + C <sub>av</sub> + C <sub>poor</sub> + C <sub>barrier</sub> + 10 log (N/T) + C <sub>fac</sub> |           |          |               |          |          |          |                 |         |                         |                 |                   |                      |                   |                             |                                  |                  |          |

N1-22\_unmi\_171123

1 of 1

6

| Track | SEL                                 |           | Perpendicular |          | Vertical | Slant | Blocked | C <sub>av</sub> |              | C <sub>poor</sub> | C <sub>bar</sub> | C <sub>dist</sub> | Train | Train Freq. | C <sub>fac</sub> | PNL  |
|-------|-------------------------------------|-----------|---------------|----------|----------|-------|---------|-----------------|--------------|-------------------|------------------|-------------------|-------|-------------|------------------|------|
|       | Distance                            | Train SEL | Distance      | Distance |          |       |         | Angle           | By Building? |                   |                  |                   |       |             |                  |      |
| 1     | Air Borne                           | 84.7      | 111.4         | 21.4     | 113.4    | Y     | 0.0     | 0.0             | +3           | 0.0               | 5.7              | -23.0             | +2.5  | 0.0         | 585.5766         |      |
|       | Subtotal Leq                        |           |               |          |          |       |         |                 |              |                   |                  |                   |       |             | 27.7             |      |
|       | Air Borne                           | 84.7      | 111.0         | 21.4     | 113.0    | N     | 9.4     | -12.8           | +3           | -21.0             | 5.7              | -23.0             | +2.5  | 27.7        | 963.0466         |      |
|       | Subtotal Leq                        |           |               |          |          |       |         |                 |              |                   |                  |                   |       |             | 29.8             |      |
|       | Air Borne                           | 84.7      | 111.0         | 21.4     | 113.0    | N     | 15.4    | -10.7           | +3           | -21.0             | 5.7              | -23.0             | +2.5  | 29.8        | 3152.112         |      |
|       | Subtotal Leq                        |           |               |          |          |       |         |                 |              |                   |                  |                   |       |             | 35.0             |      |
| 2     | Air Borne                           | 84.7      | 110.7         | 21.4     | 112.7    | N     | 50.3    | -5.5            | +3           | -21.0             | 5.7              | -23.0             | +2.5  | 35.0        | 313.2229         |      |
|       | Subtotal Leq                        |           |               |          |          |       |         |                 |              |                   |                  |                   |       |             | 25.0             |      |
|       | Air Borne                           | 84.7      | 51.2          | 21.4     | 55.5     | N     | 2.5     | -18.6           | +3           | -21.0             | 2.6              | -23.0             | +2.5  | 25.0        | 433.1816         |      |
|       | Subtotal Leq                        |           |               |          |          |       |         |                 |              |                   |                  |                   |       |             | 26.4             |      |
|       | Air Borne                           | 84.7      | 80.7          | 21.4     | 83.5     | N     | 5.1     | -15.5           | +3           | -21.0             | 4.4              | -23.0             | +2.5  | 26.4        | 37.4             |      |
|       | Subtotal Leq                        |           |               |          |          |       |         |                 |              |                   |                  |                   |       |             | 37.4             |      |
| 1     | Air Borne                           | 88.4      | 116.0         | 21.4     | 118.0    | Y     | 0.0     | 0.0             | +3           | 0.0               | 5.4              | -23.0             | +2.5  | 0.0         | 1459.253         |      |
|       | Subtotal Leq                        |           |               |          |          |       |         |                 |              |                   |                  |                   |       |             | 31.6             |      |
|       | Air Borne                           | 88.4      | 116.2         | 21.4     | 118.1    | N     | 9.4     | -12.8           | +3           | -21.0             | 5.4              | -23.0             | +2.5  | 31.6        | 2399.943         |      |
|       | Subtotal Leq                        |           |               |          |          |       |         |                 |              |                   |                  |                   |       |             | 33.8             |      |
|       | Air Borne                           | 88.4      | 116.2         | 21.4     | 118.1    | N     | 15.4    | -10.7           | +3           | -21.0             | 5.4              | -23.0             | +2.5  | 33.8        | 7365.104         |      |
|       | Subtotal Leq                        |           |               |          |          |       |         |                 |              |                   |                  |                   |       |             | 38.7             |      |
| 3     | Air Borne                           | 88.4      | 115.0         | 21.4     | 117.0    | N     | 46.7    | -5.9            | +3           | -21.0             | 5.4              | -23.0             | +2.5  | 38.7        | 786.4899         |      |
|       | Subtotal Leq                        |           |               |          |          |       |         |                 |              |                   |                  |                   |       |             | 29.0             |      |
|       | Air Borne                           | 88.4      | 80.5          | 21.4     | 83.3     | N     | 3.6     | -17.0           | +3           | -21.0             | 3.9              | -23.0             | +2.5  | 29.0        | 42.4             |      |
|       | Subtotal Leq                        |           |               |          |          |       |         |                 |              |                   |                  |                   |       |             | 40.8             |      |
|       | Rail Far Side Sub-total Noise Level |           |               |          |          |       |         |                 |              |                   |                  |                   |       |             |                  | 42.4 |
|       | Rail total Noise Level              |           |               |          |          |       |         |                 |              |                   |                  |                   |       |             |                  | 42.4 |

Note :

$$\text{PNL (Leq (30 min) dB(A))} = \text{SEL} + C_{\text{dist}} + C_{\text{av}} + C_{\text{poor}} + C_{\text{bar}} + 10 \log (N/T) + C_{\text{fac}}$$

Sample Calculation of Railway Noise at N5-25 -

| Track                                | SEL  | Perpendicular | Vertical | Slant    | Blocked      |      | C <sub>av</sub>   | C <sub>poor</sub> | C <sub>bar</sub>    | C <sub>dist</sub>    | Train           | Train             | C <sub>fac</sub> | PNL                |      |
|--------------------------------------|------|---------------|----------|----------|--------------|------|-------------------|-------------------|---------------------|----------------------|-----------------|-------------------|------------------|--------------------|------|
|                                      |      | Distance      | Distance | Distance | By Building? | VA   | Angle Corr, dB(A) | Poor Track, dB(A) | Barrier Corr, dB(A) | Distance Corr, dB(A) | Freq. / 30 mins | Freq. Corr, dB(A) | Facade dB(A)     | Leq (30 min) dB(A) |      |
| 1<br>Rail Segment                    | 84.7 | 111.4         | 21.4     | 113.4    | Y            | 0.0  | 0.0               | +3                | 0.0                 | 5.7                  | 9               | -23.0             | +2.5             | 0.0                |      |
| 2<br>Rail Segment                    | 84.7 | 111.0         | 21.4     | 113.0    | N            | 14.2 | -11.0             | +3                | -21.0               | 5.7                  | 9               | -23.0             | +2.5             | 29.5               |      |
| 2a<br>Rail Segment                   | 84.7 | 111.0         | 21.4     | 113.0    | N            | 15.4 | -10.7             | +3                | -21.0               | 5.7                  | 9               | -23.0             | +2.5             | 29.8               |      |
| 3<br>Rail Segment                    | 84.7 | 110.7         | 21.4     | 112.7    | N            | 50.3 | -5.5              | +3                | -21.0               | 5.7                  | 9               | -23.0             | +2.5             | 35.0               |      |
| 4<br>Rail Segment                    | 84.7 | 51.2          | 21.4     | 55.5     | N            | 2.5  | -18.6             | +3                | -21.0               | 2.6                  | 9               | -23.0             | +2.5             | 25.0               |      |
| 5<br>Rail Segment                    | 84.7 | 80.7          | 21.4     | 83.5     | N            | 5.1  | -15.5             | +3                | -21.0               | 4.4                  | 9               | -23.0             | +2.5             | 26.4               |      |
| Rail Near Side Sub-total Noise Level |      |               |          |          |              |      |                   |                   |                     |                      |                 |                   |                  |                    | 37.6 |
| 1<br>Rail Segment                    | 88.4 | 116.0         | 21.4     | 118.0    | Y            | 0.0  | 0.0               | +3                | 0.0                 | 5.4                  | 9               | -23.0             | +2.5             | 0.0                |      |
| 22<br>Rail Segment                   | 88.4 | 116.2         | 21.4     | 118.1    | N            | 14.2 | -11.0             | +3                | -21.0               | 5.4                  | 9               | -23.0             | +2.5             | 33.5               |      |
| 22a<br>Rail Segment                  | 88.4 | 116.2         | 21.4     | 118.1    | N            | 15.4 | -10.7             | +3                | -21.0               | 5.4                  | 9               | -23.0             | +2.5             | 33.8               |      |
| 33<br>Rail Segment                   | 88.4 | 115.0         | 21.4     | 117.0    | N            | 46.7 | -5.9              | +3                | -21.0               | 5.4                  | 9               | -23.0             | +2.5             | 38.7               |      |
| 44<br>Rail Segment                   | 88.4 | 80.5          | 21.4     | 83.3     | N            | 3.6  | -17.0             | +3                | -21.0               | 3.9                  | 9               | -23.0             | +2.5             | 29.0               |      |
| Rail Far Side Sub-total Noise Level  |      |               |          |          |              |      |                   |                   |                     |                      |                 |                   |                  |                    | 41.1 |
| Rail total Noise Level               |      |               |          |          |              |      |                   |                   |                     |                      |                 |                   |                  |                    | 42.7 |

Note :

$$\text{PNL (Leq (30 min) dB(A))} = \text{SEL} + C_{\text{dist}} + C_{\text{av}} + C_{\text{poor}} + C_{\text{bar}} + 10 \log (N/T) + C_{\text{fac}}$$



| Track                                | SEL          |          | Perpendicular |          | Vertical | Slant | Blocked | C <sub>av</sub> | C <sub>poor</sub> | C <sub>bar</sub> | C <sub>dist</sub> | Train | Train | C <sub>fac</sub> | PNL  |              |
|--------------------------------------|--------------|----------|---------------|----------|----------|-------|---------|-----------------|-------------------|------------------|-------------------|-------|-------|------------------|------|--------------|
|                                      | Train SEL    | Distance | Distance      | Distance |          |       |         |                 |                   |                  |                   |       |       |                  |      | By Building? |
| 1<br>Rail Segment                    | 84.7         | 105.7    | 21.4          | 107.8    | Y        | 0.0   | 0.0     | +3              | 0.0               | 0.0              | 5.5               | 9     | -23.0 | +2.5             | 0.0  |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 0.0  |              |
|                                      | Subtotal Leq |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 0.0  |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 0.0  |              |
| 2<br>Rail Segment                    | 84.7         | 105.3    | 21.4          | 107.5    | Y        | 0.0   | 0.0     | +3              | 0.0               | 0.0              | 5.5               | 9     | -23.0 | +2.5             | 0.0  |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 0.0  |              |
|                                      | Subtotal Leq |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 0.0  |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 0.0  |              |
| 2a<br>Rail Segment                   | 84.7         | 105.3    | 21.4          | 107.5    | N        | 13.1  | -11.4   | +3              | -21.0             |                  | 5.5               | 9     | -23.0 | +2.5             | 29.3 |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 29.3 |              |
|                                      | Subtotal Leq |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 29.3 |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 29.3 |              |
| 3<br>Rail Segment                    | 84.7         | 104.7    | 21.4          | 106.9    | N        | 46.8  | -5.8    | +3              | -21.0             |                  | 5.4               | 9     | -23.0 | +2.5             | 34.9 |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 34.9 |              |
|                                      | Subtotal Leq |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 34.9 |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 34.9 |              |
| 4<br>Rail Segment                    | 84.7         | 44.1     | 21.4          | 49.0     | N        | 2.1   | -19.4   | +3              | -21.0             |                  | 2.0               | 9     | -23.0 | +2.5             | 24.8 |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 24.8 |              |
|                                      | Subtotal Leq |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 24.8 |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 24.8 |              |
| 4b<br>Rail Segment                   | 84.7         | 73.9     | 21.4          | 77.0     | N        | 4.6   | -15.9   | +3              | -21.0             |                  | 4.0               | 9     | -23.0 | +2.5             | 26.3 |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 26.3 |              |
|                                      | Subtotal Leq |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 26.3 |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 26.3 |              |
| Rail Near Side Sub-total Noise Level |              |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  |      |              |
| 11<br>Rail Segment                   | 88.4         | 110.3    | 21.4          | 112.4    | Y        | 0.0   | 0.0     | +3              | 0.0               | 0.0              | 5.2               | 9     | -23.0 | +2.5             | 36.7 |              |
|                                      | Subtotal Leq |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 36.7 |              |
| 12<br>Rail Segment                   | 88.4         | 110.9    | 21.4          | 112.9    | Y        | 0.0   | 0.0     | +3              | 0.0               | 0.0              | 5.2               | 9     | -23.0 | +2.5             | 0.0  |              |
|                                      | Subtotal Leq |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 0.0  |              |
| 22a<br>Rail Segment                  | 88.4         | 110.4    | 21.4          | 112.4    | N        | 13.1  | -11.4   | +3              | -21.0             |                  | 5.2               | 9     | -23.0 | +2.5             | 0.0  |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 0.0  |              |
|                                      | Subtotal Leq |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 33.3 |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 33.3 |              |
| 33<br>Rail Segment                   | 88.4         | 108.5    | 21.4          | 110.6    | N        | 43.2  | -6.2    | +3              | -21.0             |                  | 5.1               | 9     | -23.0 | +2.5             | 38.6 |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 38.6 |              |
|                                      | Subtotal Leq |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 38.6 |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 38.6 |              |
| 44<br>Rail Segment                   | 88.4         | 73.6     | 21.4          | 76.6     | N        | 3.2   | -17.5   | +3              | -21.0             |                  | 3.5               | 9     | -23.0 | +2.5             | 28.9 |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 28.9 |              |
|                                      | Subtotal Leq |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 28.9 |              |
|                                      | Air Borne    |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  | 28.9 |              |
| Rail Far Side Sub-total Noise Level  |              |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  |      |              |
| Rail total Noise Level               |              |          |               |          |          |       |         |                 |                   |                  |                   |       |       |                  |      |              |

Note :

$$\text{PNL (Leq (30 min) dB(A))} = \text{SEL} + C_{\text{dist}} + C_{\text{av}} + C_{\text{poor}} + C_{\text{bar}} + 10 \log (N/T) + C_{\text{fac}}$$

Sample Calculation of Railway Noise at N5-28 -

| Track                                | SEL          |          | Perpendicular |          | Vertical | Slant        |                   | Blocked | C <sub>av</sub>   |                     | C <sub>poor</sub>  |             | C <sub>bar</sub> |       | C <sub>dist</sub> | Train |      | C <sub>fac</sub> | PNL |
|--------------------------------------|--------------|----------|---------------|----------|----------|--------------|-------------------|---------|-------------------|---------------------|--------------------|-------------|------------------|-------|-------------------|-------|------|------------------|-----|
|                                      | Train SEL    | Distance | Distance      | Distance |          | By Building? | Angle Corr, dB(A) |         | Track Corr, dB(A) | Barrier Corr, dB(A) | Façade Corr, dB(A) | Freq. dB(A) | Freq. / 30 mins  |       |                   |       |      |                  |     |
| 1<br>Rail Segment                    | 84.7         | 105.7    | 21.4          | 107.8    |          | Y            | 0.0               |         | 0.0               | +3                  | 0.0                | 5.5         | 9                | -23.0 | +2.5              | 0.0   | 0.0  |                  |     |
|                                      | Air Borne    |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |
| 2<br>Rail Segment                    | 84.7         | 105.3    | 21.4          | 107.5    |          | Y            | 0.0               |         | 0.0               | +3                  | 0.0                | 5.5         | 9                | -23.0 | +2.5              | 0.0   | 0.0  |                  |     |
|                                      | Subtotal Leq |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |
| 2a<br>Rail Segment                   | 84.7         | 105.3    | 21.4          | 107.5    |          | N            | 20.4              |         | -9.4              | +3                  | -21.0              | 5.5         | 9                | -23.0 | +2.5              | 31.3  | 31.3 |                  |     |
|                                      | Air Borne    |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |
| 3<br>Rail Segment                    | 84.7         | 104.7    | 21.4          | 106.9    |          | N            | 46.8              |         | -5.8              | +3                  | -21.0              | 5.4         | 9                | -23.0 | +2.5              | 34.9  | 34.9 |                  |     |
|                                      | Subtotal Leq |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |
| 4<br>Rail Segment                    | 84.7         | 44.1     | 21.4          | 49.0     |          | N            | 2.1               |         | -19.4             | +3                  | -21.0              | 2.0         | 9                | -23.0 | +2.5              | 24.8  | 24.8 |                  |     |
|                                      | Subtotal Leq |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |
| 4b<br>Rail Segment                   | 84.7         | 73.9     | 21.4          | 77.0     |          | N            | 4.6               |         | -15.9             | +3                  | -21.0              | 4.0         | 9                | -23.0 | +2.5              | 26.3  | 26.3 |                  |     |
|                                      | Subtotal Leq |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |
| Rail Near Side Sub-total Noise Level |              |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |
| 11<br>Rail Segment                   | 88.4         | 110.3    | 21.4          | 112.4    |          | Y            | 0.0               |         | 0.0               | +3                  | 0.0                | 5.2         | 9                | -23.0 | +2.5              | 0.0   | 0.0  |                  |     |
|                                      | Subtotal Leq |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |
| 12<br>Rail Segment                   | 88.4         | 110.9    | 21.4          | 112.9    |          | Y            | 0.0               |         | 0.0               | +3                  | 0.0                | 5.2         | 9                | -23.0 | +2.5              | 0.0   | 0.0  |                  |     |
|                                      | Subtotal Leq |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |
| 12a<br>Rail Segment                  | 88.4         | 110.4    | 21.4          | 112.4    |          | N            | 20.4              |         | -9.4              | +3                  | -21.0              | 5.2         | 9                | -23.0 | +2.5              | 35.2  | 35.2 |                  |     |
|                                      | Subtotal Leq |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |
| 13<br>Rail Segment                   | 88.4         | 108.5    | 21.4          | 110.6    |          | N            | 43.2              |         | -6.2              | +3                  | -21.0              | 5.1         | 9                | -23.0 | +2.5              | 38.6  | 38.6 |                  |     |
|                                      | Subtotal Leq |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |
| 14<br>Rail Segment                   | 88.4         | 73.6     | 21.4          | 76.6     |          | N            | 3.2               |         | -17.5             | +3                  | -21.0              | 3.5         | 9                | -23.0 | +2.5              | 28.9  | 28.9 |                  |     |
|                                      | Subtotal Leq |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |
| Rail Far Side Sub-total Noise Level  |              |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |
| Rail total Noise Level               |              |          |               |          |          |              |                   |         |                   |                     |                    |             |                  |       |                   |       |      |                  |     |

Note :

$$\text{PNL (Leq (30 min) dB(A))} = \text{SEL} + C_{\text{dist}} + C_{\text{av}} + C_{\text{poor}} + C_{\text{bar}} + 10 \log (N/T) + C_{\text{fac}}$$

| Track                                | SEL       |          | Perpendicular |          | Vertical | Slant        |                   | Blocked | C <sub>av</sub>   |                     | C <sub>poor</sub> | C <sub>barrier</sub> | C <sub>dist</sub> | Train | Train | C <sub>fac</sub> | PNL  |
|--------------------------------------|-----------|----------|---------------|----------|----------|--------------|-------------------|---------|-------------------|---------------------|-------------------|----------------------|-------------------|-------|-------|------------------|------|
|                                      | Train SEL | Distance | Distance      | Distance |          | By Building? | Angle Corr. dB(A) |         | Poor Track, dB(A) | Barrier Corr. dB(A) |                   | Distance Corr. dB(A) |                   |       |       |                  |      |
| 1<br>Rail Segment                    | 84.7      | 100.5    | 21.4          | 102.7    |          |              | Y                 | 0.0     | 0.0               | +3                  | 0.0               | 0.0                  | 5.3               | 9     | -23.0 | +2.5             | 0.0  |
| 2<br>Rail Segment                    | 84.7      | 100.1    | 21.4          | 102.4    |          |              | Y                 | 0.0     | 0.0               | +3                  | 0.0               | 0.0                  | 5.2               | 9     | -23.0 | +2.5             | 0.0  |
| 2a<br>Rail Segment                   | 84.7      | 100.1    | 21.4          | 102.4    |          |              | N                 | 8.0     | -13.5             | +3                  | -21.0             | 5.2                  | 9                 | 9     | -23.0 | +2.5             | 27.4 |
| 3<br>Rail Segment                    | 84.7      | 99.5     | 21.4          | 101.8    |          |              | N                 | 47.2    | -5.8              | +3                  | -21.0             | 5.2                  | 9                 | 9     | -23.0 | +2.5             | 35.2 |
| 4<br>Rail Segment                    | 84.7      | 38.9     | 21.4          | 44.4     |          |              | N                 | 1.8     | -19.9             | +3                  | -21.0             | 1.6                  | 9                 | 9     | -23.0 | +2.5             | 24.7 |
| 5<br>Rail Segment                    | 84.7      | 68.7     | 21.4          | 71.9     |          |              | N                 | 4.3     | -16.2             | +3                  | -21.0             | 3.7                  | 9                 | 9     | -23.0 | +2.5             | 26.3 |
| 5b<br>Rail Segment                   |           |          |               |          |          |              |                   |         |                   |                     |                   |                      |                   |       |       |                  |      |
| Rail Near Side Sub-total Noise Level |           |          |               |          |          |              |                   |         |                   |                     |                   |                      |                   |       |       |                  |      |
| 11<br>Rail Segment                   | 88.4      | 105.1    | 21.4          | 107.2    |          |              | Y                 | 0.0     | 0.0               | +3                  | 0.0               | 5.0                  | 9                 | 9     | -23.0 | +2.5             | 36.6 |
| 12<br>Rail Segment                   |           |          |               |          |          |              |                   |         |                   |                     |                   |                      |                   |       |       |                  |      |
| 22<br>Rail Segment                   | 88.4      | 105.6    | 21.4          | 107.8    |          |              | Y                 | 0.0     | 0.0               | +3                  | 0.0               | 5.0                  | 9                 | 9     | -23.0 | +2.5             | 0.0  |
| 22a<br>Rail Segment                  | 88.4      | 105.1    | 21.4          | 107.3    |          |              | N                 | 7.9     | -13.6             | +3                  | -21.0             | 5.0                  | 9                 | 9     | -23.0 | +2.5             | 0.0  |
| 32<br>Rail Segment                   | 88.4      | 103.2    | 21.4          | 105.4    |          |              | N                 | 43.6    | -6.2              | +3                  | -21.0             | 4.9                  | 9                 | 9     | -23.0 | +2.5             | 31.3 |
| 42<br>Rail Segment                   | 88.4      | 68.3     | 21.4          | 71.6     |          |              | N                 | 3.0     | -17.8             | +3                  | -21.0             | 3.2                  | 9                 | 9     | -23.0 | +2.5             | 38.8 |
| 44<br>Rail Segment                   | 88.4      | 68.3     | 21.4          | 71.6     |          |              | N                 | 3.0     | -17.8             | +3                  | -21.0             | 3.2                  | 9                 | 9     | -23.0 | +2.5             | 28.9 |
| Rail Far Side Sub-total Noise Level  |           |          |               |          |          |              |                   |         |                   |                     |                   |                      |                   |       |       |                  |      |
| Rail total Noise Level               |           |          |               |          |          |              |                   |         |                   |                     |                   |                      |                   |       |       |                  |      |

Note :

$$\text{PNL (Leq (30 min) dB(A))} = \text{SEL} + C_{\text{dist}} + C_{\text{av}} + C_{\text{poor}} + C_{\text{barrier}} + 10 \log (N/T) + C_{\text{fac}}$$

Sample Calculation of Railway Noise at N5-29 -

6 F

| Track                                | SEL       |          | Perpendicular |          | Vertical | Slant        |                   | Blocked | C <sub>av</sub> |                     | C <sub>poor</sub> | C <sub>barrier</sub> | C <sub>dist</sub> | Train | Train | C <sub>fac</sub> | PNL |
|--------------------------------------|-----------|----------|---------------|----------|----------|--------------|-------------------|---------|-----------------|---------------------|-------------------|----------------------|-------------------|-------|-------|------------------|-----|
|                                      | Train SEL | Distance | Distance      | Distance |          | By Building? | Angle Corr. dB(A) |         | Track, dB(A)    | Barrier Corr. dB(A) |                   | Distance Corr. dB(A) |                   |       |       |                  |     |
| 1<br>Rail Segment                    | 84.7      | 100.5    | 21.4          | 102.7    |          |              | Y                 | 0.0     | 0.0             | +3                  | 0.0               | 5.3                  | 9                 | -23.0 | +2.5  | 0.0              |     |
| 2<br>Rail Segment                    | 84.7      | 100.1    | 21.4          | 102.4    |          |              | Y                 | 0.0     | 0.0             | +3                  | 0.0               | 5.2                  | 9                 | -23.0 | +2.5  | 0.0              |     |
| 2a<br>Rail Segment                   | 84.7      | 100.1    | 21.4          | 102.4    |          |              | N                 | 21.5    | -9.2            | +3                  | -21.0             | 5.2                  | 9                 | -23.0 | +2.5  | 31.7             |     |
| 3<br>Rail Segment                    | 84.7      | 99.5     | 21.4          | 101.8    |          |              | N                 | 47.2    | -5.8            | +3                  | -21.0             | 5.2                  | 9                 | -23.0 | +2.5  | 35.2             |     |
| 4<br>Rail Segment                    | 84.7      | 38.9     | 21.4          | 44.4     |          |              | N                 | 1.8     | -19.9           | +3                  | -21.0             | 1.6                  | 9                 | -23.0 | +2.5  | 24.7             |     |
| 5<br>Rail Segment                    | 84.7      | 68.7     | 21.4          | 71.9     |          |              | N                 | 4.3     | -16.2           | +3                  | -21.0             | 3.7                  | 9                 | -23.0 | +2.5  | 26.3             |     |
| EB<br>Rail Segment                   | 26.3      |          |               |          |          |              |                   |         |                 |                     |                   |                      |                   |       |       |                  |     |
| Rail Near Side Sub-total Noise Level |           |          |               |          |          |              |                   |         |                 |                     |                   |                      |                   |       |       |                  |     |
| 11<br>Rail Segment                   | 88.4      | 105.1    | 21.4          | 107.2    |          |              | Y                 | 0.0     | 0.0             | +3                  | 0.0               | 5.0                  | 9                 | -23.0 | +2.5  | 37.4             |     |
| 22<br>Rail Segment                   | 88.4      | 105.6    | 21.4          | 107.8    |          |              | Y                 | 0.0     | 0.0             | +3                  | 0.0               | 5.0                  | 9                 | -23.0 | +2.5  | 0.0              |     |
| 22a<br>Rail Segment                  | 88.4      | 105.1    | 21.4          | 107.3    |          |              | N                 | 21.4    | -9.2            | +3                  | -21.0             | 5.0                  | 9                 | -23.0 | +2.5  | 0.0              |     |
| 32<br>Rail Segment                   | 88.4      | 103.2    | 21.4          | 105.4    |          |              | N                 | 43.6    | -6.2            | +3                  | -21.0             | 4.9                  | 9                 | -23.0 | +2.5  | 35.7             |     |
| 42<br>Rail Segment                   | 88.4      | 68.3     | 21.4          | 71.6     |          |              | N                 | 3.0     | -17.8           | +3                  | -21.0             | 3.2                  | 9                 | -23.0 | +2.5  | 38.8             |     |
| 38.8                                 |           |          |               |          |          |              |                   |         |                 |                     |                   |                      |                   |       |       |                  |     |
| Rail Far Side Sub-total Noise Level  |           |          |               |          |          |              |                   |         |                 |                     |                   |                      |                   |       |       |                  |     |
| 40.8                                 |           |          |               |          |          |              |                   |         |                 |                     |                   |                      |                   |       |       |                  |     |
| Rail total Noise Level               |           |          |               |          |          |              |                   |         |                 |                     |                   |                      |                   |       |       |                  |     |
| 42.4                                 |           |          |               |          |          |              |                   |         |                 |                     |                   |                      |                   |       |       |                  |     |

Note :

$$\text{PNL (Leq (30 min) dB(A))} = \text{SEL} + C_{\text{dist}} + C_{\text{av}} + C_{\text{poor}} + C_{\text{barrier}} + 10 \log (N/T) + C_{\text{fac}}$$



| Track                               | SEL                                  | Perpendicular |          | Vertical | Slant | Blocked | C <sub>av</sub> | C <sub>poor</sub> | C <sub>barrier</sub> | C <sub>dist</sub> | Train | Train | C <sub>fac</sub> | PNL   |              |
|-------------------------------------|--------------------------------------|---------------|----------|----------|-------|---------|-----------------|-------------------|----------------------|-------------------|-------|-------|------------------|-------|--------------|
|                                     |                                      | Distance      | Distance |          |       |         |                 |                   |                      |                   |       |       |                  |       | By Building? |
|                                     | Train SEL                            | Distance      | Distance |          |       |         | dB(A)           | dB(A)             | dB(A)                | dB(A)             | mins  |       | dB(A)            | dB(A) |              |
| 1                                   | Air Borne                            | 84.7          | 93.4     | 21.4     | 95.8  | Y       | 0.0             | 0.0               | +3                   | 0.0               | 5.0   | 9     | -23.0            | +2.5  |              |
|                                     | Subtotal Leq                         |               |          |          |       |         |                 |                   |                      |                   |       |       |                  | 0.0   |              |
| 1                                   | Air Borne                            | 84.7          | 93.0     | 21.4     | 95.5  | Y       | 0.0             | 0.0               | +3                   | 0.0               | 4.9   | 9     | -23.0            | +2.5  |              |
|                                     | Subtotal Leq                         |               |          |          |       |         |                 |                   |                      |                   |       |       |                  | 0.0   |              |
| 1                                   | Air Borne                            | 84.7          | 93.0     | 21.4     | 95.5  | Y       | 0.0             | 0.0               | +3                   | -21.0             | 4.9   | 9     | -23.0            | +2.5  |              |
|                                     | Subtotal Leq                         |               |          |          |       |         |                 |                   |                      |                   |       |       |                  | 0.0   |              |
| 700.9105                            | Air Borne                            | 84.7          | 91.0     | 21.4     | 93.5  | N       | 9.3             | -12.9             | +3                   | -21.0             | 4.9   | 9     | -23.0            | +2.5  |              |
|                                     | Subtotal Leq                         |               |          |          |       |         |                 |                   |                      |                   |       |       |                  | 28.5  |              |
| 281.7533                            | Air Borne                            | 84.7          | 32.0     | 21.4     | 38.5  | N       | 1.5             | -20.7             | +3                   | -21.0             | 1.0   | 9     | -23.0            | +2.5  |              |
|                                     | Subtotal Leq                         |               |          |          |       |         |                 |                   |                      |                   |       |       |                  | 24.5  |              |
| 425.4122                            | Air Borne                            | 84.7          | 61.7     | 21.4     | 65.3  | N       | 3.9             | -16.6             | +3                   | -21.0             | 3.3   | 9     | -23.0            | +2.5  |              |
|                                     | Subtotal Leq                         |               |          |          |       |         |                 |                   |                      |                   |       |       |                  | 26.3  |              |
| 1                                   | Rail Near Side Sub-total Noise Level |               |          |          |       |         |                 |                   |                      |                   |       |       |                  |       | 31.5         |
|                                     | Air Borne                            | 88.4          | 98.0     | 21.4     | 100.3 | Y       | 0.0             | 0.0               | +3                   | 0.0               | 4.7   | 9     | -23.0            | +2.5  |              |
|                                     | Subtotal Leq                         |               |          |          |       |         |                 |                   |                      |                   |       |       |                  | 0.0   |              |
| 1                                   | Air Borne                            | 88.4          | 98.6     | 21.4     | 100.9 | Y       | 0.0             | 0.0               | +3                   | 0.0               | 4.7   | 9     | -23.0            | +2.5  |              |
|                                     | Subtotal Leq                         |               |          |          |       |         |                 |                   |                      |                   |       |       |                  | 0.0   |              |
| 1                                   | Air Borne                            | 88.4          | 98.6     | 21.4     | 100.9 | Y       | 0.0             | 0.0               | +3                   | -21.0             | 4.7   | 9     | -23.0            | +2.5  |              |
|                                     | Subtotal Leq                         |               |          |          |       |         |                 |                   |                      |                   |       |       |                  | 0.0   |              |
| 1072.572                            | Air Borne                            | 88.4          | 91.9     | 21.4     | 94.4  | N       | 5.5             | -15.2             | +3                   | -21.0             | 4.4   | 9     | -23.0            | +2.5  |              |
|                                     | Subtotal Leq                         |               |          |          |       |         |                 |                   |                      |                   |       |       |                  | 30.3  |              |
| 768.6469                            | Air Borne                            | 88.4          | 61.4     | 21.4     | 65.0  | N       | 2.7             | -18.2             | +3                   | -21.0             | 2.8   | 9     | -23.0            | +2.5  |              |
|                                     | Subtotal Leq                         |               |          |          |       |         |                 |                   |                      |                   |       |       |                  | 28.9  |              |
| Rail Far Side Sub-total Noise Level |                                      |               |          |          |       |         |                 |                   |                      |                   |       |       |                  |       | 32.7         |
| Rail total Noise Level              |                                      |               |          |          |       |         |                 |                   |                      |                   |       |       |                  |       | 35.1         |

Note :

$$\text{PNL (Leq (30 min) dB(A))} = \text{SEL} + C_{\text{dist}} + C_{\text{av}} + C_{\text{poor}} + C_{\text{bar}} + 10 \log (N/T) + C_{\text{fac}}$$

Sample Calculation of Railway Noise at N5-32 -

6 F

| Track                                | SEL       | Perpendicular | Vertical | Slant | Blocked | C <sub>av</sub><br>Angle<br>dB(A) | C <sub>floor</sub><br>Poor<br>Track,<br>dB(A) | C <sub>bar</sub><br>Barrier<br>dB(A) | C <sub>dist</sub><br>Distance<br>Corr. dB(A) | Train | Freq.<br>dB(A) | C <sub>facade</sub><br>Corr.<br>dB(A) | PNL  |
|--------------------------------------|-----------|---------------|----------|-------|---------|-----------------------------------|---|--------------------------------------|--|-------|----------------|---------------------------------------|------|
| 1<br>Rail Segment                    | 84.7      | 93.4          | 21.4     | 95.8  | Y       | 0.0                               | +3  | 0.0                                  | 5.0  | 9     | -23.0          | +2.5                                  | 0.0  |
|                                      | Air Borne |               |          |       |         |                                   |   |                                      |  |       |                |                                       | 0.0  |
| 2<br>Rail Segment                    | 84.7      | 93.0          | 21.4     | 95.5  | N       | 34.7                              | +3  | -21.0                                | 4.9  | 9     | -23.0          | +2.5                                  | 34.1 |
| 2a<br>Rail Segment                   | 84.7      | 93.0          | 21.4     | 95.5  | N       | 19.6                              | +3  | -21.0                                | 4.9  | 9     | -23.0          | +2.5                                  | 31.6 |
| 3<br>Rail Segment                    | 84.7      | 92.4          | 21.4     | 94.8  | N       | 46.4                              | +3  | -21.0                                | 4.9  | 9     | -23.0          | +2.5                                  | 35.4 |
| 4<br>Rail Segment                    | 84.7      | 32.0          | 21.4     | 38.5  | N       | 1.5                               | +3  | -21.0                                | 1.0  | 9     | -23.0          | +2.5                                  | 24.5 |
| 5<br>Rail Segment                    | 84.7      | 61.7          | 21.4     | 65.3  | N       | 3.9                               | +3  | -21.0                                | 3.3  | 9     | -23.0          | +2.5                                  | 26.3 |
| 5a<br>Rail Segment                   | 84.7      | 61.7          | 21.4     | 65.3  | N       | 3.9                               | +3  | -21.0                                | 3.3  | 9     | -23.0          | +2.5                                  | 26.3 |
| Rail Near Side Sub-total Noise Level |           |               |          |       |         |                                   |   |                                      |  |       |                |                                       |      |
| 11<br>Rail Segment                   | 88.4      | 98.0          | 21.4     | 100.3 | Y       | 0.0                               | 0.0   | 0.0                                  | 4.7  | 9     | -23.0          | +2.5                                  | 0.0  |
| 22<br>Rail Segment                   | 88.4      | 98.1          | 21.4     | 100.4 | N       | 34.7                              | +3  | -21.0                                | 4.7  | 9     | -23.0          | +2.5                                  | 38.0 |
| 22a<br>Rail Segment                  | 88.4      | 98.1          | 21.4     | 100.4 | N       | 19.6                              | +3  | -21.0                                | 4.7  | 9     | -23.0          | +2.5                                  | 35.5 |
| 33<br>Rail Segment                   | 88.4      | 96.0          | 21.4     | 98.3  | N       | 42.6                              | +3  | -21.0                                | 4.6  | 9     | -23.0          | +2.5                                  | 39.0 |
| 44<br>Rail Segment                   | 88.4      | 61.4          | 21.4     | 65.0  | N       | 2.7                               | +3  | -21.0                                | 2.8  | 9     | -23.0          | +2.5                                  | 28.9 |
| Rail Far Side Sub-total Noise Level  |           |               |          |       |         |                                   |   |                                      |  |       |                |                                       |      |
| Rail total Noise Level               |           |               |          |       |         |                                   |   |                                      |  |       |                |                                       |      |

Note :

$$\text{PNL (Leq (30 min) dB(A))} = \text{SEL} + C_{\text{dist}} + C_{\text{av}} + C_{\text{poor}} + C_{\text{bar}} + 10 \log (N/T) + C_{\text{fac}}$$

| Track  | SEL          |          | Perpendicular |          | Vertical | Slant    |              | Blocked | C <sub>av</sub>   |                   | C <sub>poor</sub> | C <sub>barrier</sub> | C <sub>dist</sub> | Train | Train | C <sub>facade</sub> | PNL                |
|--|--------------|----------|---------------|----------|----------|----------|--------------|---------|-------------------|-------------------|-------------------|----------------------|-------------------|-------|-------|---------------------|--------------------|
|  | Train SEL    | Distance | Distance      | Distance |          | Distance | By Building? | VA      | Angle Corr, dB(A) | Poor Track, dB(A) |                   |                      |                   |       |       |                     | Leq (30 min) dB(A) |
| Rail Segment 1   | 84.7         | 93.9     | 25.9          | 97.4     | N        | 4.8      | N            | 8.5     | -15.8             | +3                | 0.0               | 5.0                  | 9                 | -23.0 | +2.5  | 46.4                | 43608.47           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 46.4               |
| Rail Segment 1a  | 84.7         | 93.7     | 25.9          | 97.2     | N        | 8.5      | N            | 8.5     | -13.3             | +3                | -21.0             | 5.0                  | 9                 | -23.0 | +2.5  | 27.9                | 614.6211           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 27.9               |
| Rail Segment 1b  | 84.7         | 94.0     | 25.9          | 97.5     | Y        | 0.0      | Y            | 0.0     | 0.0               | +3                | 0.0               | 5.0                  | 9                 | -23.0 | +2.5  | 0.0                 | 1                  |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 0.0                |
| Rail Segment 2   | 84.7         | 94.0     | 25.9          | 97.5     | Y        | 0.0      | Y            | 0.0     | 0.0               | +3                | -19.2             | 5.0                  | 9                 | -23.0 | +2.5  | 0.0                 | 1                  |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 0.0                |
| Rail Segment 2a  | 84.7         | 93.6     | 25.9          | 97.1     | Y        | 0.0      | Y            | 0.0     | 0.0               | +3                | -21.0             | 5.0                  | 9                 | -23.0 | +2.5  | 0.0                 | 1                  |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 0.0                |
| Rail Segment 2b  | 84.7         | 93.6     | 25.9          | 97.1     | Y        | 0.0      | Y            | 0.0     | 0.0               | +3                | -21.0             | 5.0                  | 9                 | -23.0 | +2.5  | 0.0                 | 1                  |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 0.0                |
| Rail Near Side Sub-total Noise Level   |              |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
| Rail Segment 11  | 88.4         | 98.0     | 25.9          | 101.4    | N        | 4.0      | N            | 4.0     | -16.5             | +3                | 0.0               | 4.7                  | 9                 | -23.0 | +2.5  | 46.5                | 92052.19           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 46.5               |
| Rail Segment 1a  | 88.4         | 96.3     | 25.9          | 99.7     | N        | 8.5      | N            | 8.5     | -13.3             | +3                | -21.0             | 4.7                  | 9                 | -23.0 | +2.5  | 31.9                | 1561.285           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 31.9               |
| Rail Segment 1b  | 88.4         | 96.8     | 25.9          | 100.2    | Y        | 0.0      | Y            | 0.0     | 0.0               | +3                | 0.0               | 4.7                  | 9                 | -23.0 | +2.5  | 0.0                 | 1                  |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 0.0                |
| Rail Segment 2   | 88.4         | 97.5     | 25.9          | 100.9    | Y        | 0.0      | Y            | 0.0     | 0.0               | +3                | -18.4             | 4.7                  | 9                 | -23.0 | +2.5  | 0.0                 | 1                  |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 0.0                |
| Rail Segment 2a  | 88.4         | 98.5     | 25.9          | 101.8    | Y        | 0.0      | Y            | 0.0     | 0.0               | +3                | -21.0             | 4.8                  | 9                 | -23.0 | +2.5  | 0.0                 | 1                  |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 0.0                |
| Rail Segment 2b  | 88.4         | 98.6     | 25.9          | 102.0    | Y        | 0.0      | Y            | 0.0     | 0.0               | +3                | -21.0             | 4.8                  | 9                 | -23.0 | +2.5  | 0.0                 | 1                  |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 0.0                |
| Rail Far Side Sub-total Noise Level  |              |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
| Rail total Noise Level   |              |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
| Note :   |              |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
| PNL (Leq (30 min) dB(A)) = SEL + C <sub>dist</sub> + C <sub>av</sub> + C <sub>poor</sub> + 10 log (N/T) + C <sub>fac</sub> |              |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |

| Track  | SEL          |          | Perpendicular |          | Vertical | Slant    |              | Blocked | C <sub>av</sub>   |                   | C <sub>poor</sub> | C <sub>barrier</sub> | C <sub>dist</sub> | Train | Train | C <sub>facade</sub> | PNL                |
|--|--------------|----------|---------------|----------|----------|----------|--------------|---------|-------------------|-------------------|-------------------|----------------------|-------------------|-------|-------|---------------------|--------------------|
|  | Train SEL    | Distance | Distance      | Distance |          | Distance | By Building? | VA      | Angle Corr, dB(A) | Poor Track, dB(A) |                   |                      |                   |       |       |                     | Leq (30 min) dB(A) |
| Rail Segment 1   | 84.7         | 93.9     | 25.9          | 97.4     | N        | 4.8      | N            | 4.8     | -15.8             | +3                | 0.0               | 5.0                  | 9                 | -23.0 | +2.5  | 46.4                | 43608.47           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 46.4               |
| Rail Segment 1a  | 84.7         | 93.7     | 25.9          | 97.2     | N        | 8.5      | N            | 8.5     | -13.3             | +3                | -21.0             | 5.0                  | 9                 | -23.0 | +2.5  | 27.9                | 614.6211           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 27.9               |
| Rail Segment 1b  | 84.7         | 94.0     | 25.9          | 97.5     | N        | 11.5     | N            | 11.5    | -12.0             | +3                | 0.0               | 5.0                  | 9                 | -23.0 | +2.5  | 50.2                | 104498.2           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 50.2               |
| Rail Segment 2   | 84.7         | 94.0     | 25.9          | 97.5     | N        | 14.4     | N            | 14.4    | -11.0             | +3                | -19.2             | 5.0                  | 9                 | -23.0 | +2.5  | 32.0                | 1583.801           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 32.0               |
| Rail Segment 2a  | 84.7         | 93.6     | 25.9          | 97.1     | N        | 45.1     | N            | 45.1    | -6.0              | +3                | -21.0             | 5.0                  | 9                 | -23.0 | +2.5  | 35.2                | 3282.098           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 35.2               |
| Rail Segment 2b  | 84.7         | 93.6     | 25.9          | 97.1     | N        | 20.2     | N            | 20.2    | -9.5              | +3                | -21.0             | 5.0                  | 9                 | -23.0 | +2.5  | 31.7                | 1470.206           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 31.7               |
| Rail Near Side Sub-total Noise Level   |              |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
| Rail Segment 11  | 88.4         | 98.0     | 25.9          | 101.4    | N        | 4.0      | N            | 4.0     | -16.5             | +3                | 0.0               | 4.7                  | 9                 | -23.0 | +2.5  | 49.6                | 92052.19           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 49.6               |
| Rail Segment 1a  | 88.4         | 96.3     | 25.9          | 99.7     | N        | 8.5      | N            | 8.5     | -13.3             | +3                | -21.0             | 4.7                  | 9                 | -23.0 | +2.5  | 31.9                | 1561.285           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 31.9               |
| Rail Segment 1b  | 88.4         | 96.8     | 25.9          | 100.2    | N        | 11.5     | N            | 11.5    | -12.0             | +3                | 0.0               | 4.7                  | 9                 | -23.0 | +2.5  | 54.2                | 264987.4           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 54.2               |
| Rail Segment 2   | 88.4         | 97.5     | 25.9          | 100.9    | N        | 14.4     | N            | 14.4    | -11.0             | +3                | -18.4             | 4.7                  | 9                 | -23.0 | +2.5  | 36.8                | 4798.76            |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 36.8               |
| Rail Segment 2a  | 88.4         | 98.5     | 25.9          | 101.8    | N        | 45.1     | N            | 45.1    | -6.0              | +3                | -21.0             | 4.8                  | 9                 | -23.0 | +2.5  | 39.1                | 8156.558           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 39.1               |
| Rail Segment 2b  | 88.4         | 98.6     | 25.9          | 102.0    | N        | 20.2     | N            | 20.2    | -9.5              | +3                | -21.0             | 4.8                  | 9                 | -23.0 | +2.5  | 35.6                | 3645.876           |
|  | Air Borne    |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
|  | Subtotal Leq |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     | 35.6               |
| Rail Far Side Sub-total Noise Level  |              |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
| Rail total Noise Level   |              |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
| Note :   |              |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |
| PNL (Leq (30 min) dB(A)) = SEL + C <sub>dist</sub> + C <sub>av</sub> + C <sub>poor</sub> + 10 log (N/T) + C <sub>fac</sub> |              |          |               |          |          |          |              |         |                   |                   |                   |                      |                   |       |       |                     |                    |



| Track  | SEL          |          | Perpendicular |          | Vertical | Slant | Blocked | By Building? | C <sub>av</sub><br>Angle<br>Corr.<br>dB(A) | C <sub>poor</sub><br>Poor<br>Track,<br>dB(A) | C <sub>barrier</sub><br>Barrier<br>Corr.<br>dB(A) | C <sub>dist</sub><br>Distance<br>Corr. dB(A) | Train<br>Freq. / 30<br>mins | Train<br>Freq.<br>Corr.<br>dB(A) | C <sub>fac</sub><br>Facade<br>Corr.<br>dB(A) | PNL  |          |
|--|--------------|----------|---------------|----------|----------|-------|---------|--------------|--|--|---|--|-----------------------------|----------------------------------|--|------|----------|
|  | Train SEL    | Distance | Distance      | Distance |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
| Rail Segment 1   | 84.7         | 101.2    | 25.9          | 104.4    | N        | 6.5   | N       | -14.4        | +3   | 0.0  | -23.0   | 5.3  | 9                           | -23.0                            | +2.5   | 47.4 | 55577.44 |
|  | Air Borne    |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
|  | Subtotal Leq |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      | 566.3647 |
| Rail Segment 1a  | 84.7         | 101.3    | 25.9          | 104.6    | N        | 8.4   | N       | -13.3        | +3   | -21.0  | -23.0   | 5.3  | 9                           | -23.0                            | +2.5   | 27.5 | 115998.2 |
|  | Air Borne    |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
|  | Subtotal Leq |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      | 115998.2 |
| Rail Segment 1b  | 84.7         | 101.3    | 25.9          | 104.5    | N        | 13.6  | N       | -11.2        | +3   | 0.0  | -23.0   | 5.3  | 9                           | -23.0                            | +2.5   | 50.6 | 1013.072 |
|  | Air Borne    |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
|  | Subtotal Leq |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      | 1408.664 |
| Rail Segment 2   | 84.7         | 101.4    | 25.9          | 104.6    | N        | 13.1  | N       | -11.4        | +3   | -20.4  | -23.0   | 5.3  | 9                           | -23.0                            | +2.5   | 30.1 | 1        |
|  | Air Borne    |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
|  | Subtotal Leq |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      | 124072.3 |
| Rail Segment 2a  | 84.7         | 101.4    | 25.9          | 104.7    | N        | 20.9  | N       | -9.4         | +3   | -21.0  | -23.0   | 5.3  | 9                           | -23.0                            | +2.5   | 31.5 | 1444.203 |
|  | Air Borne    |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
|  | Subtotal Leq |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      | 294269.6 |
| Rail Segment 3   | 84.7         | 98.4     | 25.9          | 101.8    | Y        | 0.0   | Y       | 0.0          | +3   | 0.0  | -23.0   | 5.2  | 9                           | -23.0                            | +2.5   | 0.0  | 3014.648 |
|  | Air Borne    |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
|  | Subtotal Leq |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      | 3532.863 |
| Rail Near Side Sub-total Noise Level   |              |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
| Rail Segment 11  | 88.4         | 104.9    | 25.9          | 108.0    | N        | 5.8   | N       | -14.9        | +3   | 0.0  | -23.0   | 5.0  | 9                           | -23.0                            | +2.5   | 50.9 | 1        |
|  | Air Borne    |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
|  | Subtotal Leq |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      | 124072.3 |
| Rail Segment 11a   | 88.4         | 103.6    | 25.9          | 106.8    | N        | 8.4   | N       | -13.3        | +3   | -21.0  | -23.0   | 5.0  | 9                           | -23.0                            | +2.5   | 31.6 | 1444.203 |
|  | Air Borne    |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
|  | Subtotal Leq |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      | 294269.6 |
| Rail Segment 11b   | 88.4         | 104.2    | 25.9          | 107.3    | N        | 13.6  | N       | -11.2        | +3   | 0.0  | -23.0   | 5.0  | 9                           | -23.0                            | +2.5   | 54.7 | 3014.648 |
|  | Air Borne    |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
|  | Subtotal Leq |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      | 3532.863 |
| Rail Segment 22  | 88.4         | 105.1    | 25.9          | 108.2    | N        | 13.1  | N       | -11.4        | +3   | -19.7  | -23.0   | 5.0  | 9                           | -23.0                            | +2.5   | 34.8 | 1        |
|  | Air Borne    |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
|  | Subtotal Leq |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      | 3532.863 |
| Rail Segment 22a   | 88.4         | 105.6    | 25.9          | 108.7    | N        | 20.9  | N       | -9.4         | +3   | -21.0  | -23.0   | 5.0  | 9                           | -23.0                            | +2.5   | 35.5 | 1        |
|  | Air Borne    |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
|  | Subtotal Leq |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      | 1        |
| Rail Segment 33  | 88.4         | 98.5     | 25.9          | 101.9    | Y        | 0.0   | Y       | 0.0          | +3   | 0.0  | -23.0   | 4.8  | 9                           | -23.0                            | +2.5   | 0.0  | 1        |
|  | Air Borne    |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
|  | Subtotal Leq |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      | 56.3     |
| Rail Far Side Sub-total Noise Level  |              |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
| Rail total Noise Level   |              |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
| Note :   |              |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |
| PNL (Leq (30 min) dB(A)) = SEL + C <sub>dist</sub> + C <sub>av</sub> + C <sub>poor</sub> + 10 log (N/T) + C <sub>fac</sub> |              |          |               |          |          |       |         |              |  |  |   |  |                             |                                  |  |      |          |

N5-36\_m1\_171123

1 of 1

Sample Calculation of Railway Noise at N5-36 -

| Track                                | SEL          |          | Perpendicular |              | Vertical | Slant | Blocked | C <sub>av</sub> |            | C <sub>poor</sub> | Barrier | C <sub>dist</sub> | Train | Train | C <sub>fac</sub> | PNL      |
|--------------------------------------|--------------|----------|---------------|--------------|----------|-------|---------|-----------------|------------|-------------------|---------|-------------------|-------|-------|------------------|----------|
|                                      | Train SEL    | Distance | Distance      | By Building? |          |       |         | Angle           | Poor Track |                   |         |                   |       |       |                  |          |
| Rail Segment 1                       | 84.7         | 101.2    | 25.9          | 104.4        | N        | 6.5   | N       | -14.4           | +3         | 0.0               | -23.0   | 5.3               | 9     | -23.0 | +2.5             | 47.4     |
|                                      | Air Borne    |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 55577.44 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 566.3647 |
| Rail Segment 1a                      | 84.7         | 101.3    | 25.9          | 104.6        | N        | 8.4   | N       | -13.3           | +3         | -21.0             | -23.0   | 5.3               | 9     | -23.0 | +2.5             | 27.5     |
|                                      | Air Borne    |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 566.3647 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 27.5     |
| Rail Segment 1b                      | 84.7         | 101.3    | 25.9          | 104.5        | N        | 13.6  | N       | -11.2           | +3         | 0.0               | -23.0   | 5.3               | 9     | -23.0 | +2.5             | 50.6     |
|                                      | Air Borne    |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 115998.2 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 50.6     |
| Rail Segment 2                       | 84.7         | 101.4    | 25.9          | 104.6        | N        | 13.1  | N       | -11.4           | +3         | -20.4             | -23.0   | 5.3               | 9     | -23.0 | +2.5             | 30.1     |
|                                      | Air Borne    |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 1013.072 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 30.1     |
| Rail Segment 2a                      | 84.7         | 101.0    | 25.9          | 104.2        | N        | 32.7  | N       | -7.4            | +3         | -21.0             | -23.0   | 5.3               | 9     | -23.0 | +2.5             | 33.5     |
|                                      | Air Borne    |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 2217.416 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 33.5     |
| Rail Segment 3                       | 84.7         | 98.4     | 25.9          | 101.8        | Y        | 0.0   | Y       | 0.0             | +3         | 0.0               | -23.0   | 5.2               | 9     | -23.0 | +2.5             | 0.0      |
|                                      | Air Borne    |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 1        |
|                                      | Subtotal Leq |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 0.0      |
| Rail Near Side Sub-total Noise Level |              |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  |          |
| Rail Segment 11                      | 88.4         | 104.9    | 25.9          | 108.0        | N        | 5.8   | N       | -14.9           | +3         | 0.0               | -23.0   | 5.0               | 9     | -23.0 | +2.5             | 52.4     |
|                                      | Air Borne    |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 124072.3 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 50.9     |
| Rail Segment 11a                     | 88.4         | 103.6    | 25.9          | 106.8        | N        | 8.4   | N       | -13.3           | +3         | -21.0             | -23.0   | 5.0               | 9     | -23.0 | +2.5             | 31.6     |
|                                      | Air Borne    |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 1444.203 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 31.6     |
| Rail Segment 11b                     | 88.4         | 104.2    | 25.9          | 107.3        | N        | 13.6  | N       | -11.2           | +3         | 0.0               | -23.0   | 5.0               | 9     | -23.0 | +2.5             | 54.7     |
|                                      | Air Borne    |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 294269.6 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 54.7     |
| Rail Segment 22                      | 88.4         | 105.1    | 25.9          | 108.2        | N        | 13.1  | N       | -11.4           | +3         | -19.7             | -23.0   | 5.0               | 9     | -23.0 | +2.5             | 34.8     |
|                                      | Air Borne    |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 3014.648 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 34.8     |
| Rail Segment 22a                     | 88.4         | 105.7    | 25.9          | 108.8        | N        | 32.7  | N       | -7.4            | +3         | -21.0             | -23.0   | 5.1               | 9     | -23.0 | +2.5             | 37.4     |
|                                      | Air Borne    |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 5532.494 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 37.4     |
| Rail Segment 33                      | 88.4         | 98.5     | 25.9          | 101.9        | Y        | 0.0   | Y       | 0.0             | +3         | 0.0               | -23.0   | 4.8               | 9     | -23.0 | +2.5             | 0.0      |
|                                      | Air Borne    |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 1        |
|                                      | Subtotal Leq |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  | 0.0      |
| Rail Far Side Sub-total Noise Level  |              |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  |          |
| Rail total Noise Level               |              |          |               |              |          |       |         |                 |            |                   |         |                   |       |       |                  |          |

N5-36\_unmi\_171123

1 of 1

| Track                                | SEL          |          | Perpendicular |          | Vertical     | Slant | Blocked | C <sub>av</sub>   |                   | C <sub>poor</sub>   | C <sub>barrier</sub> | C <sub>dist</sub> | Train             | Train | C <sub>facade</sub> | PNL |
|--------------------------------------|--------------|----------|---------------|----------|--------------|-------|---------|-------------------|-------------------|---------------------|----------------------|-------------------|-------------------|-------|---------------------|-----|
|                                      | Train SEL    | Distance | Distance      | Distance | By Building? |       | VA      | Angle Corr, dB(A) | Poor Track, dB(A) | Barrier Corr, dB(A) | Distance Corr, dB(A) | Freq. / 30 mins   | Freq. Corr, dB(A) | dB(A) | Leq (30 min)        |     |
| Rail Segment 1                       | Air Borne    | 84.7     | 107.1         | 25.9     | 110.2        | N     | 8.3     | -13.4             | +3                | 0.0                 | 5.6                  | 9                 | -23.0             | +2.5  | 48.3                |     |
|                                      | Subtotal Leq |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       | 48.3                |     |
|                                      | Air Borne    | 84.7     | 107.0         | 25.9     | 110.1        | N     | 8.5     | -13.3             | +3                | -21.0               | 5.6                  | 9                 | -23.0             | +2.5  | 27.4                |     |
| Rail Segment 1a                      | Subtotal Leq |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       | 27.4                |     |
|                                      | Air Borne    | 84.7     | 107.2         | 25.9     | 110.3        | N     | 16.2    | -10.5             | +3                | 0.0                 | 5.6                  | 9                 | -23.0             | +2.5  | 51.2                |     |
|                                      | Subtotal Leq |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       | 51.2                |     |
| Rail Segment 2                       | Air Borne    | 84.7     | 107.3         | 25.9     | 110.4        | N     | 12.4    | -11.6             | +3                | -21.0               | 5.6                  | 9                 | -23.0             | +2.5  | 29.0                |     |
|                                      | Subtotal Leq |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       | 29.0                |     |
|                                      | Air Borne    | 84.7     | 106.9         | 25.9     | 110.0        | N     | 32.0    | -7.5              | +3                | -21.0               | 5.6                  | 9                 | -23.0             | +2.5  | 33.1                |     |
| Rail Segment 2a                      | Subtotal Leq |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       | 33.1                |     |
|                                      | Air Borne    | 84.7     | 103.9         | 25.9     | 107.1        | Y     | 0.0     | 0.0               | +3                | 0.0                 | 5.4                  | 9                 | -23.0             | +2.5  | 0.0                 |     |
|                                      | Subtotal Leq |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       | 0.0                 |     |
| Rail Near Side Sub-total Noise Level |              |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       |                     |     |
| Rail Segment 11                      | Air Borne    | 88.4     | 110.5         | 25.9     | 113.5        | N     | 7.6     | -13.8             | +3                | 0.0                 | 5.2                  | 9                 | -23.0             | +2.5  | 53.0                |     |
|                                      | Subtotal Leq |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       | 53.0                |     |
|                                      | Air Borne    | 88.4     | 109.6         | 25.9     | 112.6        | N     | 8.5     | -13.3             | +3                | -21.0               | 5.2                  | 9                 | -23.0             | +2.5  | 51.9                |     |
| Rail Segment 11a                     | Subtotal Leq |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       | 31.4                |     |
|                                      | Air Borne    | 88.4     | 110.1         | 25.9     | 113.1        | N     | 16.2    | -10.5             | +3                | 0.0                 | 5.2                  | 9                 | -23.0             | +2.5  | 55.2                |     |
|                                      | Subtotal Leq |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       | 55.2                |     |
| Rail Segment 11b                     | Air Borne    | 88.4     | 111.3         | 25.9     | 114.3        | N     | 12.4    | -11.6             | +3                | -20.5               | 5.3                  | 9                 | -23.0             | +2.5  | 33.5                |     |
|                                      | Subtotal Leq |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       | 33.5                |     |
|                                      | Air Borne    | 88.4     | 111.5         | 25.9     | 114.5        | N     | 32.0    | -7.5              | +3                | -21.0               | 5.3                  | 9                 | -23.0             | +2.5  | 37.1                |     |
| Rail Segment 22a                     | Subtotal Leq |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       | 37.1                |     |
|                                      | Air Borne    | 88.4     | 104.1         | 25.9     | 107.2        | Y     | 0.0     | 0.0               | +3                | 0.0                 | 5.0                  | 9                 | -23.0             | +2.5  | 0.0                 |     |
|                                      | Subtotal Leq |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       | 0.0                 |     |
| Rail Far Side Sub-total Noise Level  |              |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       |                     |     |
| Rail total Noise Level               |              |          |               |          |              |       |         |                   |                   |                     |                      |                   |                   |       |                     |     |

Note :

$$\text{PNL (Leq (30 min) dB(A))} = \text{SEL} + C_{\text{dist}} + C_{\text{av}} + C_{\text{poor}} + 10 \log (N/T) + C_{\text{facade}}$$

Sample Calculation of Railway Noise at N5-37 -

| Track                                | SEL          |          | Perpendicular |              | Vertical | Slant | Blocked | C <sub>av</sub>   |                   | C <sub>poor</sub> | C <sub>barrier</sub> | C <sub>dist</sub> | Train | Train | C <sub>fac</sub> | PNL  |
|--------------------------------------|--------------|----------|---------------|--------------|----------|-------|---------|-------------------|-------------------|-------------------|----------------------|-------------------|-------|-------|------------------|------|
|                                      | Train SEL    | Distance | Distance      | By Building? |          |       |         | Angle Corr, dB(A) | Poor Track, dB(A) |                   |                      |                   |       |       |                  |      |
| Rail Segment 1                       | Air Borne    | 84.7     | 107.1         | 25.9         | 110.2    | N     | 8.3     | -13.4             | +3                | 0.0               | 5.6                  | 9                 | -23.0 | +2.5  | 48.3             | 48.3 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       | 48.3             |      |
|                                      | Air Borne    | 84.7     | 107.0         | 25.9         | 110.1    | N     | 8.5     | -13.3             | +3                | -21.0             | 5.6                  | 9                 | -23.0 | +2.5  | 27.4             | 27.4 |
| Rail Segment 1a                      | Subtotal Leq |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       | 27.4             |      |
|                                      | Air Borne    | 84.7     | 107.2         | 25.9         | 110.3    | N     | 16.2    | -10.5             | +3                | 0.0               | 5.6                  | 9                 | -23.0 | +2.5  | 51.2             | 51.2 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       | 51.2             |      |
| Rail Segment 1b                      | Air Borne    | 84.7     | 107.3         | 25.9         | 110.4    | N     | 12.4    | -11.6             | +3                | -21.0             | 5.6                  | 9                 | -23.0 | +2.5  | 29.0             | 29.0 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       | 29.0             |      |
|                                      | Air Borne    | 84.7     | 107.0         | 25.9         | 110.1    | N     | 38.3    | -6.7              | +3                | -21.0             | 5.6                  | 9                 | -23.0 | +2.5  | 33.9             | 33.9 |
| Rail Segment 2a                      | Subtotal Leq |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       | 33.9             |      |
|                                      | Air Borne    | 84.7     | 103.9         | 25.9         | 107.1    | Y     | 0.0     | 0.0               | +3                | 0.0               | 5.4                  | 9                 | -23.0 | +2.5  | 0.0              | 0.0  |
|                                      | Subtotal Leq |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       | 0.0              |      |
| Rail Near Side Sub-total Noise Level |              |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       |                  |      |
| Rail Segment 11                      | Air Borne    | 88.4     | 110.5         | 25.9         | 113.5    | N     | 7.6     | -13.8             | +3                | 0.0               | 5.2                  | 9                 | -23.0 | +2.5  | 51.9             | 51.9 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       | 51.9             |      |
|                                      | Air Borne    | 88.4     | 109.6         | 25.9         | 112.6    | N     | 8.5     | -13.3             | +3                | -21.0             | 5.2                  | 9                 | -23.0 | +2.5  | 31.4             | 31.4 |
| Rail Segment 11a                     | Subtotal Leq |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       | 31.4             |      |
|                                      | Air Borne    | 88.4     | 110.1         | 25.9         | 113.1    | N     | 16.2    | -10.5             | +3                | 0.0               | 5.2                  | 9                 | -23.0 | +2.5  | 55.2             | 55.2 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       | 55.2             |      |
| Rail Segment 11b                     | Air Borne    | 88.4     | 111.3         | 25.9         | 114.3    | N     | 12.4    | -11.6             | +3                | -20.5             | 5.3                  | 9                 | -23.0 | +2.5  | 33.5             | 33.5 |
|                                      | Subtotal Leq |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       | 33.5             |      |
|                                      | Air Borne    | 88.4     | 111.5         | 25.9         | 114.5    | N     | 38.3    | -6.7              | +3                | -21.0             | 5.3                  | 9                 | -23.0 | +2.5  | 37.9             | 37.9 |
| Rail Segment 22                      | Subtotal Leq |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       | 37.9             |      |
|                                      | Air Borne    | 88.4     | 104.1         | 25.9         | 107.2    | Y     | 0.0     | 0.0               | +3                | 0.0               | 5.0                  | 9                 | -23.0 | +2.5  | 0.0              | 0.0  |
|                                      | Subtotal Leq |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       | 0.0              |      |
| Rail Far Side Sub-total Noise Level  |              |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       |                  |      |
| Rail total Noise Level               |              |          |               |              |          |       |         |                   |                   |                   |                      |                   |       |       |                  |      |

Note :

$$\text{PNL (Leq (30 min) dB(A))} = \text{SEL} + C_{\text{dist}} + C_{\text{av}} + C_{\text{poor}} + 10 \log (N/T) + C_{\text{facade}}$$



| Track                               | SEL          |          | Perpendicular |          | Vertical          |    | Slant | Blocked | C <sub>av</sub>      |                      | C <sub>poor</sub> | Barrier | C <sub>dist</sub> | Train | Freq. Corr. dB(A) | C <sub>fac</sub> | PNL      |
|-------------------------------------|--------------|----------|---------------|----------|-------------------|----|-------|---------|----------------------|----------------------|-------------------|---------|-------------------|-------|-------------------|------------------|----------|
|                                     | Train SEL    | Distance | Distance      | Distance | Angle Corr. dB(A) | VA |       |         | Distance Corr. dB(A) | Distance Corr. dB(A) |                   |         |                   |       |                   |                  |          |
| Rail Segment 1                      | Air Borne    | 84.7     | 112.3         | 25.9     | 115.2             | N  | 10.2  | -12.5   | +3                   | 0.0                  | 5.8               | -23.0   | +2.5              | 49.0  |                   |                  | 78773.51 |
|                                     | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   | 49.0  |                   |                  |          |
|                                     | Air Borne    | 84.7     | 112.2         | 25.9     | 115.2             | N  | 8.7   | -13.1   | +3                   | -21.0                | 5.8               | 9       | -23.0             | +2.5  | 27.3              |                  | 536.0833 |
| Rail Segment 1a                     | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   | 27.3  |                   |                  |          |
|                                     | Air Borne    | 84.7     | 112.5         | 25.9     | 115.4             | N  | 19.0  | -9.8    | +3                   | 0.0                  | 5.8               | 9       | -23.0             | +2.5  | 51.7              |                  | 146420.3 |
|                                     | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   | 51.7  |                   |                  |          |
| Rail Segment 1b                     | Air Borne    | 84.7     | 112.1         | 25.9     | 115.0             | N  | 11.8  | -11.8   | +3                   | -20.7                | 5.8               | 9       | -23.0             | +2.5  | 28.9              |                  | 767.6203 |
|                                     | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   | 28.9  |                   |                  |          |
|                                     | Air Borne    | 84.7     | 112.1         | 25.9     | 115.1             | N  | 31.6  | -7.6    | +3                   | -21.0                | 5.8               | 9       | -23.0             | +2.5  | 32.9              |                  | 1940.299 |
| Rail Segment 2                      | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   | 32.9  |                   |                  |          |
|                                     | Air Borne    | 84.7     | 112.1         | 25.9     | 115.1             | N  | 6.5   | -14.4   | +3                   | -21.0                | 5.8               | 9       | -23.0             | +2.5  | 26.0              |                  | 401.5546 |
|                                     | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   | 26.0  |                   |                  |          |
| Rail Segment 3                      | Air Borne    | 88.4     | 115.6         | 25.9     | 118.5             | N  | 9.5   | -12.8   | +3                   | 0.0                  | 5.4               | 9       | -23.0             | +2.5  | 53.6              |                  | 184904.6 |
|                                     | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   | 53.6  |                   |                  |          |
|                                     | Air Borne    | 88.4     | 114.8         | 25.9     | 117.7             | N  | 8.7   | -13.1   | +3                   | -21.0                | 5.4               | 9       | -23.0             | +2.5  | 52.7              |                  | 1366.068 |
| Rail Segment 11                     | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   | 52.7  |                   |                  |          |
|                                     | Air Borne    | 88.4     | 115.4         | 25.9     | 118.3             | N  | 19.0  | -9.8    | +3                   | 0.0                  | 5.4               | 9       | -23.0             | +2.5  | 31.4              |                  | 372418.4 |
|                                     | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   | 31.4  |                   |                  |          |
| Rail Segment 11a                    | Air Borne    | 88.4     | 116.7         | 25.9     | 119.5             | N  | 11.8  | -11.8   | +3                   | -20.1                | 5.5               | 9       | -23.0             | +2.5  | 55.7              |                  | 2222.943 |
|                                     | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   | 55.7  |                   |                  |          |
|                                     | Air Borne    | 88.4     | 116.7         | 25.9     | 119.5             | N  | 31.6  | -7.6    | +3                   | -21.0                | 5.5               | 9       | -23.0             | +2.5  | 36.9              |                  | 4865.563 |
| Rail Segment 11b                    | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   | 36.9  |                   |                  |          |
|                                     | Air Borne    | 88.4     | 116.7         | 25.9     | 119.5             | N  | 6.5   | -14.4   | +3                   | -21.0                | 5.5               | 9       | -23.0             | +2.5  | 30.0              |                  | 1006.955 |
|                                     | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   | 30.0  |                   |                  |          |
| Rail Segment 22                     | Air Borne    | 88.4     | 116.7         | 25.9     | 119.5             | N  | 6.5   | -14.4   | +3                   | -21.0                | 5.5               | 9       | -23.0             | +2.5  | 57.5              |                  |          |
|                                     | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   | 57.5  |                   |                  |          |
|                                     | Subtotal Leq |          |               |          |                   |    |       |         |                      |                      |                   |         |                   |       |                   |                  | 59.0     |
| Rail Far Side Sub-total Noise Level |              |          |               |          |                   |    |       |         |                      |                      |                   |         |                   |       |                   |                  |          |
| Rail total Noise Level              |              |          |               |          |                   |    |       |         |                      |                      |                   |         |                   |       |                   |                  |          |

Note :

$$\text{PNL (Leq (30 min) dB(A))} = \text{SEL} + C_{\text{dist}} + C_{\text{av}} + C_{\text{poor}} + 10 \log (N/T) + C_{\text{fac}}$$

Sample Calculation of Railway Noise at N5-40 -

| Track              | SEL                    |          | Perpendicular |       | Vertical | Slant | Blocked | C <sub>av</sub> |    | C <sub>poor</sub> | Barrier | C <sub>dist</sub> | Train | Train | C <sub>fac</sub> | PNL |
|--------------------|------------------------|----------|---------------|-------|----------|-------|---------|-----------------|----|-------------------|---------|-------------------|-------|-------|------------------|-----|
|                    | Train SEL              | Distance | Distance      | Angle | Corr.    |       |         | Facade          |    |                   |         |                   |       |       |                  |     |
| 1<br>Seg<br>Rail   | Air Borne              | 84.7     | 112.3         | 25.9  | 115.2    | N     | 10.2    | -12.5           | +3 | 0.0               | 5.8     | -23.0             | +2.5  | 49.0  | 78773.51         |     |
|                    | Subtotal Leq           |          |               |       |          |       |         |                 |    |                   |         |                   |       | 49.0  |                  |     |
|                    | Air Borne              | 84.7     | 112.2         | 25.9  | 115.2    | N     | 8.7     | -13.1           | +3 | -21.0             | 5.8     | -23.0             | +2.5  | 27.3  | 536.0833         |     |
| 1a<br>Seg<br>Rail  | Subtotal Leq           |          |               |       |          |       |         |                 |    |                   |         |                   |       | 27.3  |                  |     |
|                    | Air Borne              | 84.7     | 112.5         | 25.9  | 115.4    | N     | 19.0    | -9.8            | +3 | 0.0               | 5.8     | -23.0             | +2.5  | 51.7  | 146420.3         |     |
|                    | Subtotal Leq           |          |               |       |          |       |         |                 |    |                   |         |                   |       | 51.7  |                  |     |
| 2<br>Seg<br>Rail   | Air Borne              | 84.7     | 112.1         | 25.9  | 115.0    | N     | 11.8    | -11.8           | +3 | -20.7             | 5.8     | -23.0             | +2.5  | 28.9  | 767.6203         |     |
|                    | Subtotal Leq           |          |               |       |          |       |         |                 |    |                   |         |                   |       | 28.9  |                  |     |
|                    | Air Borne              | 84.7     | 112.1         | 25.9  | 115.1    | N     | 31.6    | -7.6            | +3 | -21.0             | 5.8     | -23.0             | +2.5  | 32.9  | 1940.299         |     |
| 2a<br>Seg<br>Rail  | Subtotal Leq           |          |               |       |          |       |         |                 |    |                   |         |                   |       | 32.9  |                  |     |
|                    | Air Borne              | 84.7     | 112.1         | 25.9  | 115.1    | N     | 10.4    | -12.4           | +3 | -21.0             | 5.8     | -23.0             | +2.5  | 28.1  | 640.0858         |     |
|                    | Subtotal Leq           |          |               |       |          |       |         |                 |    |                   |         |                   |       | 28.1  |                  |     |
| 3<br>Seg<br>Rail   | Air Borne              | 88.4     | 115.6         | 25.9  | 118.5    | N     | 9.5     | -12.8           | +3 | 0.0               | 5.4     | -23.0             | +2.5  | 52.7  | 184904.6         |     |
|                    | Subtotal Leq           |          |               |       |          |       |         |                 |    |                   |         |                   |       | 52.7  |                  |     |
|                    | Air Borne              | 88.4     | 114.8         | 25.9  | 117.7    | N     | 8.7     | -13.1           | +3 | -21.0             | 5.4     | -23.0             | +2.5  | 31.4  | 1366.068         |     |
| 11a<br>Seg<br>Rail | Subtotal Leq           |          |               |       |          |       |         |                 |    |                   |         |                   |       | 31.4  |                  |     |
|                    | Air Borne              | 88.4     | 115.4         | 25.9  | 118.3    | N     | 19.0    | -9.8            | +3 | 0.0               | 5.4     | -23.0             | +2.5  | 55.7  | 372418.4         |     |
|                    | Subtotal Leq           |          |               |       |          |       |         |                 |    |                   |         |                   |       | 55.7  |                  |     |
| 11b<br>Seg<br>Rail | Air Borne              | 88.4     | 116.7         | 25.9  | 119.5    | N     | 11.8    | -11.8           | +3 | -20.1             | 5.5     | -23.0             | +2.5  | 33.5  | 2222.943         |     |
|                    | Subtotal Leq           |          |               |       |          |       |         |                 |    |                   |         |                   |       | 33.5  |                  |     |
|                    | Air Borne              | 88.4     | 116.7         | 25.9  | 119.5    | N     | 31.6    | -7.6            | +3 | -21.0             | 5.5     | -23.0             | +2.5  | 36.9  | 4865.563         |     |
| 22a<br>Seg<br>Rail | Subtotal Leq           |          |               |       |          |       |         |                 |    |                   |         |                   |       | 36.9  |                  |     |
|                    | Air Borne              | 88.4     | 116.7         | 25.9  | 119.5    | N     | 10.4    | -12.4           | +3 | -21.0             | 5.5     | -23.0             | +2.5  | 32.1  | 1605.318         |     |
|                    | Subtotal Leq           |          |               |       |          |       |         |                 |    |                   |         |                   |       | 32.1  |                  |     |
| 33<br>Seg<br>Rail  | Air Borne              | 88.4     | 116.7         | 25.9  | 119.5    | N     | 10.4    | -12.4           | +3 | -21.0             | 5.5     | -23.0             | +2.5  | 57.5  | 59.0             |     |
|                    | Subtotal Leq           |          |               |       |          |       |         |                 |    |                   |         |                   |       | 57.5  |                  |     |
|                    | Rail total Noise Level |          |               |       |          |       |         |                 |    |                   |         |                   |       |       |                  |     |

Note :

$$\text{PNL (Leq (30 min) dB(A))} = \text{SEL} + C_{\text{dist}} + C_{\text{av}} + C_{\text{poor}} + 10 \log (N/T) + C_{\text{fac}}$$

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**Annex 6:**  
**Not Used**

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**Annex 7:**  
**Design and Elevation of the Acoustic window**  
**(baffle type) and Enhanced acoustic balcony**

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1 ACOUSTIC WINDOWS SECTION  
T1 UNIT F BR, T5 UNIT K/L/M/N BR

|  |  |  |  |
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|  |  |  |  |
|--|--|--|--|



**WONG TUNG & PARTNERS LIMITED**  
ARCHITECTS & PLANNERS

28th Floor, Cityplaza 3, Taikoo Shing, Hong Kong  
T 852-2853 9888 F 852-2511 1728 [www.wonghong.com](http://www.wonghong.com)

PROJECT:

URA KWUN TONG TOWN

CENTRE REDEVELOPMENT  
(ARTS & CULTURE)

(AREA 2 & 3) AT  
NKII 6514

KWUN TONG, KOWLOON

---

1. TITLE: LOGISTICS MANAGEMENT LAB

ACOUSTIC WINDOWS LAB  
LAB TEST 10004-18

LAB TEST MOCK UP

ACOUSTIC WINDOWS

ACOUSTIC WINDOWS

\_\_\_\_\_

\_\_\_\_\_

|               |                |
|---------------|----------------|
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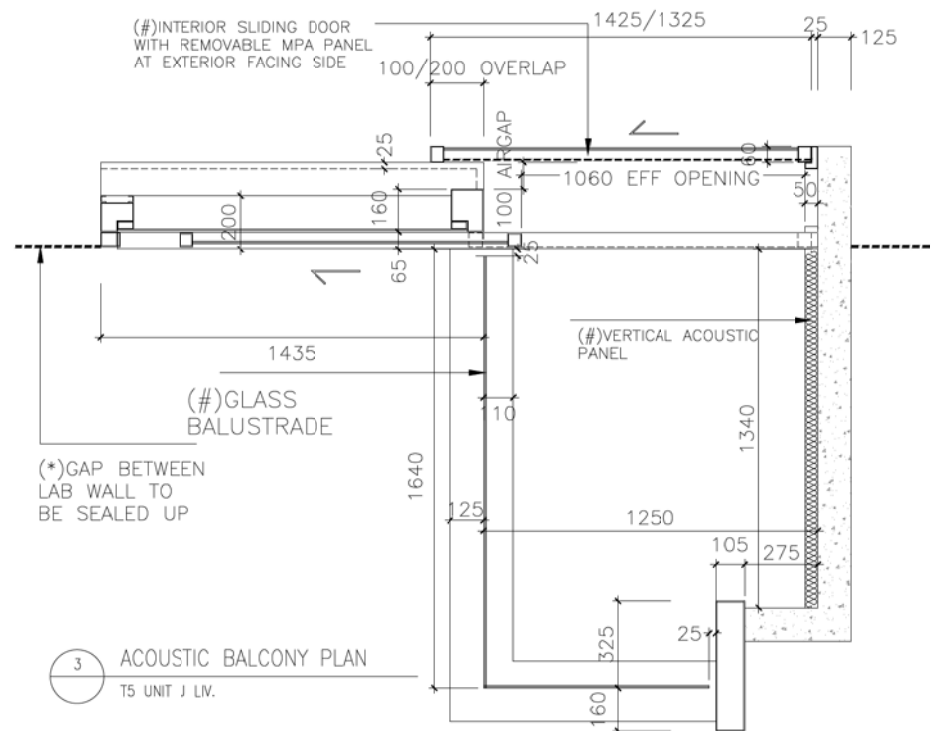
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**NOTES**  
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PROJECT:  
URA KWUN TONG TOWN  
CENTRE REDEVELOPMENT  
(AREA 2 & 3) AT  
NKIL 6514,  
KWUN TONG, KOWLOON

TITLE:  
ACOUSTIC WINDOWS LAB  
LAB TEST MOCK UP

ACOUSTIC BALCONY PLAN

|                    |                         |                     |                     |
|--------------------|-------------------------|---------------------|---------------------|
| DATE: 02/2017      |                         | SCALE: 1:200A3      |                     |
| DRAFTED BY:<br>( ) | CHECKED BY:<br>( )      | DESIGNED BY:<br>( ) | REVIEWED BY:<br>( ) |
| JOB NO.<br>31690   | DRAWING NO.<br>T/A62/11 | REV. NO.<br>01      |                     |



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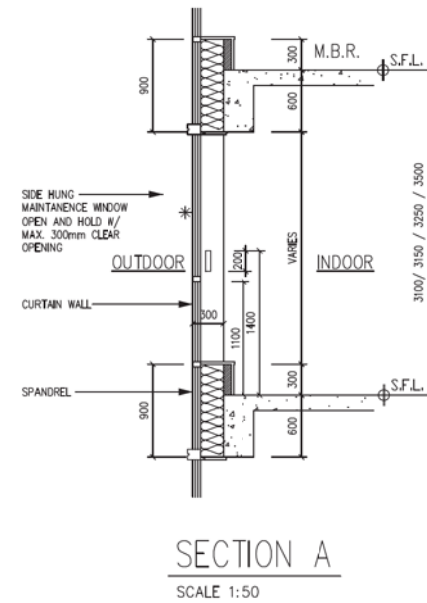
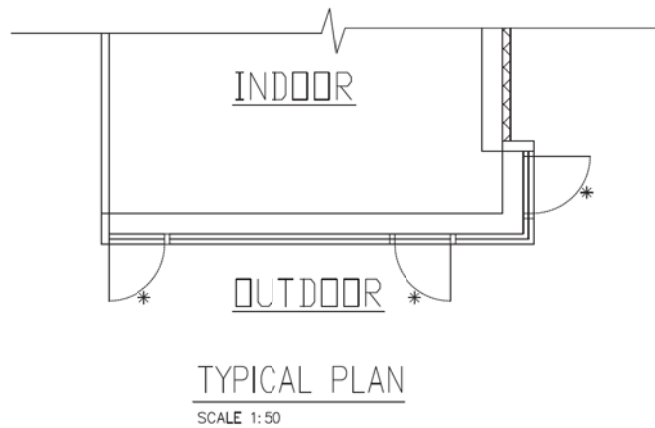
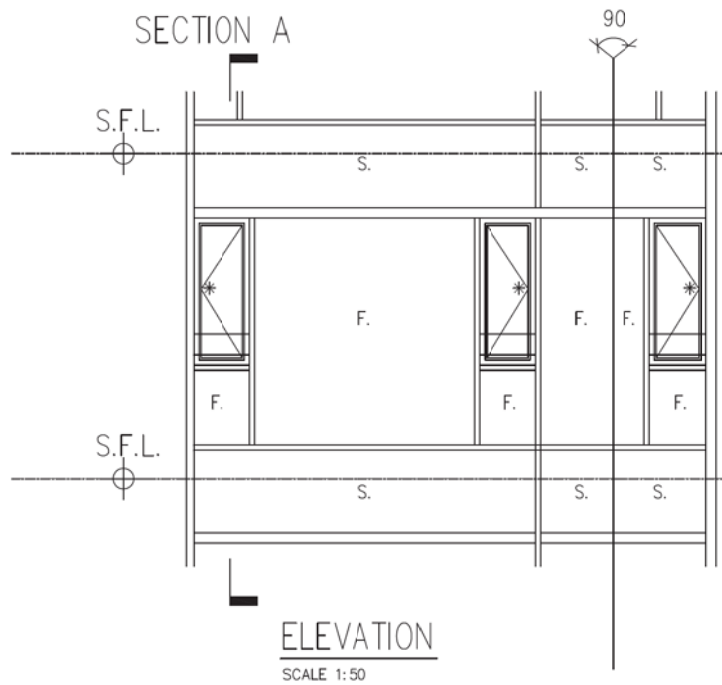


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**Annex 8:**  
**Typical Design of the Maintenance Window**

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# PROPOSED MAINTENANCE WINDOW DESIGN



## LEGEND:

- \* WINDOW FIXED BY REMOVABLE HANDLE;  
UNLOCK W/ MAX. 300mm CLEAR FOR  
MAINTENANCE ONLY
- S. CURTAIN WALL SPANDREL
- F. FIXED GLAZING



**Annex 9:  
MTRC's letter on train frequency**

MTR Corporation Limited  
香港鐵路有限公司  
www.mtr.com.hk

SNOKTC23EI00/010060 Fax  
 **RECEIVED**  
30 MAY 2016  
BY: \_\_\_\_\_

Ramboll Environ Hong Kong Limited  
Room 2403, 24/F, Jubilee Centre  
18 Fenwick Street,  
Wanchai,  
Hong Kong

Our ref: T&ESD/TS&SE/EnvE/L767

26 May 2016

Attention: Mr. Tony Cheng

**By Post and Fax**  
**(Fax no.: 3465 2899)**

Dear Mr. Cheng,

**Re: Environmental and Noise Consultancy Services for NKIL 6514, Kwun Tong Town Centre (Development Area 2 & 3), Kowloon**

**Request for Information of Kwun Tong Rail Train Frequency and Rail Grinding Records**

We refer to your letter dated 5 May 2016 (ref.: SNOKTC23EI00\_0\_0058L.16) requesting information regarding the Kwun Tong Line's (KTL) operational parameters.

Current Operational Headway

- The current peak KTL passenger train frequency during the period of 07:00 to 23:00 hours is 15 trains per 30 minutes per direction.
- The current peak KTL passenger train frequency during the period of 23:00 to 07:00 hours is 8 trains per 30 minutes per direction.

The above information, which is sensitive in nature, shall only be used solely as reference for this project. Further distribution and/or publication of the above information for purposes not connected with this project are strictly prohibited without the prior consent of the MTR Corporation. The above information on train headways are subject to change without prior notification.

Should you have any additional enquiries, please feel free to contact our Environmental Engineering Manager, Ms. Catherine Leung at 2993 4127.

Yours sincerely,



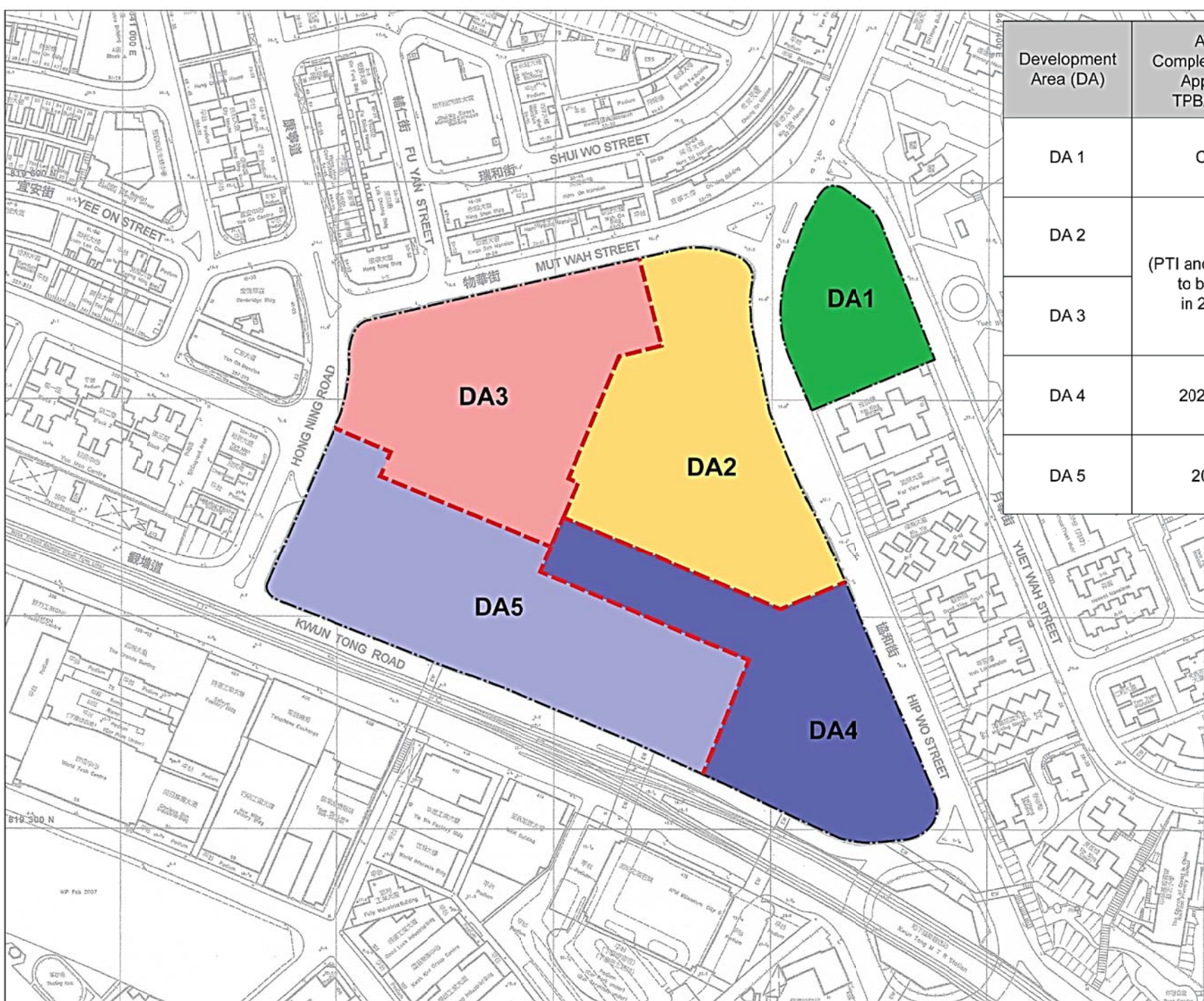
Philip Wong  
General Manager – Technical & Engineering Services

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**Annex 10:**  
**Tentative Development Programme**

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| Development Area (DA) | Anticipated Completion Year under Application No. TPB/A/K14/727 | Revised Anticipated Completion Year |
|-----------------------|---|-------------------------------------|
| DA 1                  | Completed   | Completed                           |
| DA 2                  | 2021<br>(PTI and hawker bazaar to be completed in 2020 - 2021)  | No change                           |
| DA 3                  |   |                                     |
| DA 4                  | 2024 (tentative)  | 2026 (tentative)                    |
| DA 5                  | 2024  | 2026 (tentative)                    |

Project:  
URA Kwun Tong Town Centre Redevelopment – Main Site  
Section 16 Planning Application for Comprehensive Redevelopment  
in the “Comprehensive Development Area (1)” Zone  
(Amendments to Approved Scheme)

Title:

## Kwun Tong Town Centre Redevelopment Development Package Plan



Figure: 4  
Date: July 2017  
Scale: As Shown

