Appendix 6

Air Ventilation Assessment

(AVA) Expert Evaluation Report

Prepared for

Urban Renewal Authority

Prepared by

Ramboll Hong Kong Limited

TWO DEVELOPMENT SCHEMES - MING LUN STREET/ MA TAU KOK ROAD (KC-018) AND TO KWA WAN ROAD/ MA TAU KOK ROAD (KC-019)

AIR VENTILATION ASSESSMENT (EXPERT EVALUATION)

Date	**21 September 2022**
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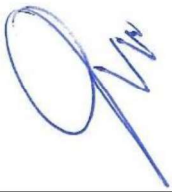
Signed	
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1. INTRODUCTION

1.1 Project Background

1.2 Under a holistic planning approach, the URA has proposed two Development Schemes at Ming Lun Street / Ma Tau Kok Road (KC-018) and To Kwa Wan Road / Ma Tau Kok Road (KC-019) (the Schemes). URA's intention is to implement the 2 Schemes as 1 inclusive redevelopment. A comprehensive notional scheme is prepared considering the 2 connecting sites as one redevelopment.

1.2.1 This Air Ventilation Assessment (AVA) Study report – Expert Evaluation is prepared to support the two draft Development Scheme Plans (DSPs) submission to the Town Planning Board (TPB) under Section 25 of the Urban Renewal Authority Ordinance. This Report covers and supports both Schemes as one comprehensive redevelopment.

1.2.2 Ramboll Hong Kong Limited is commissioned by the Applicant to prepare an Air Ventilation Assessment (AVA) Study report – Expert Evaluation (EE) to support the DSP submission for KC-018 and KC-019 sites. Architectural drawings and technical information are provided by the project architect.

1.3 Objectives

1.3.1 This AVA-EE report has been prepared to evaluate if the proposed redevelopment would have any significant impact on the overall air ventilation performance of the assessment area by comparing the Proposed Scheme and OZP Conforming Baseline Scheme.

1.4 Application Site and its Environs

1.4.1 The Application Site (i.e. KC-018 site & KC-019 site) has a total gross site area of 20,189m^2 (with net site areas of 11,430 m^2 and 8,759 m^2 respectively). It is situated in Kowloon City area and about bounded by Hong Kong Housing Society's reserved site for Dedicated Rehousing Estate (DRE) to the north, To Kwa Wan Road to the west, existing Grand Waterfront (residential use) to the south and Ma Tau Kok waterfront to the east. **Figure 1** shows the location of the Application Site and its environs.

1.4.2 The Application Site currently is composed of ageing residential buildings (more than 60 years old) of 8 storeys with ground level shops within KC-018 site, and Newport Centre within KC-019 site.

1.4.3 Ma Tau Kok Gas Work North Plant is situated on the opposite side of To Kwa Wan Road. Developments further away include Cattle Depot Art Park and Artiest Village, To Kwa Wan Recreation Ground, a number of industrial/commercial buildings (e.g. Merit Industrial Centre, Kapok Industrial Building, New Lee Wah Centre) along To Kwa Wan Road, Wyler Gardens (residential uses) and a ferry pier.

1.5 The OZP Conforming Baseline Scheme

1.5.1 The KC-018 consists of 2 residential towers above podium level (+13.6 mPD) and has a maximum plot ratio of 6 (as recommended in DURF) and a maximum building height of 28 storeys (which is approximately +110 mPD for the main roof) under the OZP Conforming Baseline Scheme. A low-rise building (which is approximately +8.6 mPD) for the use of retails is located at the southeast of T2. The two residential towers within KC-018 (i.e. T1 and T2) are located with a 43m of separation. A 10m wide non-building area (NBA) is reserved between the Application Site and Grand Waterfront.

1.5.2 The KC-019 Site consists of 2 residential towers erected at grade and has a maximum plot ratio of 5 and a maximum building height of 19 storeys (which is approximately +65 mPD for the main roof) under the OZP Conforming Baseline Scheme. A low-rise

building (which is approximately +8.0 mPD) for the use of retails is located at the southeast of T2. The two residential towers within KC-019 (i.e. T1 and T2) has an L-shaped layout, with a low-rise building (which is approximately +8.0 mPD) for the use of retail development located at the southeast of T2. A 20m building setback of the residential towers from the southeast boundary of KC-019 site is proposed. A 10m wide of NBA is reserved within the Schemes.

1.5.3 An indicative MLP of the OZP Conforming Baseline Scheme as shown in **Appendix 1**.

1.6 Proposed Scheme

1.6.1 The Proposed Development at the Schemes consists of 4 residential towers (5AT1, 5AT2, 5BT1 and 5BT2) with the lowest 3 floors for retail/clubhouse/GIC (+18.6 mPD) and 31 domestic storeys above. There is a maximum BH (measured at the main roof of the tower) of +120 mPD.

1.6.2 The design of the Proposed Scheme has due consideration of the waterfront site nature and prevailing wind directions (to be discussed in subsequent chapter). Under the Proposed Development, the layout has provided building setbacks ranging from 2 to 20m from the northeast, southeast, southwest and northwest boundaries of the Schemes. The building towers are disposited and oriented to minimise wind blockage impact with respect to sea breeze from east to southeast direction which are prevailing annually. The towers of 5AT1 and 5AT2 are shifted closer to the southern boundary in order to create a wind corridor with better connection to Ma Tau Kok Road on the west to northwest side. A 20m building setback of the residential towers from the southeast boundaries of KC-018 and KC-019 are retained to serve as waterfront promenade.

1.6.3 Referring to the OZP, two 10m wide of NBAs within the "CDA' site, one abutting the existing "R(A)1" site to the south and another near the middle aligning with Ma Tau Kok Road, are maintained to enhance visual and physical permeability at the waterfront area, as well as to enhance ventilation. Both 10m wide NBA are reserved within the Schemes. In addition, the 2-storey retail belt along the eastern site boundaries as stated in the OZP will be retained.

1.6.4 The Master Layout Plan (MLP) and section of the Proposed Development are shown in **Appendix 2**.

2. SITE WIND AVAILABILITY

2.1 Site Wind Availability Data

RAMS

2.1.1 According to the Planning Department's website, a meso-scale Regional Atmospheric Modeling System (RAMS) was used to produce a simulated 10-year wind climate at the horizontal resolution of 0.5 km x 0.5 km covering the whole territory of Hong Kong. The simulated wind data represents the annual, winter and summer wind condition at various levels, i.e. 200 m, 300 m, and 500 m above terrain.

2.1.2 The RAMS data of the grid (X: 084, Y: 042) has been extracted from the Site Wind Availability Data of Planning Department's website.

2.1.3 Based on the wind roses with different heights (200, 300 or 500m) available, the 200m site wind availability data represents wind data that takes into account the topographical effect around the Application Site. Therefore, a lower level of wind roses at 200 m height is selected to study the prevailing wind condition as it represents the incoming wind to the Application Site and considers the influence on the prevailing winds by the surrounding topography.

2.1.4 According to the wind roses at 200m altitude, the annual prevailing wind directions for the Application Site are ENE, E and ESE; whereas the summer prevailing wind directions are E, SSW and SW.

2.1.5 **Figure 2a** shows the relevant wind roses diagrams representing the frequency and wind speed distribution at 200m height in annual and summer conditions. The wind frequency data is provided in **Table 2.1** below.

Table 2.1 Summary of RAMS Data and Wind Direction at 200m

Wind Direction	Probability for Annual Condition (%)	Probability for Summer Condition (%)
N	3.5%	1.2%
NNE	9.1%	1.4%
NE	6.1%	1.3%
ENE	**12.2%**	3.7%
E	**28.4%**	**11.6%**
ESE	**9.7%**	10.3%
SE	4.3%	7.9%
SSE	2.9%	6.4%
S	3.2%	7.4%
SSW	5.5%	**12.7%**
SW	5.4%	**14.6%**
WSW	3.7%	10.2%
W	2.7%	6.2%
WNW	1.3%	2.5%
NW	0.8%	1.3%
NNW	1.2%	1.2%

Note: Bolded characters highlighted in grey represent the selected prevailing wind directions for evaluation.

Simulated Site Wind Availability Data from Term Consultancy for Expert Evaluation on Ma Tau Kok Area

2.1.6 According to the wind availability data from the Term Consultancy for Provision of Advisory Services on Air Ventilation Assessment Submissions - Expert Evaluation on Ma Tau Kok Area", published by the Planning Department in March 2008 (referred as

Ma Tau Kok -EE), it stated that the annual wind of the study area is mainly from the NNE, E and ENE directions. The Summer wind is mainly coming from the E, ESE and SE directions. The relevant Site Wind Availability Data (SWAD) from Ma Tau Kok-EE is presented in **Figure 2b.**

2.1.7 Based on both sets of wind data, it is considered that the annual prevailing winds come from **NNE, ENE, E, and ESE directions**. While in summer condition, the prevailing winds mainly come from **E, ESE, SE, SW and SSW directions**.

2.2 Topography and Building Morphology

Topography

2.2.1 The Schemes is located at and adjacent to the waterfront and the topography is generally flat. Ho Man Tin Hill with the hill-top around +100mPD is located around 800m to the southwest of the Schemes.

2.2.2 In general, the Application Site is a waterfront site. The ground level at the waterfront area is about +3.6mPD. It is expected that east to southeast prevailing winds towards the Application Site is the least obstructed and wind availability from these directions are considered to be optimal.

Building Morphology

2.2.3 Based on checking by site visit for existing developments and the published information in Statutory Planning Portal under the Town Planning Board regarding planned / committed developments, the Schemes is surrounded by high- to medium-rise developments, e.g. the Committed Government, Institution or Community (G/IC) Site, and proposed building blocks in Dedicated Rehousing Estate at Ma Tau Kok to the northeast, Grand Waterfront to the south, and planned developments at Residential (Group (A) (R(A)) Site (max. building height +100mPD[1]) & G/IC Site (proposed building height +67.75mPD[2]) to the further northwest. **Figure 1** shows the planned/committed developments adjacent the Schemes. It is confirmed that all major noise barriers, elevated structure, planned and committed development in the surrounding, if any, have been taken into account.

2.2.4 The building height information of identified existing developments was extracted from Geo-Reference Database (BG1000) provided by Survey and Mapping Office/ Lands Department, and as shown in **Table 2.2** below. As higher building masses are concentrated to the south, southwest and northwest of the site, it is likely that annual prevailing wind availability will be lowered due to the existing building morphology.

2.2.5 There are some existing open areas or relatively low-rise buildings in the surrounding, i.e. Cattle Deport Artists Village and To Kwa Wan Recreation Ground to the southwest of the Schemes. In addition, to the further north-east and east of the Schemes across Sung Wong Toi Road, a large open space is planned in the Kai Tak Development Area.

Table 2.2 Building Height of Surrounding Developments

Name of Development	Maximum Building Height mPD	Location from Application Site
Dedicated Rehousing Estate at Ma Tau Kok	~100	Northeast
Grand Waterfront	~175	Southeast

[1] The maximum building height of the Proposed Redevelopment at the R(A) Site, which is partly vacant and partly occupied by the Kowloon Animal Management Centre was made reference to the building height restriction stated in MPC Paper No. 2/15.

[2] The proposed building height of the Proposed Redevelopment at the G/IC Site, which is currently occupied by the Hong Kong Society of the Blind Workshop and Hostel was made reference to the indicative layout & development parameters stated in MPC Paper No. 2/15.

Name of Development	Maximum Building Height mPD	Location from Application Site
Proposed Commercial Building Application no. A/K22/3	~100	Southeast
Planned Development at G/IC Site [2]	~67.75	Northwest
Planned Development at R(A) Site [1]	~100	Northwest
Ma Tau Kok Gas Work North Plant	~14 to 36	West
Proposed Comprehensive Residential and Commercial Development "CDA(2)" Application no. A/K10/256 & A/K10/259	~100	Further Northwest
Proposed Comprehensive Residential and Commercial Development "CDA(3)" Application no. A/K10/265	~100	Further Northwest

2.3 Findings in Relevant Air Ventilation Studies

2.3.1 There are two relevant air ventilation studies completed in nearby area, i.e.

- "Term Consultancy for Provision of Advisory Services on Air Ventilation Assessment Submissions - Expert Evaluation on Ma Tau Kok Area", published by the Planning Department in March 2008; and
- Agreement No. CE 35/2006 (CE) Kai Tak Development Engineering Study Cum Design and Construction of Advance Works – Investigation, Design and Construction, Additional Services for Technical Study on Increasing the Development Density in Kai Tak, Air Ventilation Assessment – Initial Study" published by Civil Engineering Development Department in November 2014.

2.3.2 The following findings, which are relevant to the Application Site and its surrounding areas, are extracted below:

- Kowloon City Road (over 300m from the Schemes) is considered as main wind corridor in the Ma Tau Kok area under annual condition, where Sung Wong Toi Road, Mok Cheong Street, San Shan Road and Ma Tau Kok Road (adjacent to the Schemes) are considered as air paths in the area under summer condition;
- The street pattern of Ma Tau Kok Area is irregular and therefore result in relatively poor wind performance;
- The relatively taller buildings (e.g. Grand Waterfront) would induce wake area on the downwind sides; and
- Apart from east and south-easterly wind directions, other wind directions are sheltered by the surrounding existing building clusters.

2.4 Summary of Existing Site Wind Availability

2.4.1 According to the wind availability data, the annual wind directions of the area are easterlies.

2.4.2 From **Figure 2 (a & b)**, the wind probability from the E & ENE directions are dominant under both references and considered to be the dominant wind directions for the area under annual condition, particularly E wind. In addition, NNE and ESE wind are also dominant other than the E and ENE winds.

2.4.3 There is no high topography in the upwind surrounding area under ENE, E and ESE wind, thus it is considered that the potential blocking effect by the topography will not be significant.

2.4.4 For the NNE annual prevailing wind direction, there are some low- to mid-rise building structures and planned Dedicated Rehousing Estate at northeast side of the Schemes and therefore the wind blockage is considered as medium to high. To Kwa Wan Road

is considered as an air path in the area under the annual NNE condition. The presence of the future Kai Tak Development at the further upwind direction would slightly obstruct wind along To Kwa Wan Road to reach the Schemes and downwind areas including Grand Waterfront, San Ma Tau Street.

2.4.5 In summer condition, E wind is also prevailing under both references. In addition, ESE, SE, SSW and SW wind are also important. There is no high topography in the upwind surrounding area under E, ESE and SE wind, thus it is considered that the potential blocking effect by the topography will not be significant.

2.4.6 On the other hand, the building cluster near to the southwest of the Application Site and high-rise Grand Waterfront along San Ma Tau Street would obstruct the wind coming from the southwest quarter reaching the Application Site (i.e. under SSW and SW wind). Therefore, To Kwa Wan Road would serve as important air path under these summer prevailing wind directions.

2.4.7 As the Application Site is a waterfront site, the E, ESE and SE (annual and/or summer) prevailing winds towards the Application Site is least obstructed. Ma Tau Kok Road is considered an air path allowing sea breeze from these directions to inland area.

3. EXPERT EVALUATION OF AIR VENTIALTION PERFORMACE OF THE PROPOSED DEVELOPMENT

3.1 Important Pedestrian Areas

3.1.1 Important surrounding areas that the public would often access have been identified as the following:

- To Kwa Wan Recreation Ground;
- Ma Tau Kok Road;
- Mok Cheong Street;
- Cattle Depot Artist Village;
- Future Kai Tak Development;
- To Kwa Wan Road;
- Ferry Pier and Public Transport Terminus; and
- San Ma Tau Street.

3.2 Evaluation of Merit/Demerit of Design Features of the Proposed Scheme

Air corridors/ Air paths

3.2.1 **Figure 3** and **Figure 4** illustrate the prevailing wind from annual and summer wind directions for the OZP Conforming Baseline Scheme. The prevailing wind from annual and summer wind directions are illustrated in **Figure 5** and **Figure 6** for the Proposed Scheme respectively.

3.2.2 Under both Schemes, NE-SW oriented To Kwa Wan Road and SE-NW oriented Ma Tau Kok Road and San Shan Road (together with San Ma Tau Street) are major wind corridors nearby the Schemes. San Shan Road is separated from the Subject Site so that it is least affected by the proposed development. The building separation from To Kwa Wan Road is similar for both schemes. However, the proposed widened To Kwa Wan Road under the Proposed Scheme should further enhance the ventilation in the area. Regarding Ma Tau Kok Road, both schemes provide a 10m non-building area.

3.2.3 Under the OZP Conforming Baseline Scheme, while there are setback distances (around 5m to 20m) from the southeast and northwest sides of site boundaries. In addition, there are two 10m building setbacks located along the southwest side of the boundary and within the Site. It will act as air paths to allow wind penetration.

3.2.4 Under the Proposed Scheme, two high-rise towers (5AT1 and 5AT2) at KC-018 are located close to the southern boundary. Moreover, 5AT2 is of narrow frontage facing waterfront to vacate more area on the northern side with good connection to Ma Tau Kok Road, which facilitate more E, ESE and SE wind flow through the Site and towards the downward areas (e.g. the section of Ma Tau Kok Road to the west of To Kwa Wan Road).

3.2.5 For KC-019 Site, two high-rise towers (5BT1 and 5BT2) are designed, elongated and in parallel to the sea breeze direction (from ESE) under the Proposed Scheme. They are located relatively close to the northeastern boundary to vacate more area on the southwestern side with good connection to Ma Tau Kok Road, which also facilitate more E, ESE and SE wind flow through the Site and towards the downward areas (e.g. the section of Ma Tau Kok Road on the opposite side of To Kwa Wan Road).

3.2.6 Moreover, large building separation (not less than 25m) at 5AT1/5BT1 and 5AT2/5BT2 of the Schemes will be provided when compared to the OZP Conforming Baseline

Scheme, it would further improve wind connection between the area at the waterfront, the Schemes and downwind areas.

3.2.7 In addition, a 20m building setback along southeast boundary of the Application Site is provided under both schemes. This waterfront promenade also serves as an air path for improving pedestrian ventilation performance.

Building Disposition

3.2.8 Under the OZP Conforming Baseline Scheme, the building disposition of two T2 of the KC-018 and KC-019 are perpendicular to the sea breeze and would block more portion of E/ESE/SE wind flow to the Application Site and its surrounding areas. It is anticipated that there will be slightly lower wind availability to the downstream areas of the Site, including Ma Tau Kok Gas Works North Plant.

3.2.9 However, building separations (about 24m at KC-019 and 43m at KC-018) between residential blocks are proposed to be incorporated into the building design under the OZP Conforming Baseline Scheme to allow annual prevailing NNE wind penetration in principle. However, it is noted that another planned development (Dedicated Housing Estate at Ma Tau Kok elevated up to 100mPD) to the immediate north of the Application Site is of narrower gap (11m gap above 21.4mPD). The gap is also slightly block by another tower of the same development on northern side. It will restricting wind flow and reduce the effectiveness of the 24m and 43m gap.

3.2.10 Under the Proposed Scheme, the building disposition of high-rise 5AT1 and 5AT2 located close to the southern boundary and 5BT1 and 5BT2 located close to the northeast boundary, resulting in more open spaces within the Application Site. It would facilitate more E/ESE/SE wind flow through the proposed development and further penetrates surrounding areas when compared to the OZP Conforming Baseline Scheme. In addition, there are provision of building setback (not less than 5m) along the northeast side of the boundary, more portion of E/ESE/SE will flow through the Site and towards downwards areas. Moreover, building separation is provided between residential blocks with respect to NNE wind direction. As NNE wind is mostly blocked by planned development on upwind direction, the increased blockage impact due to smaller building gap may not be significant.

Building Height

3.2.11 Under the Proposed Scheme, the building heights for KC- 18 and KC-019 under the OZP Conforming Baseline Scheme should be 110mPD and 65mPD respectively and hence, the maximum building height under proposed scheme would be similar to that of KC-018 under the OZP Conforming Baseline Scheme and considerably higher when for KC-019. However, as for typical urbanised area, air ventilation usually relies on availability of open space and air corridor at pedestrian level as well as low-podium design. The possible impact due to higher building height at KC-019 can be offset by other good design features.

3.3 Directional Analysis of the development

3.3.1 As discussed in Section 2.1 & 2.2, winds from NNE, ENE, E, and ESE direction are prevailing annually whereas winds from E, ESE, SE, SSW and SW are dominant in summer.

E, ESE and SE Winds

3.3.2 Under E, ESE & SE winds, the proposed development of the Schemes would obstruct winds from reaching the downstream areas such as Ma Tau Kok Road to the west of To Kwa Wan Road, Ma Tau Kok Gas Work North Plant and Cattle Depot Art Park and Artiest Village. The decline of wind environment at the downstream areas would be expected at immediate downwind location. However, the optimised Proposed Scheme

and the OZP Conforming Baseline Scheme already minimised potential blockage under these wind directions with narrow frontage perpendicular to these directions.

3.3.3 An approximately 5m to 10m building setbacks along the northeast and southwest site boundary are proposed within the Schemes in order to alleviate any possible air ventilation impacts from the Development on the surrounding areas by increasing the wind penetration of the Schemes. In addition, another 10m of non-building area is reserved within the Schemes in connection with Ma Tau Kok Road. It would facilitate E, ESE and SE wind flow along this building separation and reach the Schemes and its surroundings. In other words, wind can come from and flow around both sides of the development to inland area so that the effective wake area will be minimised.

3.3.4 As shown **Figure 6**, building setbacks is provided along northeast side of the boundary under Proposed Scheme and could enhance E, ESE and SE flow through this building setback distance and reach the Schemes and its surrounding when compared to the OZP Conforming Baseline Scheme. In addition, there are provisions of building separation (not less than 25m) at 5AT1/5BT1 and 5AT2/5BT2, more wind from E/ESE/SE directions can flow through the Site and towards its surrounding areas. Hence the wind blockage effect with respect to sea breeze could be significantly reduced when compared to the OZP Conforming Baseline Scheme.

ENE Wind

3.3.5 Similar to E/ESE/SE wind, ENE wind will more likely come and reach the Application Site from sea side. However, roads like Ma Tau Kok Road and San Shan Road are not oriented with ENE wind so that less wind is expected to be able to penetrate through these roads. All in all, the widened building separation within the Site under the Proposed Scheme can welcome more ENE wind.

NNE Wind

3.3.6 Under NNE prevailing winds, the Dedicated Housing Estate at Ma Tau Kok (+100mPD) and future Kai Tak Development are expected to impose wind blockage impacts on the Application Site and its surrounding areas under both Schemes. It is anticipated that there will be lower wind availability in the Proposed Development.

3.3.7 The Dedicated Housing Estate at Ma Tau Kok provides a gap of 11m width above +21.4mPD but also shielded by another block of the same development. In the Proposed Scheme for KC-019 site, building separations between two residential towers is provided. These gaps are orienting with NNE wind. Some portion of NNE wind may flow through Dedicated Housing Estate at Ma Tau Kok, then KC-019 site and eventually to the KC-018 site. With the already limited NNE wind flow to the Application Site, the impact of the proposed development would further block the NNE/ENE wind from reaching its downwind area (Grand Waterfront). Slight reduction of wind availability at the downstream areas would be expected.

SW and SSW Winds

3.3.8 Under SW and SSW wind directions, the wind environment to the Schemes will be limited due to the presence of existing medium to high- rise development to the southwest of the Schemes. To Kwa Wan Road acts as SW and SSW wind corridor. The existing high-rise Grand Waterfront obstruct wind flow to the Schemes and its downstream areas. With the already limited SSW and SW wind flow to the Schemes and further downwind area, there will not be any significant difference among both schemes.

3.4 Summary of Relative Air Ventilation Performance

3.4.1 The air ventilation performance of the OZP Conforming Baseline Scheme and the Proposed Scheme has been assessed. Both Schemes consist of two building blocks at

podium level. The Proposed Scheme has been provided additional building setbacks along southeast side of the Schemes.

3.4.2 Under the Proposed Scheme, there are optimised regarding disposition and orientation, and provided additional building setbacks from the identified air corridors for prevailing wind penetration and create additional air corridor between the Schemes and Grand Waterfront which can allow more sea breeze (prevailing E/ESE/SE wind) penetrating to inland area.

3.4.3 To conclude, with good design measures to minimise frontage, etc, the Proposed Scheme is considered unlikely to impose adverse impacts on the surrounding areas in air ventilation perspective when compared to the OZP Conforming Baseline Scheme. Building dispositions and building/podium setbacks and separations incorporated into proposed development should also be regarded as good design measures.

4. CONCLUSION

4.1.1 A qualitative assessment of the wind performance of the proposed residential development at KC-018 and KC-019 sites has been carried out.

4.1.2 According to the findings of this AVA-EE, the annual prevailing wind comes from NNE, ENE, E and ESE directions while the summer prevailing wind comes from E, ESE, SE, SSW and SW directions.

4.1.3 After considering the potential air ventilation impacts of the Schemes, the layout of the Proposed Development has incorporated design measures to enhance its air ventilation performance. It is considered that the Proposed Development would not have any significant adverse impact on the surrounding environment.

4.1.4 The Proposed Scheme has incorporated effective mitigation measures such as reduced frontage towards the waterfront, additional setbacks along the northeast/southwest side and from waterfront. Building dispositions and building/podium setbacks and separations incorporated into proposed development should also be regarded as good design measures. Therefore, the Proposed Scheme would unlikely impose adverse impacts on the surrounding sites from air ventilation perspective as compared with the OZP Conforming Baseline Scheme.

Figures

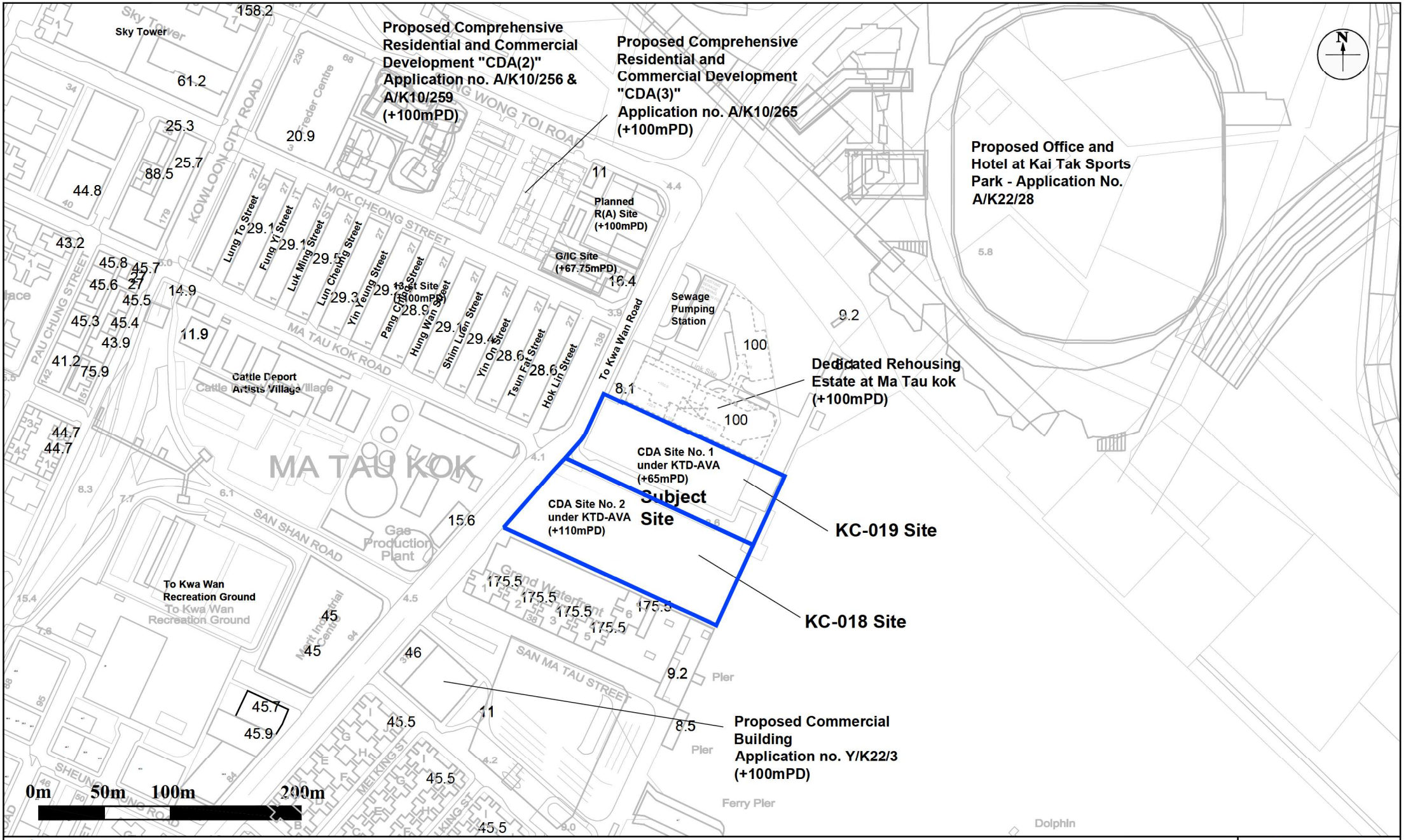

Figure: 1	RAMBOLL
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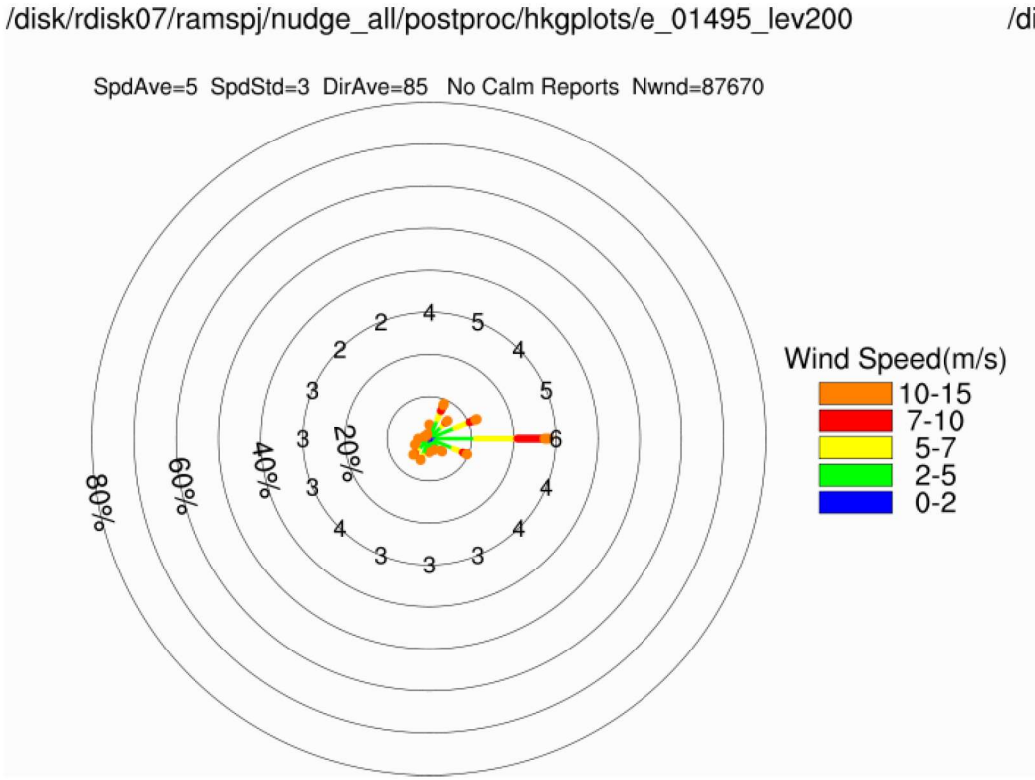
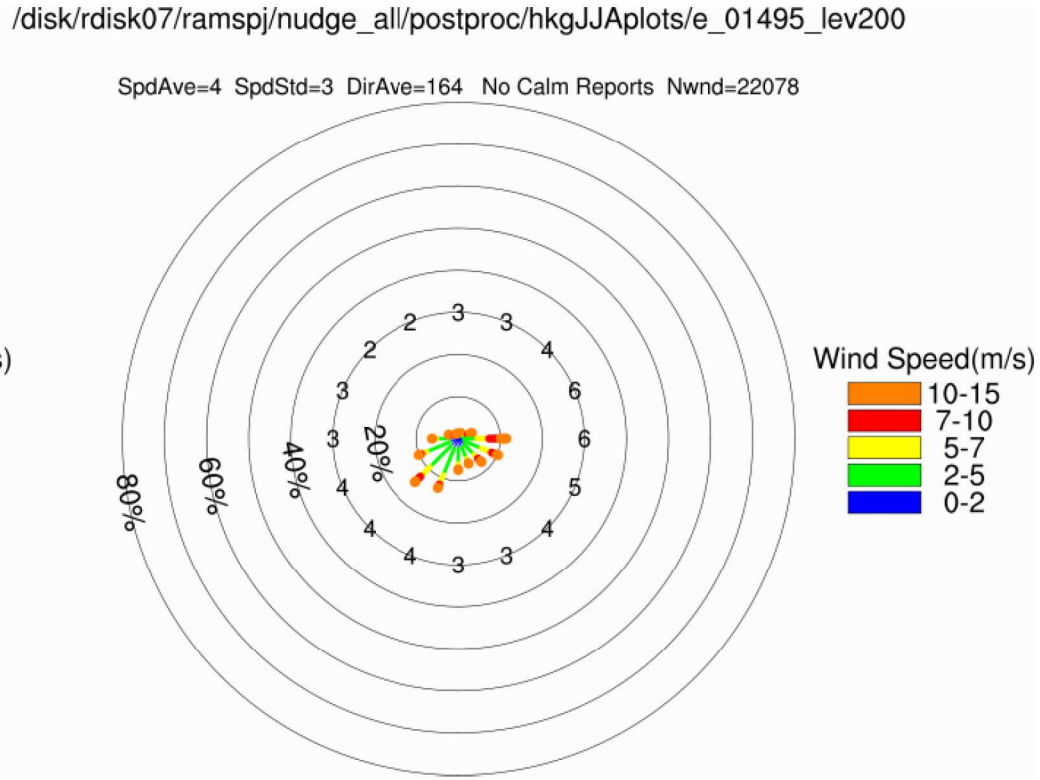
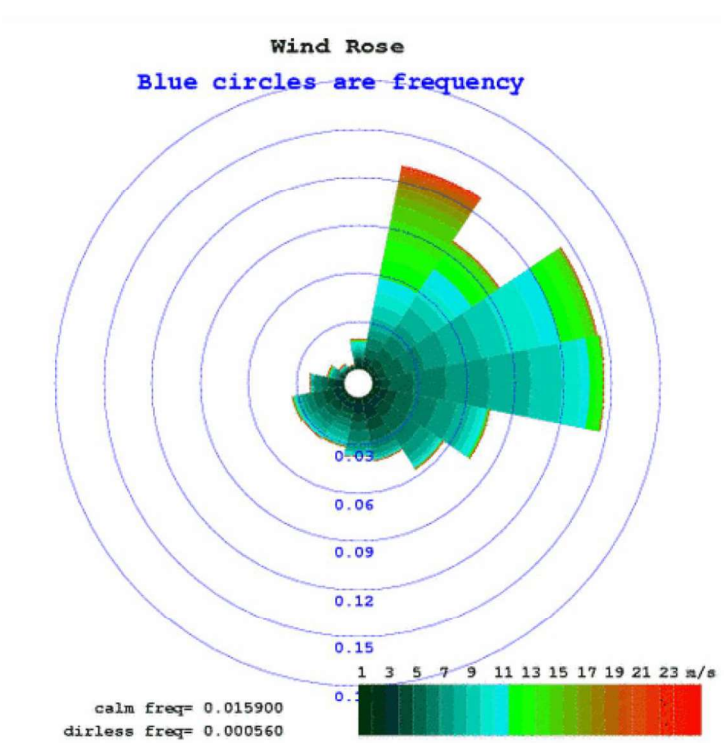


Annual Wind

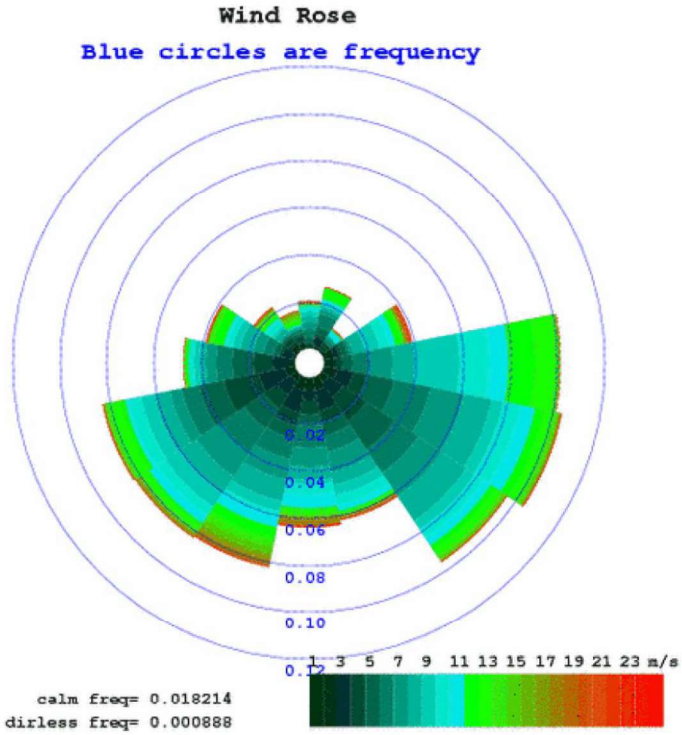


Summer Wind

Figure: 2a		RAMBOLL
Title: Windrose Diagram representing V∞ of the Area under Concern at 200m above ground (X:084, Y:042)		Drawn by: CC
		Checked by: CC
Project: Two Development Schemes - Ming Lun Street / Ma Tau Kok Road (KC-018) and To Kwa Wan Road / Ma Tau Kok Road (KC-019)		Rev.: 1.0
		Date: Jul 2022



Annual Windrose: 230m



Summer Windrose: 230m

Figure:	2b	RAMBOLL
Title:	Term Consultancy for Provision of Advisory Services on Air Ventilation Assessment Submissions - Expert Evaluation on Ma Tau Kok Area at 230m	Drawn by: CC Checked by: CC
Project:	Two Development Schemes - Ming Lun Street / Ma Tau Kok Road (KC-018) and To Kwa Wan Road / Ma Tau Kok Road (KC-019)	Rev.: 1.0 Date: Jul 2022

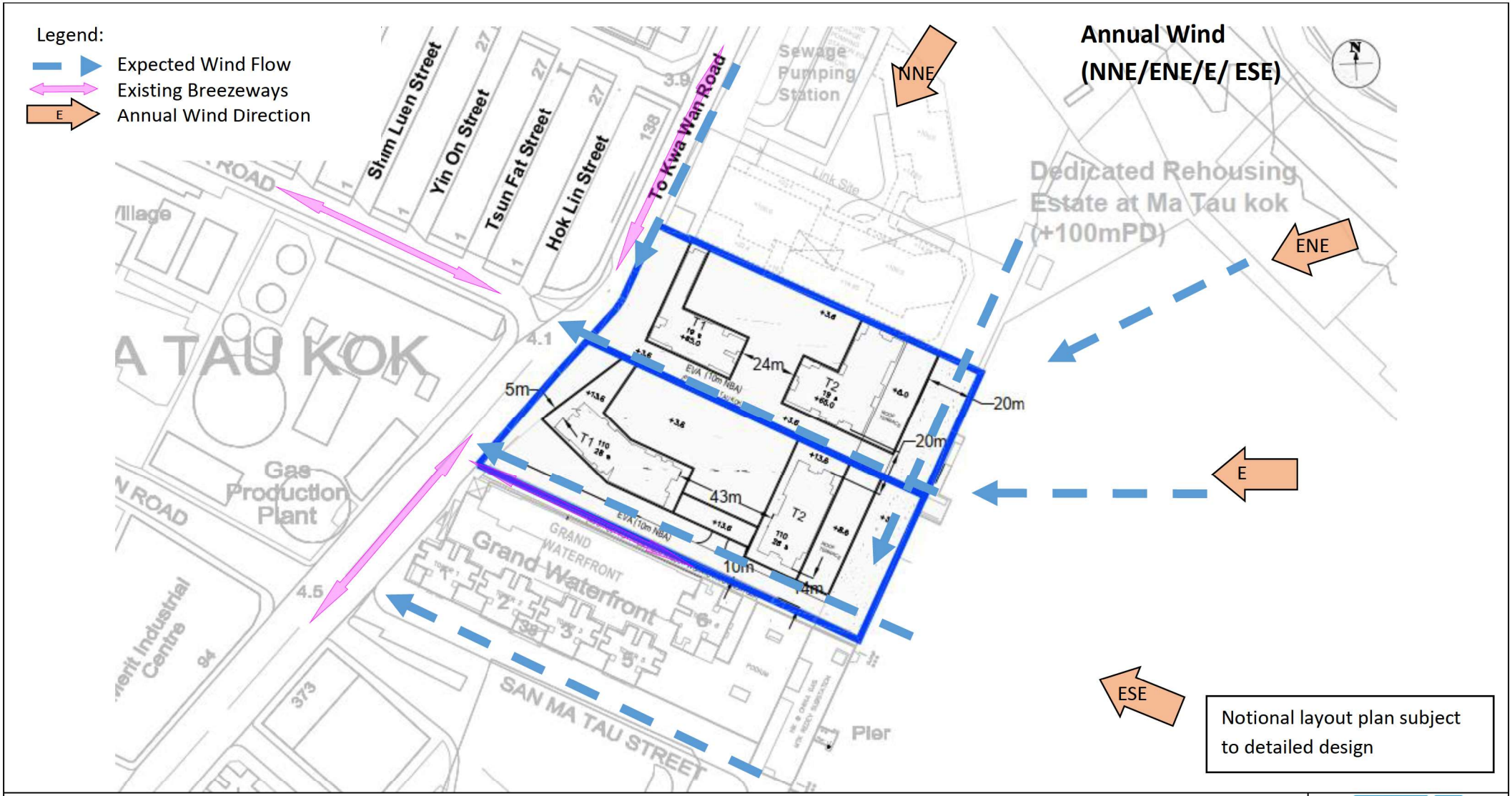


Figure: 3	RAMBOLL
Title: Illustration of Wind Flow from Annual Wind Directions for OZP Conforming Baseline Scheme	Drawn by: CC Checked by: CC
Project: Two Development Schemes - Ming Lun Street / Ma Tau Kok Road (KC-018) and To Kwa Wan Road / Ma Tau Kok Road (KC-019)	Rev.: 1.0 Date: Jul 2022

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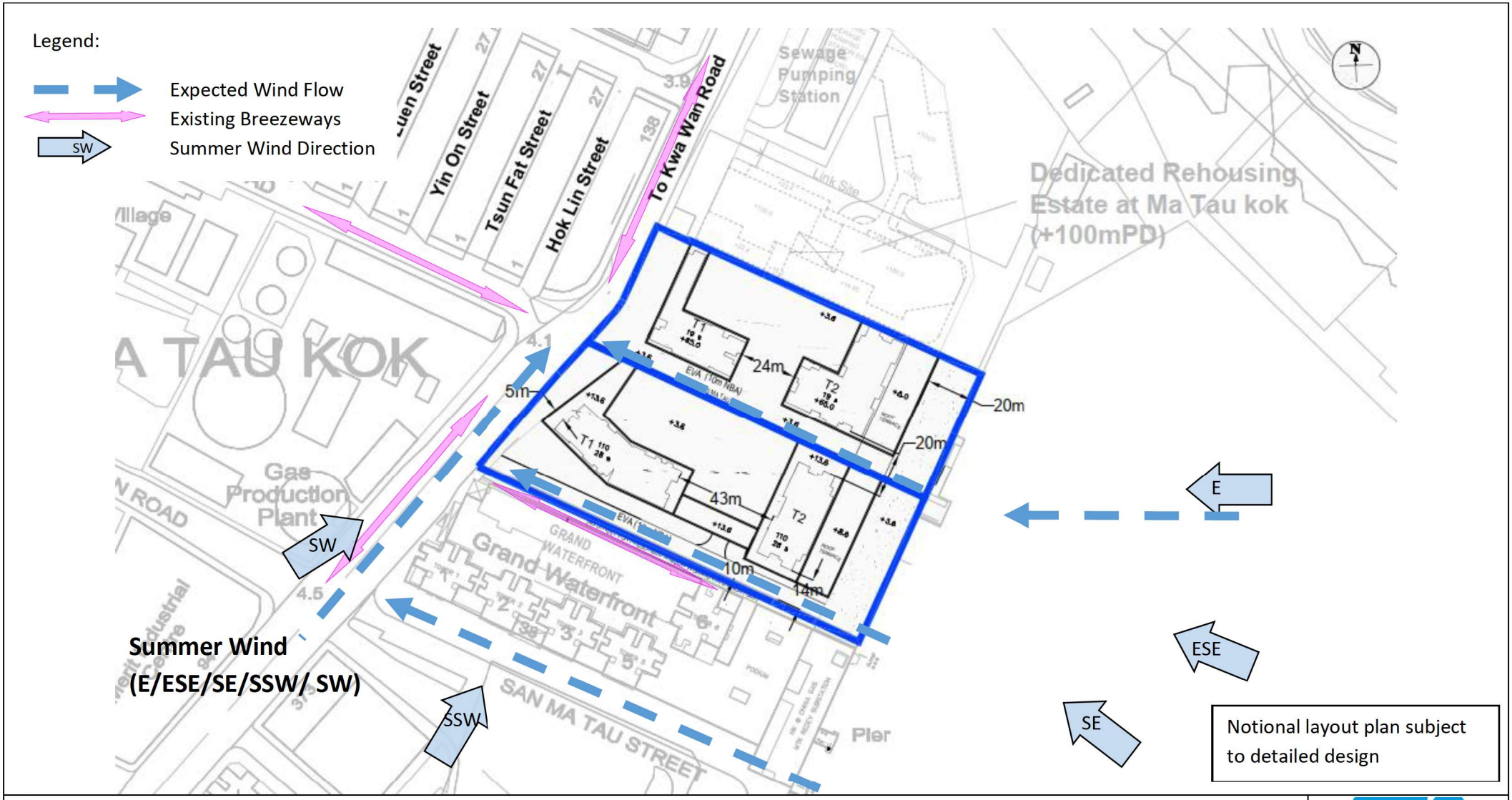

Figure: 4	RAMBOLL
Title: Illustration of Wind Flow from Summer Wind Directions for OZP Conforming Baseline Scheme	Drawn by: CC Checked by: CC
Project: Two Development Schemes - Ming Lun Street / Ma Tau Kok Road (KC-018) and To Kwa Wan Road / Ma Tau Kok Road (KC-019)	Rev.: 1.0 Date: Jul 2022

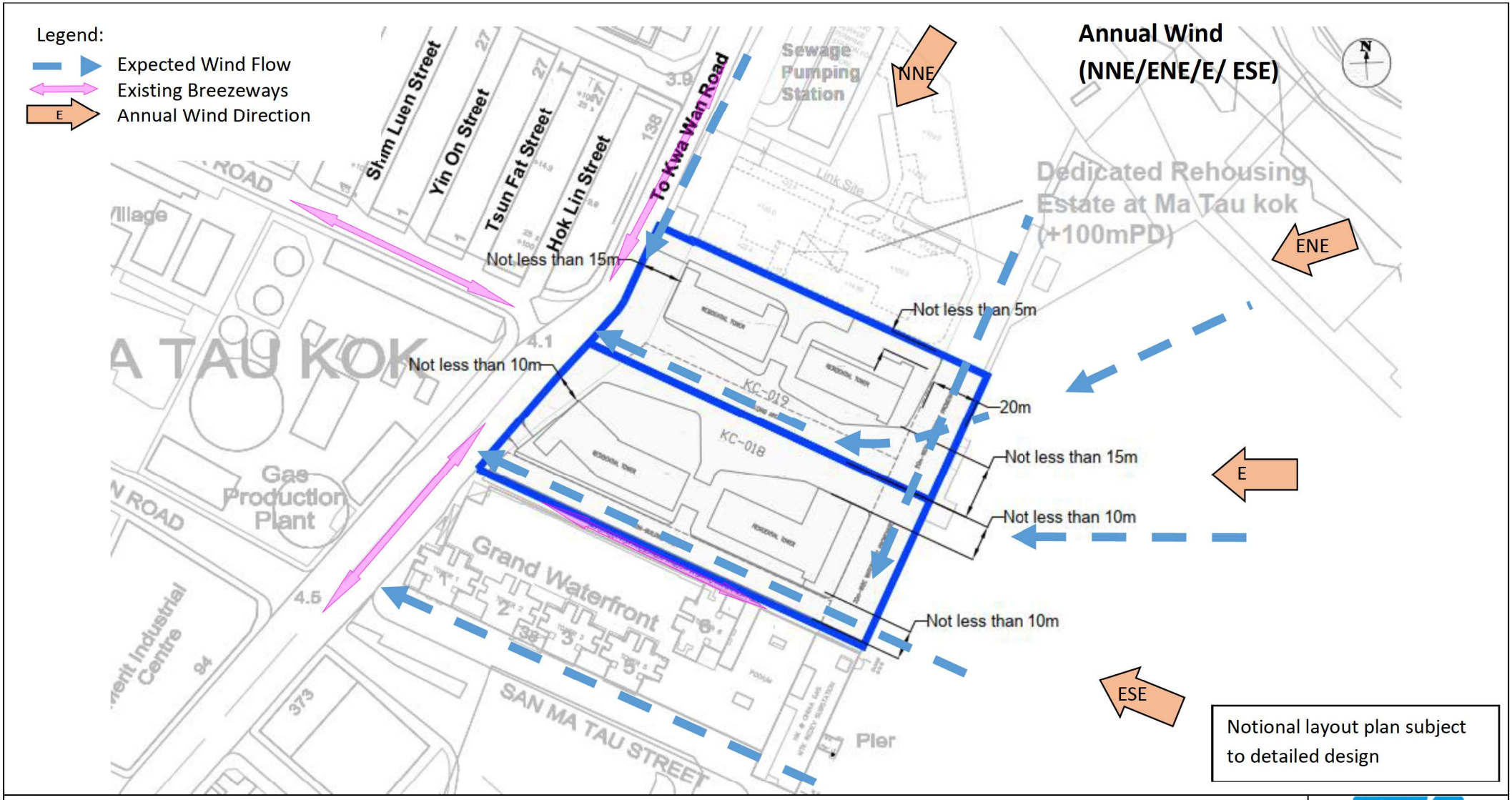

Figure: 5	RAMBOLL
Title: Illustration of Wind Flow from Annual Wind Directions for Proposed Scheme	Drawn by: CC Checked by: CC
Project: Two Development Schemes - Ming Lun Street / Ma Tau Kok Road (KC-018) and To Kwa Wan Road / Ma Tau Kok Road (KC-019)	Rev.: 1.0 Date: Aug 2022

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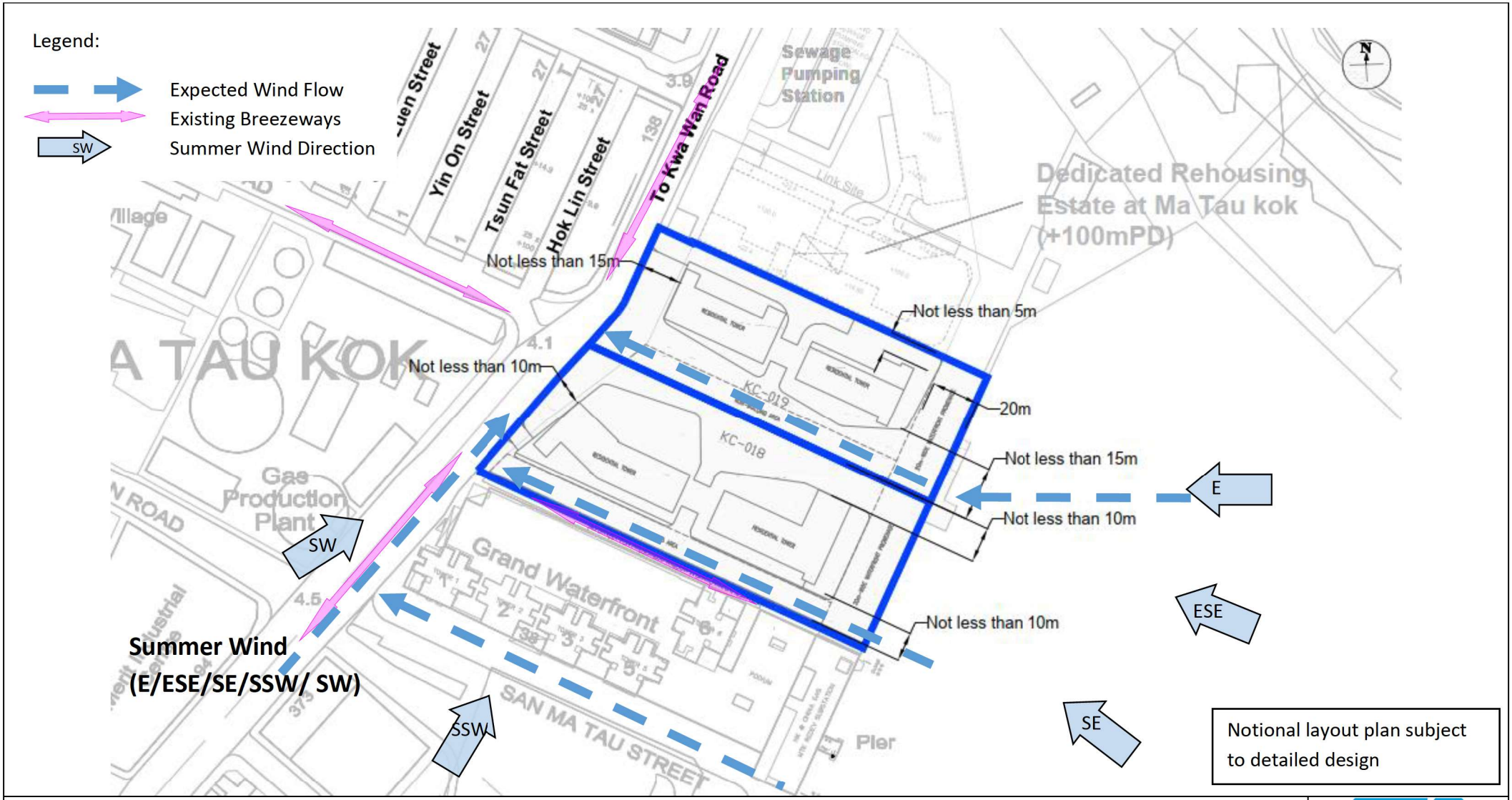
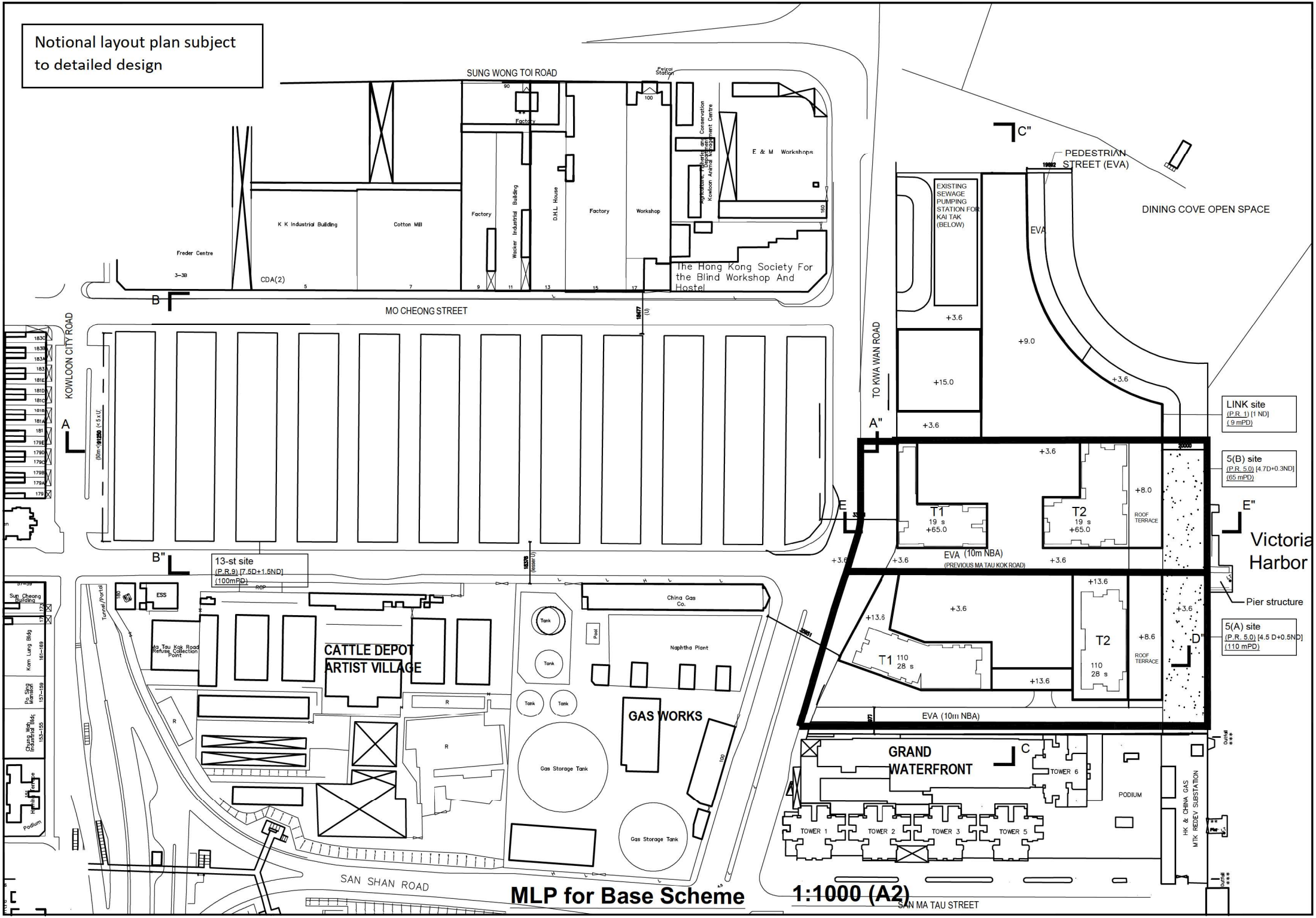


Figure: 6	RAMBOLL
Title: Illustration of Wind Flow from Summer Wind Directions for Proposed Scheme	Drawn by: CC Checked by: CC
Project: Two Development Schemes - Ming Lun Street / Ma Tau Kok Road (KC-018) and To Kwa Wan Road / Ma Tau Kok Road (KC-019)	Rev.: 1.0 Date: Aug 2022

Appendix 1

Master Layout Plan of the OZP Conforming Baseline Scheme

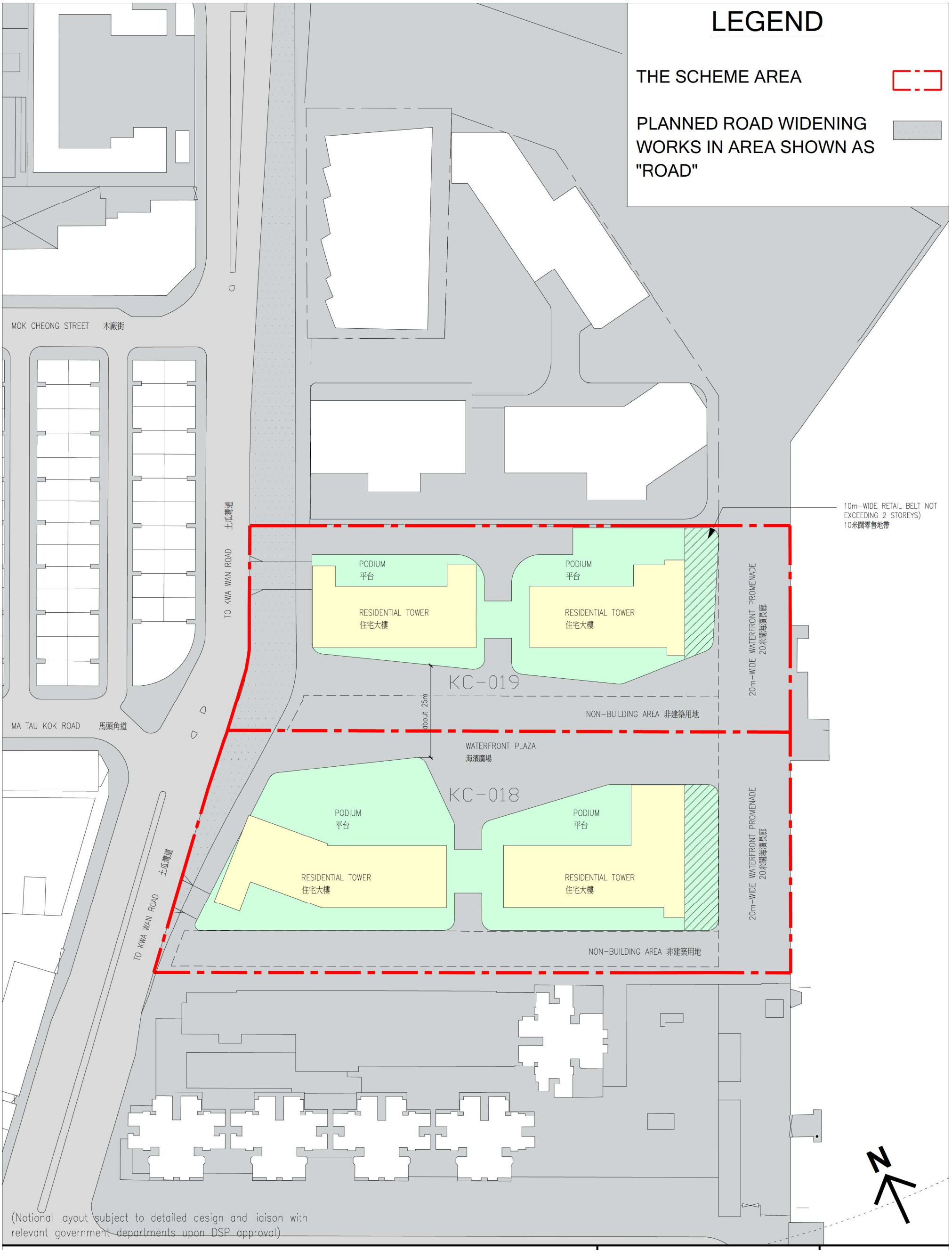
Notional layout plan subject to detailed design



MLP for Base Scheme

1:1000 (A2)

Appendix 2 Master Layout Plan of the Proposed Scheme

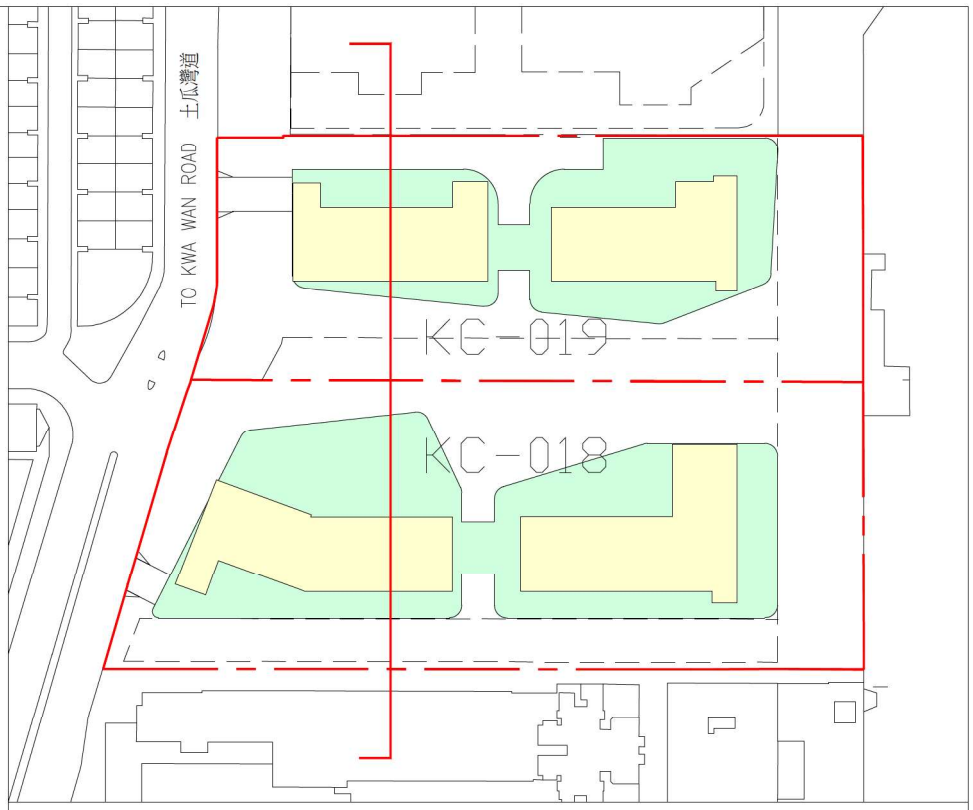


URBAN RENEWAL AUTHORITY 市區重建局

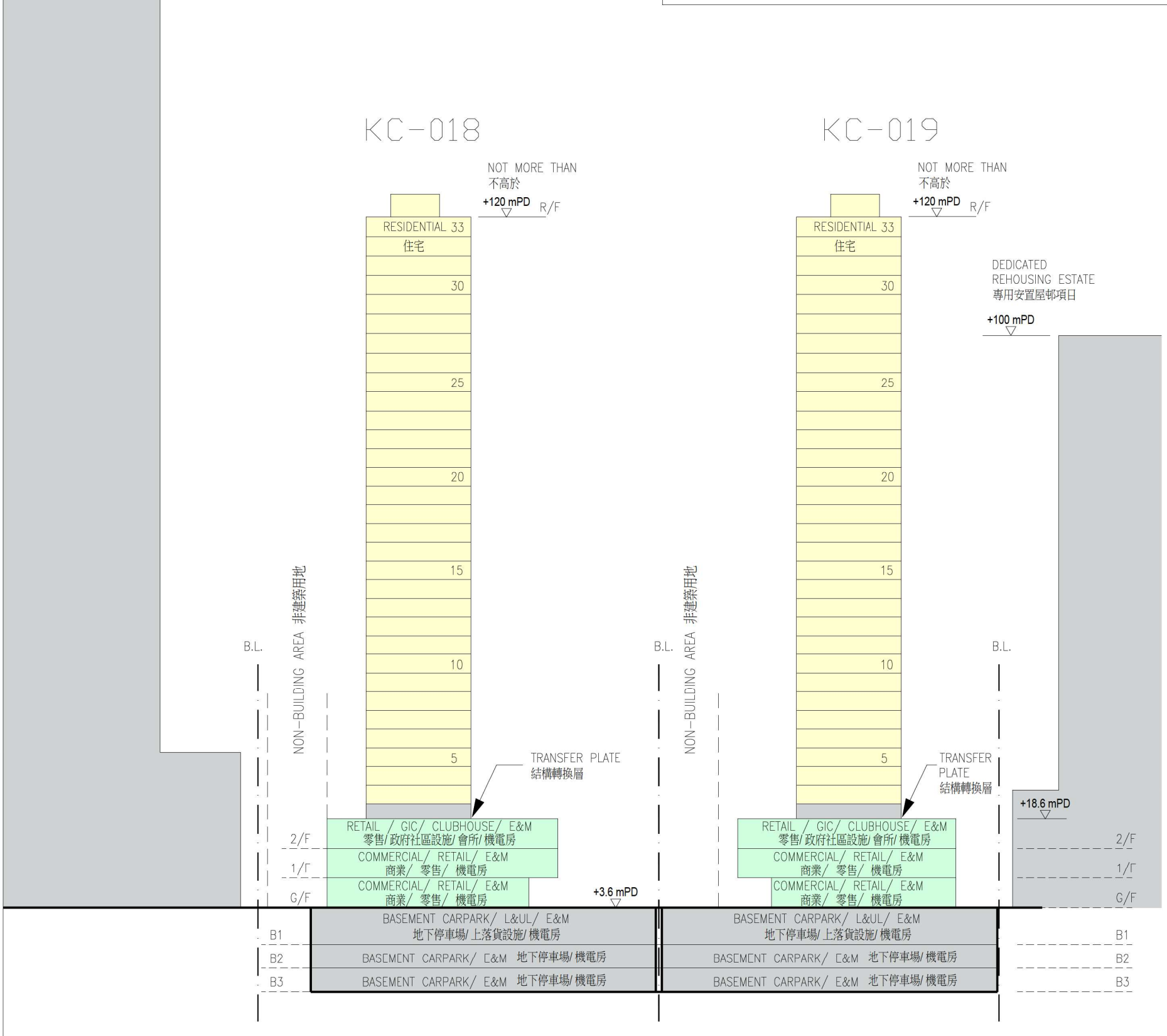
URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Block Plan

FIGURE 1.1
NOT TO SCALE



KEY PLAN 索引圖



(Notional layout subject to detailed design and liaison with relevant government departments upon DSP approval)

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URBAN RENEWAL AUTHORITY

URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
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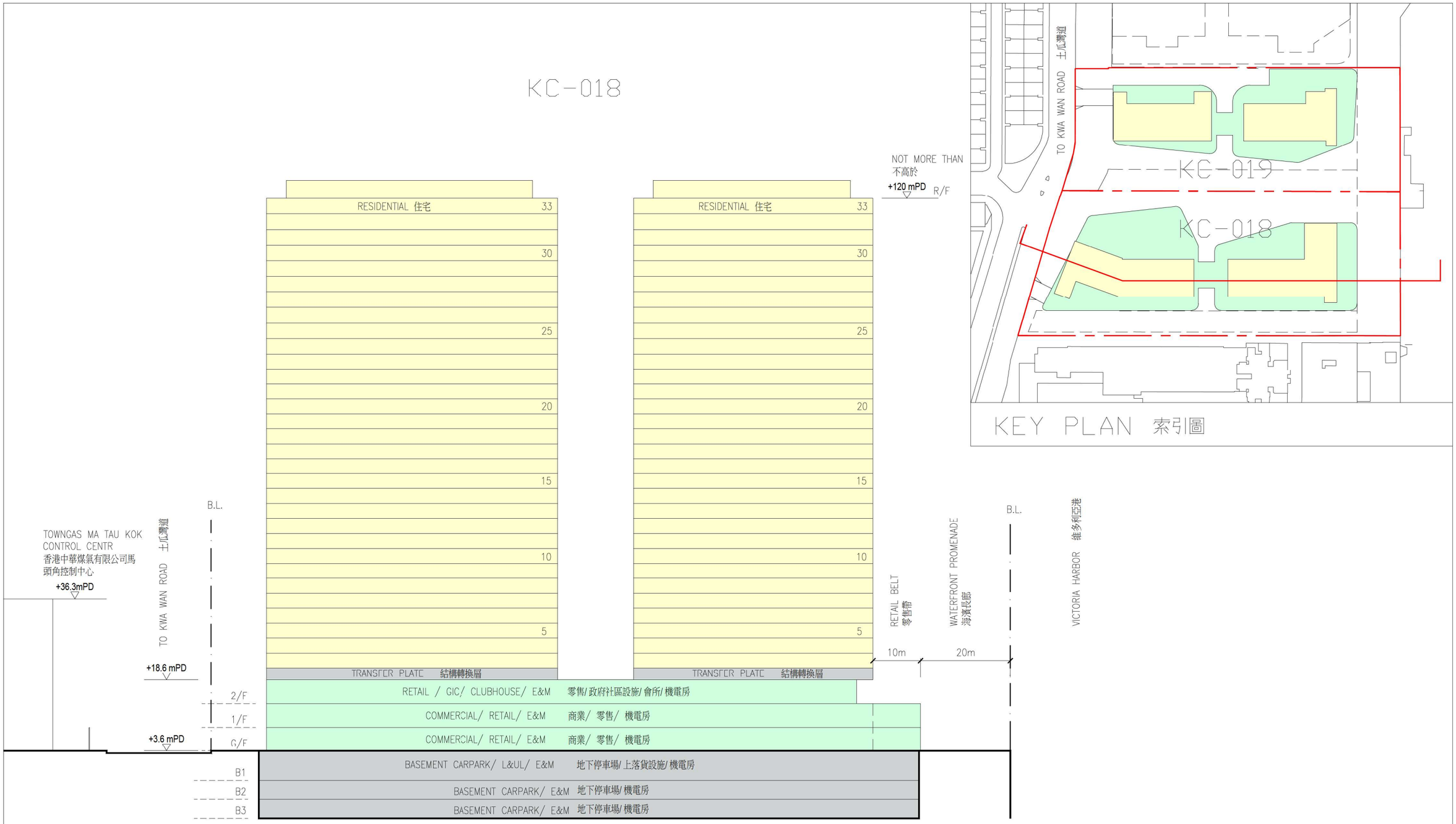
Development Scheme

Notional Design - Schematic Section

FIGURE 1.2
NOT TO SCALE

KC-018



(Notional layout subject to detailed design and liaison with relevant government departments upon DSP approval)

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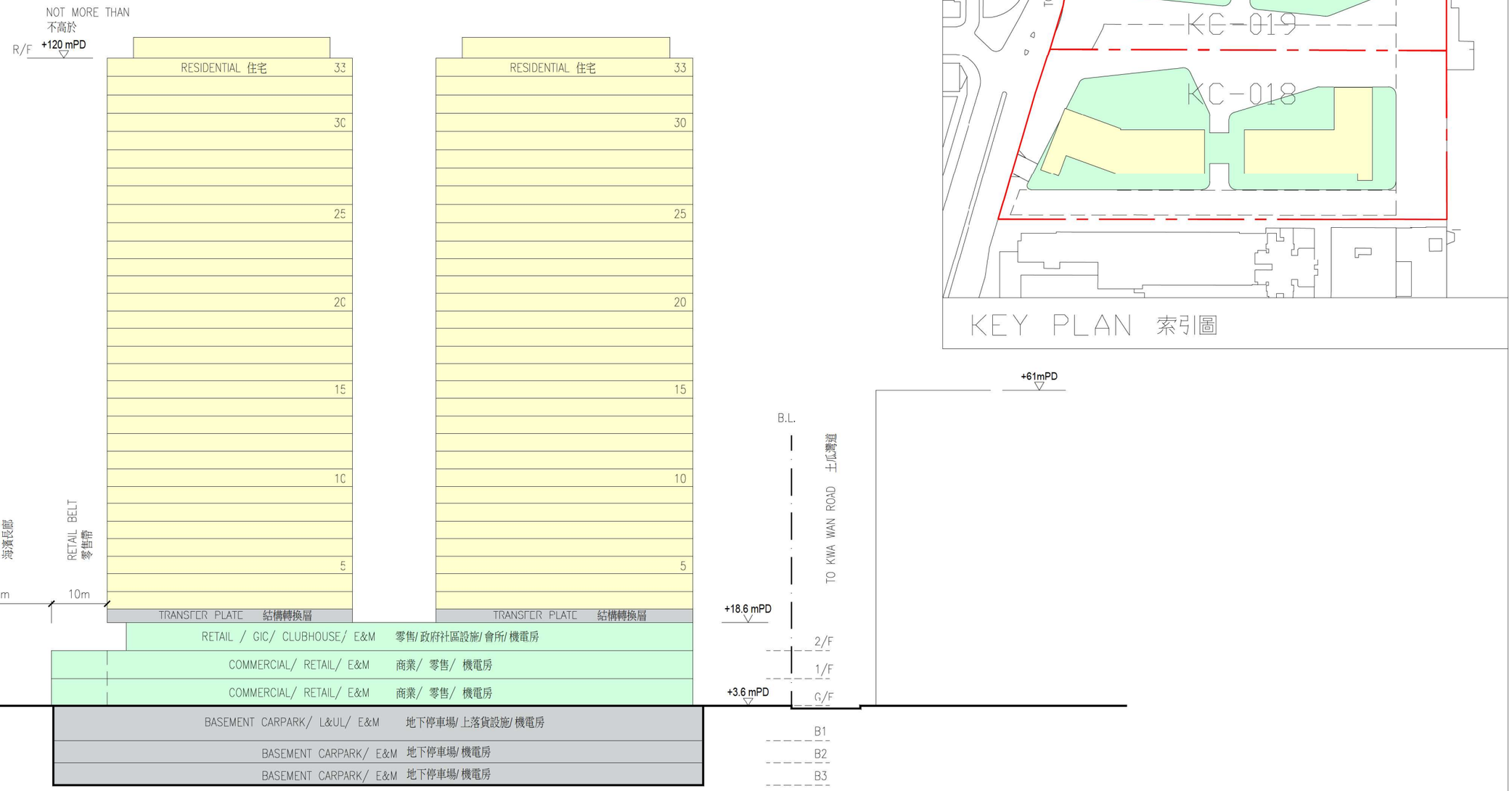
URBAN RENEWAL AUTHORITY

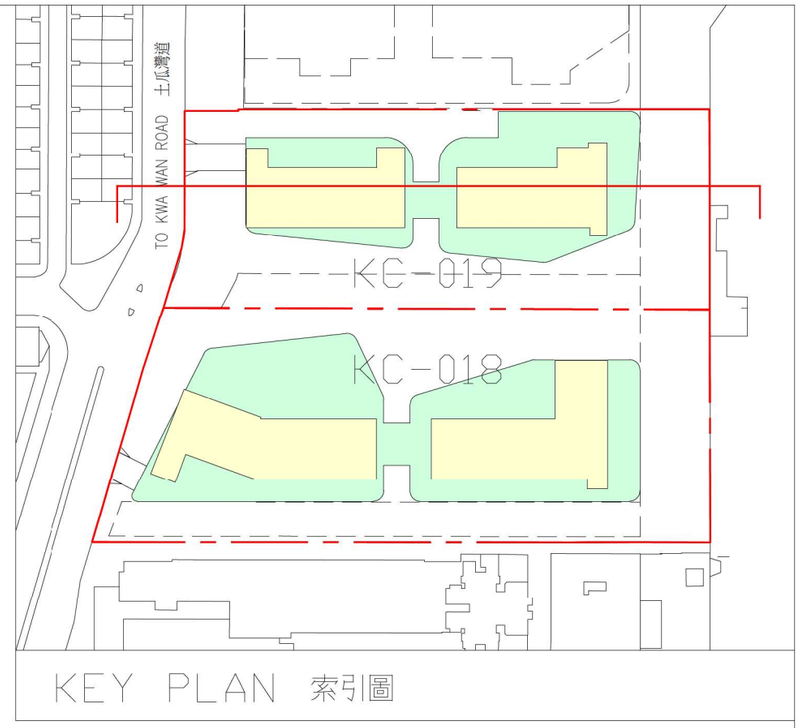
URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Schematic Section

FIGURE 1.3
NOT TO SCALE

KC-019





(Notional layout subject to detailed design and liaison with relevant government departments upon DSP approval)

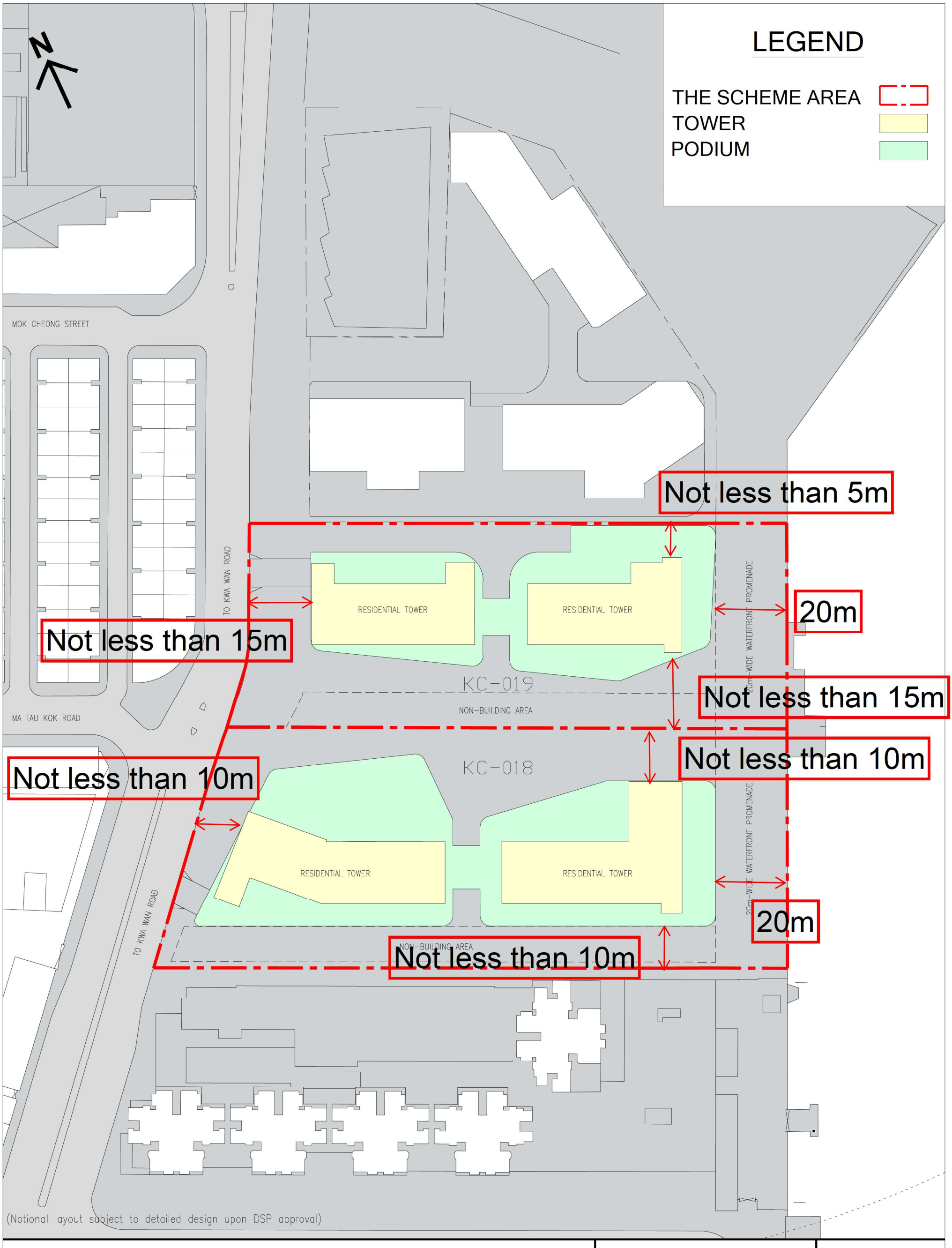
市區重建局
URBAN RENEWAL AUTHORITY

URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Schematic Section

FIGURE 1.4
NOT TO SCALE

Appendix 3 Proposed Air Ventilation Design Measures of the Proposed Scheme



URBAN RENEWAL AUTHORITY 市區重建局

URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Block Plan

FIGURE 1.1
NOT TO SCALE

Appendix 7

Drainage and Sewerage Impact Assessment (DSIA) Report

Prepared for

Urban Renewal Authority

Prepared by

Ramboll Hong Kong Limited

TWO DEVELOPMENT SCHEMES - MING LUN STREET/ MA TAU KOK ROAD (KC-018) AND TO KWA WAN ROAD/ MA TAU KOK ROAD (KC-019)

DRIANAGE IMPACT ASSESSMENT

Date	**September 2022**
Prepared by	**Miko Wan** **Assistant Environmental Consultant**
Signed	
Approved by	**Calvin CHIU** **Senior Manager**
Signed	
Project Reference	**URAKCAA2EI01**
Document No.	**R8702_V1.1**

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CHAPTERS

TABLES

FIGURES

APPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 Under a holistic planning approach, the URA has proposed two Development Schemes at Ming Lun Street / Ma Tau Kok Road (KC-018) and To Kwa Wan Road / Ma Tau Kok Road (KC-019) (the Schemes). URA's intention is to implement the 2 Schemes as 1 inclusive redevelopment. A comprehensive notional scheme is prepared considering the 2 connecting sites as one redevelopment.

1.1.2 This Drainage Impact Assessment is prepared to support the two draft Development Scheme Plans (DSPs) submission to the Town Planning Board (TPB) under Section 25 of the Urban Renewal Authority Ordinance. This Report covers and supports both Schemes as one comprehensive redevelopment.

1.1.3 Ramboll Hong Kong Limited has been appointed by URA to conduct this Drainage Impact Assessment which would evaluate any overall potential drainage impact arising from the proposed development and other planned development.

1.1.4 Architectural drawings and technical information of the redevelopment are provided by the project architect (Ho & Partners Architects Engineers & Development Consultants Limited (HPA)).

1.2 The Schemes and its Environs

1.2.1 The Schemes has a total gross site area of 20,189m^2 (11,430m^2 for KC-018 site and 8,759m^2 for KC-019 site). It is situated in Kowloon City area and about bounded by Hong Kong Housing Society's reserved site for Dedicated Rehousing Estate (DRE) to the north, To Kwa Wan Road to the west, existing Grand Waterfront (residential use) to the south and Ma Tau Kok waterfront to the east. **Figure 1** shows the location of the Schemes.

1.2.2 Existing roads including Ming Lun Street, Chung Sun Street, Hing Yin Street, Hing Yan Street and Ma Tau Kok Road fall within the Schemes. In addition, the Schemes is occupied by ageing residential buildings (more than 60 years) of 7 to 8 storeys with street shops and Newport Centre (industrial building). The street shops include restaurants, retail shop, garage, shops for auto parts, auto cleaning service, hardware store, etc. Newport Centre (Phase 1 & 2) is currently occupied for offices, storage, workshops, showrooms and retail services use.

1.2.3 "13-Street" to the northwest is currently occupied by ageing residential buildings (about 60 years) of 6 to 7 storeys with street shops. The "13-Street" area falls within a "Proposed Redevelopment Priority Area" under DURF. The site is currently zoned as "CDA" under the approved Ma Tau Kok OZP No. S/K10/28 gazetted on 25 March 2022. According to the OZP, the planning intention of this "CDA" zone is for comprehensive re-/development of the area for residential and/or commercial uses with the provision of open space and other supporting facilities.

1.2.4 Grand Waterfront with 5 residential towers erected on top of a retail podium building is situated to the immediate south. Ma Tau Kok Gas Work North Plant is situated on the opposite side of To Kwa Wan Road. Developments further away include Cattle Depot Art Park and Artiest Village, To Kwa Wan Recreation Ground, a number of industrial/commercial buildings (e.g. Merit Industrial Centre, Kapok Industrial Building, New Lee Wah Centre) along To Kwa Wan Road, Wyler Gardens (residential uses) and a ferry pier.

1.2.5 According to the latest update from DSD, there is a drainage upgrading work proposed under Agreement No. CE 42/2018 (DS) of "Drainage Improvement Works in Wong Tai

Sin and Kowloon City – Investigation" along Kowloon City Road and Ma Tau Kok Road which would also go through the Schemes. The upgrading work includes construction of drainage pipe along Kowloon City Road and box culvert along Ma Tau Kok Road. That is, existing box culvert and pipeline along Ma Tau Kok Road including the section within the Schemes will be upgraded to box culvert and it is anticipated that the overall capacity will increase after proposed upgrading work tentatively completed by 2029.

1.3 Proposed Redevelopment

1.3.1 The Proposed Redevelopment at the Schemes consists of 4 residential towers with 3 lowest floors for retail/GIC/clubhouse purpose and 31 domestic storeys above. Greenery area will be provided which covers a minimum of about 20% of the site area as required in PNAP APP-152.

1.3.2 The tentative completion dates of the proposed redevelopment at both KC-018 site and KC-019 site are 2033.

1.3.3 The Master Layout Plan (MLP), typical floor plan and section of the Proposed Development are shown in **Appendix 1.**

2. DRAINAGE IMPACT ASSESSMENT

2.1 Scope of Work

2.1.1 The aim of this DIA is to assess whether the capacity of the existing drainage network serving the Subject Site is sufficient to cope with the stormwater runoff from the proposed development.

2.1.2 Drainage Record Plans from GeoInfo Map were obtained for the purposes of this DIA.

2.2 Assessment Criteria and Methodology

2.2.1 The assessment standard complies with Drainage Services Department (DSD) Stormwater Drainage Manual (SDM) (2018 Edition).

2.2.2 The catchment runoff has been calculated using the "Rational Method", as outlined in the DSD SDM:

$$Q = 0.278\ C\ i\ A$$

Where Q = peak runoff in m^3/s
C = runoff coefficient (dimensionless)
i = rainfall intensity in mm/hr
A = catchment area in km

2.2.3 The existing Subject Site comprises of fully paved area and the Scheme comprised at least 20% greenery area. The runoff coefficients of 0.35 and 0.95 are adopted, respectively.

2.3 Existing Drainage System

2.3.1 There exists underground drainage system comprising box culvert and pipeline along Ma Tau Kok Road and through the Schemes to convey surface runoff eastward to the marine environment then (see **Figure 2**). Existing surface runoff generated onsite is collected and discharged to the aforementioned drainage system within the Schemes.

2.4 Proposed Drainage System

2.4.1 According to the proposal from Agreement No. CE 42/2018 (DS) of "Drainage Improvement Works in Wong Tai Sin and Kowloon City – Investigation", drainage pipe along Kowloon City Road and Ma Tau Kok Road will be upgraded. The works include the provision of upgraded drainage pipe and box culvert along Kowloon City Road and Ma Tau Kok Road. The upgraded proposal from DSD is shown in **Appendix 3**. The upgrading proposal from DSD could only be implemented if the two Schemes are implemented under separate development programmes.

2.4.2 It is URA's intention to implement the two sites as one inclusive redevelopment. Should the two Schemes to be implemented under the same development programme in-one-go, due to the fact that the upgrading works will also pass though the Schemes at the middle and will significantly limit the design flexibility in future, an alternative proposal of upgraded works is proposed by diverting the section of proposed box culvert along Ma Tau Kok Road at the middle of the Schemes to go south along To Kwa Wan Road first and then go east along the south side within KC-018 Site. Details of the diversion are shown in **Figure 3**. Surface runoff from the nearby catchments will be conveyed by this new pipeline through a new outfall (OF3) to the marine environment.

2.4.3 Two terminal manholes, DT-1A and DT-1B, are proposed to collect the surface runoff from the Site KC-018 and KC-019 as shown in **Figure 3.**

2.4.4 Surface runoff from Site KC-018 will be discharged from DT-1A and connected to the new box culvert at proposed manhole D6. That from Site KC-019 will be discharged from DT-1B and then connected to the existing manhole SMH4030621 (D13) and discharged to through the existing outfall SOF4003742(OF2).

2.5 Discussion

2.5.1 Under the current condition, the site is fully paved. In the Schemes, open landscape areas (unpaved area with a minimum of about 20% of the Application Site as required in PNAP APP-152) will be provided. As there will be less runoff generated from vegetated area, there would be reduction in stormwater runoff when compared to the existing condition.

2.5.2 The capacity of proposed drainage box culvert based on design under Agreement No. CE 42/2018 (DS) is estimated in **Table 2.1** below. The minimum capacity is 2.71m^3/s. Detailed calculation can be referred to **Appendix 2**.

Table 2.1 Hydraulic Capacities for Box Culvert Agreement No. CE 42/2018 (DS)

Manhole		Width mm	Height mm	Capacity (m^3/s)
From	To			
Proposed Box Culvert				
SMH4030512	SMH4030513	2200	2300	5.25
SMH4030513	SMH4030514	2200	2300	17.06
SMH4030514	SMH4030490	2200	2300	4.33
SMH4030490	SKH4067540	2200	2300	25.46
SKH4067540	SKH4067541	3600	1600	4.63
SKH4067541	SMH4030491	3600	1600	6.58
SMH4030491	SMH4067721	3600	1600	5.92
SMH4067721	SMH4003980	3600	1600	5.30
SMH4003980	SMH4030493	3600	1600	**2.71**
SMH4030493	SMH4067722	3000	1600	24.47

2.5.3 The capacity of the proposed box culvert based on the counter proposal is shown in **Table 2.2** below. The minimum capacity is 6.88m^3/s, which is more than the minimum capacity of Agreement No. CE 42/2018 (DS). In other words, it is apparently practical to have an alternative alignment of drainage upgrading work which can achieve same or even higher capacity. Detailed calculation is included in **Appendix 2**.

Table 2.2 Hydraulic Capacities for Proposed Box Culvert

Manhole		Width mm	Height mm	Capacity (m^3/s)
From	To			
Proposed Box Culvert				
D1	D2	2200	2300	9.38
D2	D3	2200	2300	**6.88**
D3	D4	2200	2300	9.43
D4	D5	3600	1600	10.50
D5	D6	3600	1600	7.16
D6	D7	3000	1600	20.18

2.5.4 A new outfall will be constructed for the alternative alignment in the counter-proposal. Similar to the originally proposed upgrading work, flap valve will be installed at the new outfall to avoid backflow. The feasibility will be further investigated in later stage.

2.5.5 A Non-Building Area (NBA) as stipulated in the Outline Zoning Plan (OZP) with an area of 10m width is located on the on southern side of KC-018 Site, which could cater the alternative alignment of the drainage upgrading work will not have any aboveground structure constructed to facilitate future maintenance of the drainage system by DSD. As the tentative completion year of the drainage upgrading work is before that of the Schemes, the applicant will liaise closely with DSD on this matter and have necessary demolition work accelerated to cope with the programme of the drainage upgrading work in detailed design and construction stage.

3. OVERALL CONCLUSION

3.1.1 With at least 20% of the Scheme designated will be allocated for landscaped area (unpaved area), there would be reduction in stormwater runoff compared with the existing condition. Adverse drainage impact due to the proposed development is not likely.

3.1.2 Besides, according to the counter proposal to divert the section of box culvert based on design in the Agreement of CE 42/2018 (DS), there will be no reduction of the upgraded capacity of the drainage system.

3.1.3 To conclude, there would be no adverse drainage impacts as a result of the proposed development and the counter proposal of drainage upgrading work.

3.1.4 This DIA confirms the feasibility of the Proposed Development in terms of impacts to the public drainage system.

Figures

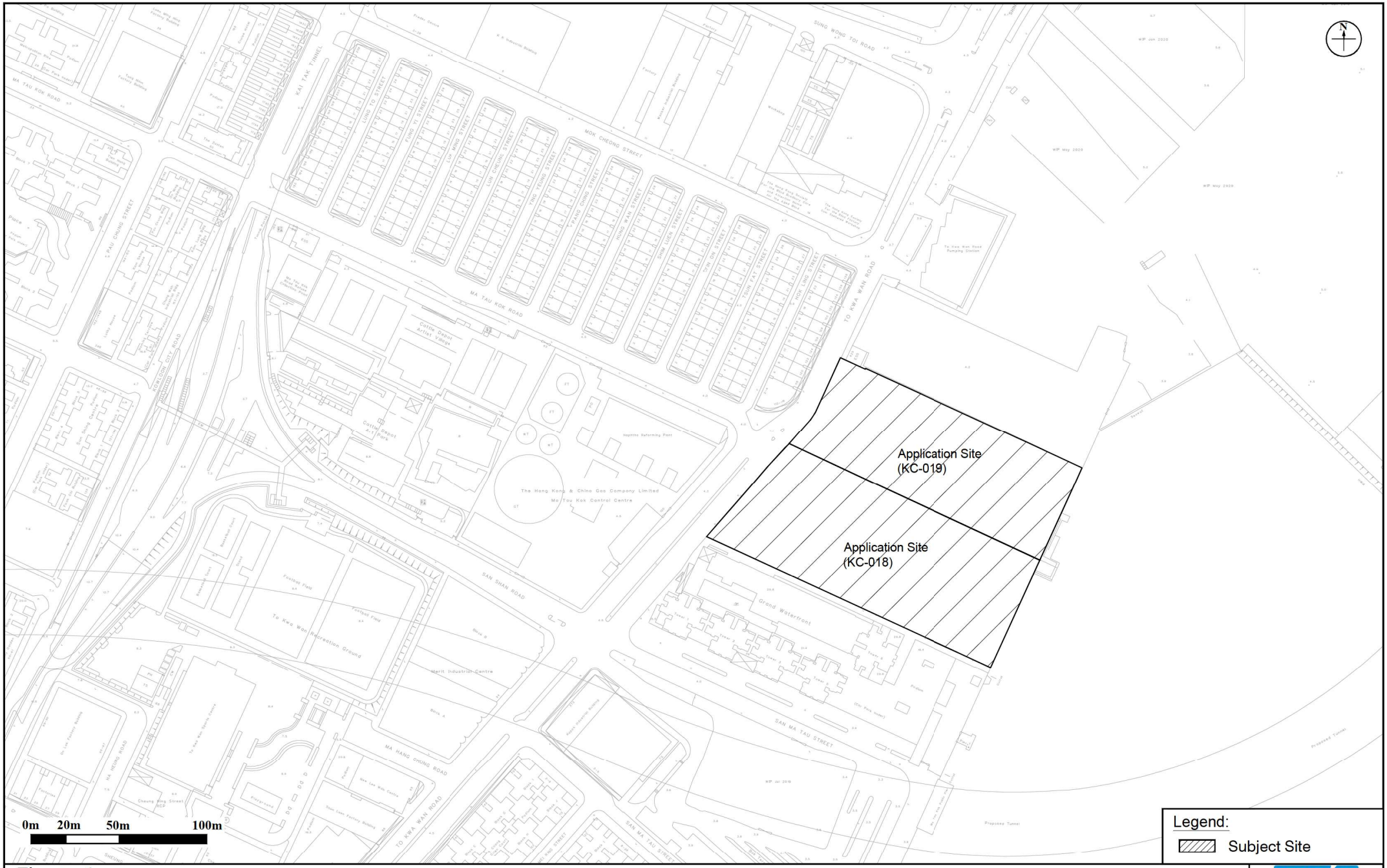

Figure: 1

Title: Location of Subject Site and Its Environs

Project: TWO DEVELOPMENT SCHEMES - MING LUN STREET/ MA TAU KOK ROAD (KC-018) AND TO KWA WAN ROAD/ MA TAU KOK ROAD (KC-019)

RAMBOLL

Drawn by:	AL
Checked by:	CC
Rev.:	1.1
Date:	Jul 2022

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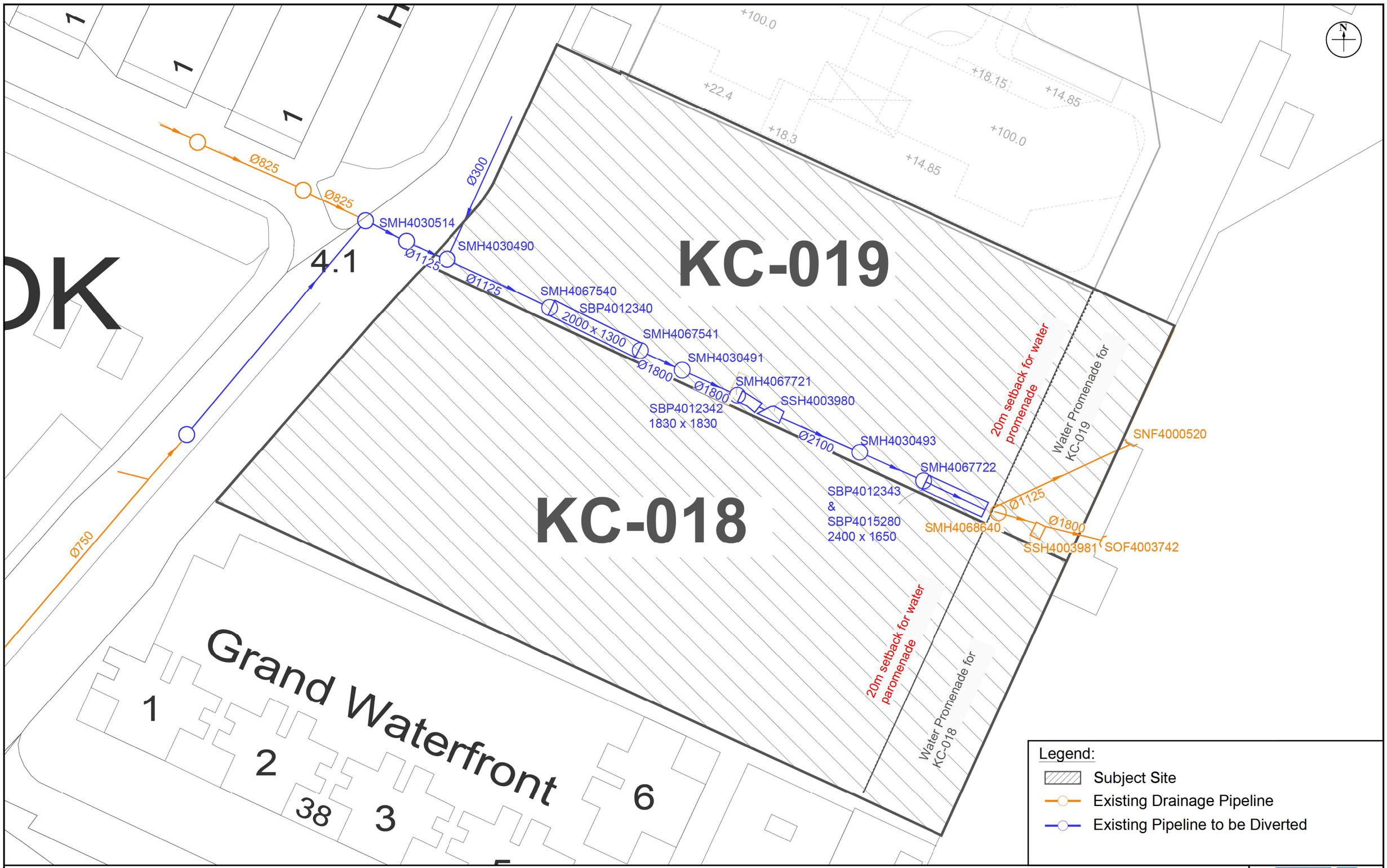

Figure: 2	RAMBOLL
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Project: TWO DEVELOPMENT SCHEMES - MING LUN STREET/ MA TAU KOK ROAD (KC-018) AND TO KWA WAN ROAD/ MA TAU KOK ROAD (KC-019)	Rev.: 1.1 Date: Sep 2022

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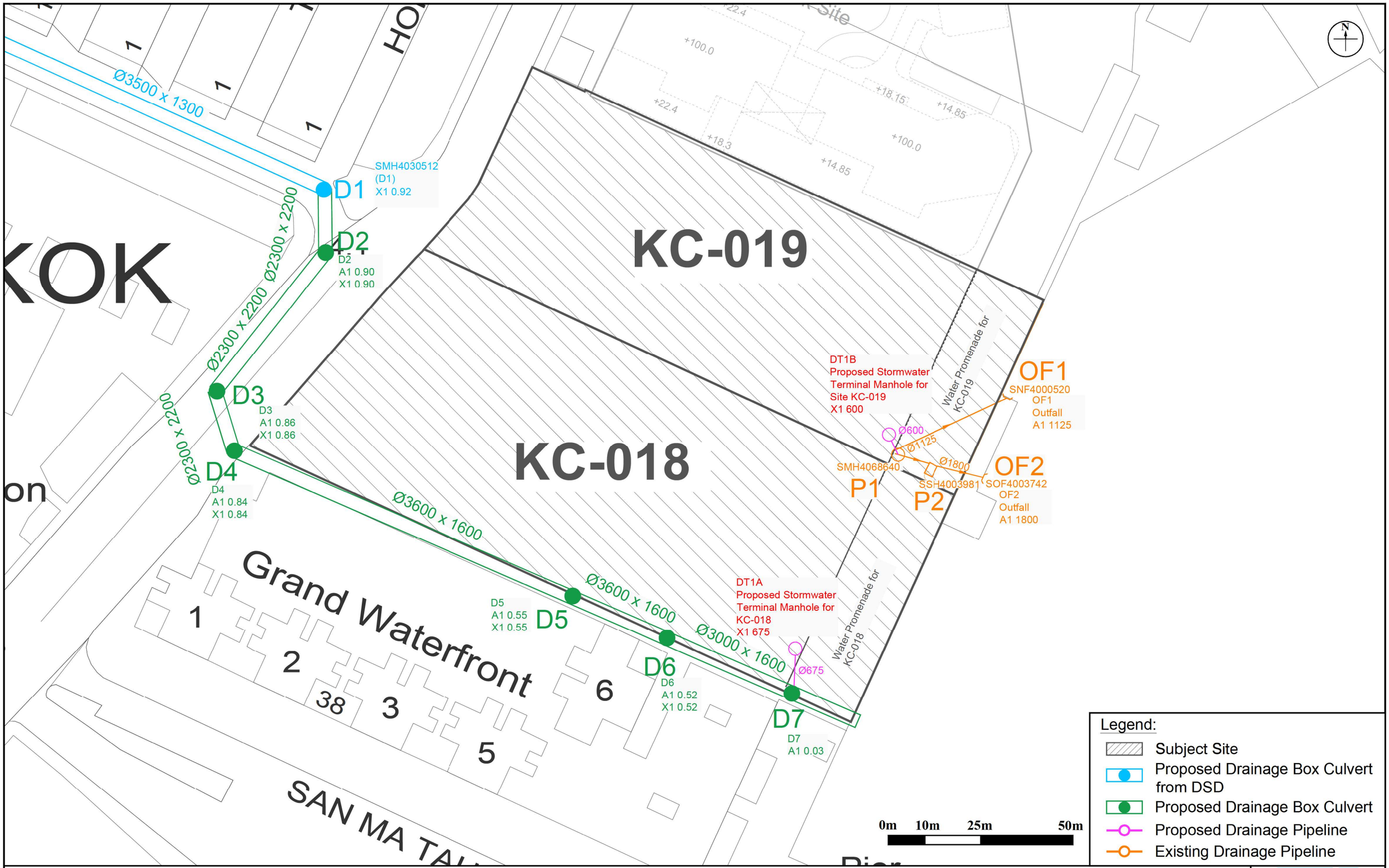

Figure:	3	RAMBOLL
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Project:	TWO DEVELOPMENT SCHEMES - MING LUN STREET/ MA TAU KOK ROAD (KC-018) AND TO KWA WAN ROAD/ MA TAU KOK ROAD (KC-019)	Rev.: 1.1 Date: Sep 2022

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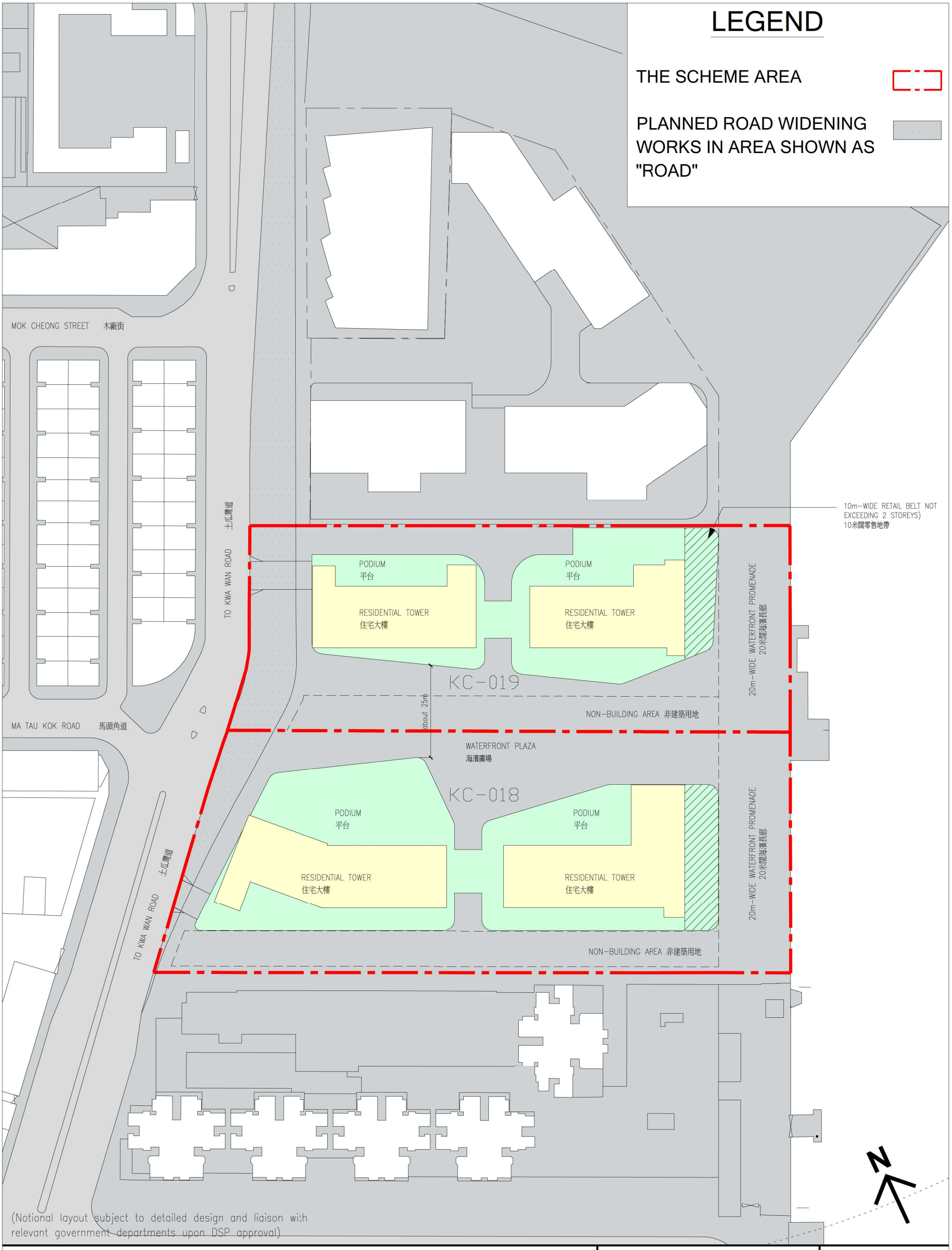
Appendix 1 Tentative Layout Plan

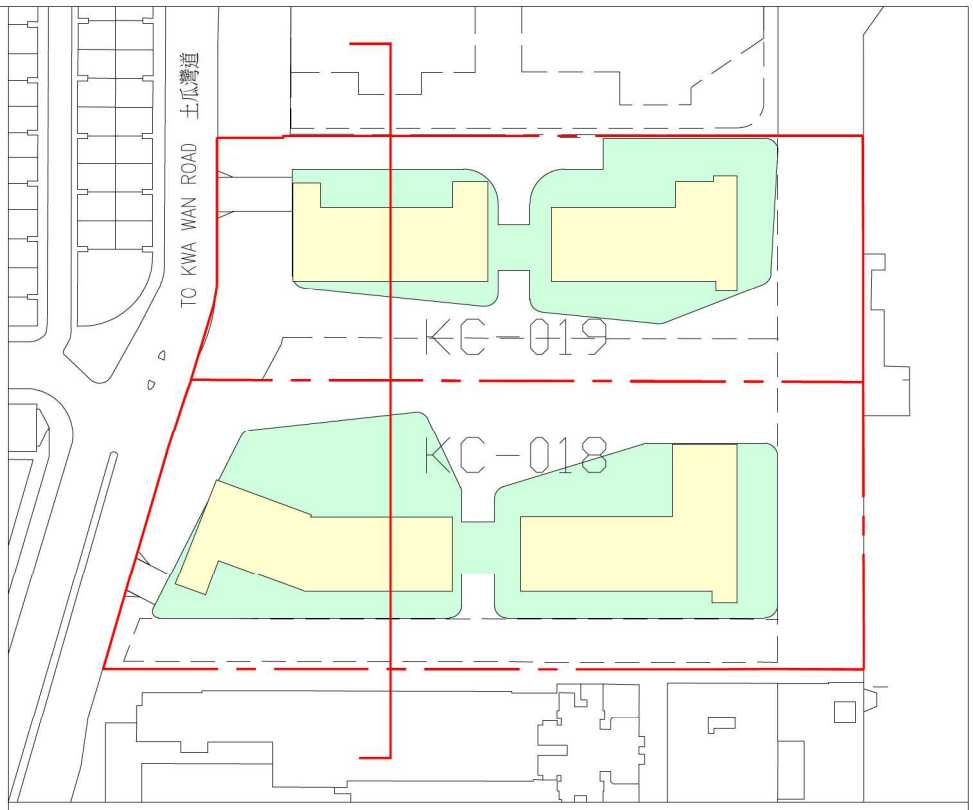


URBAN RENEWAL AUTHORITY 市區重建局

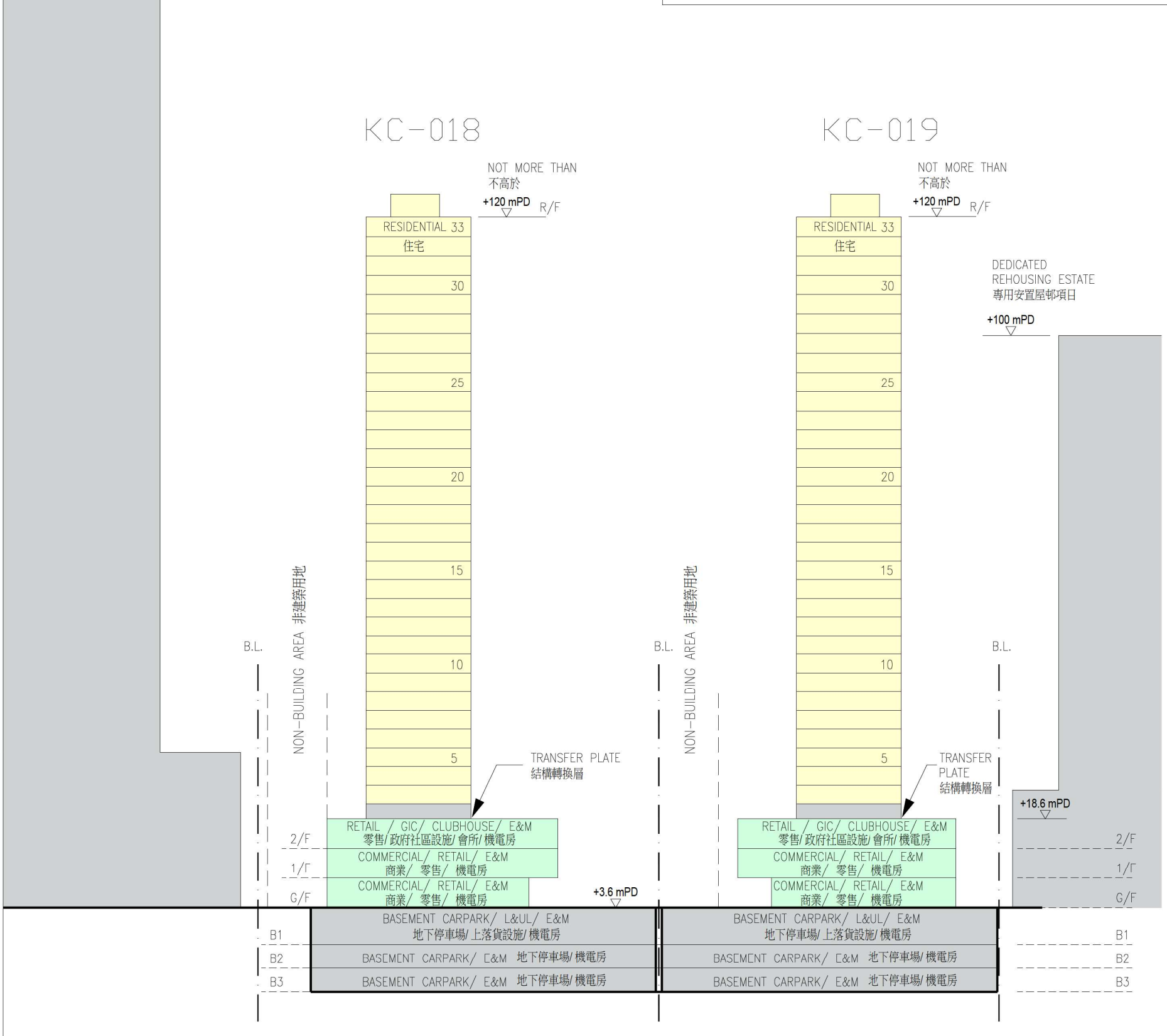
URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Block Plan

FIGURE 1.1
NOT TO SCALE



KEY PLAN 索引圖



(Notional layout subject to detailed design and liaison with relevant government departments upon DSP approval)

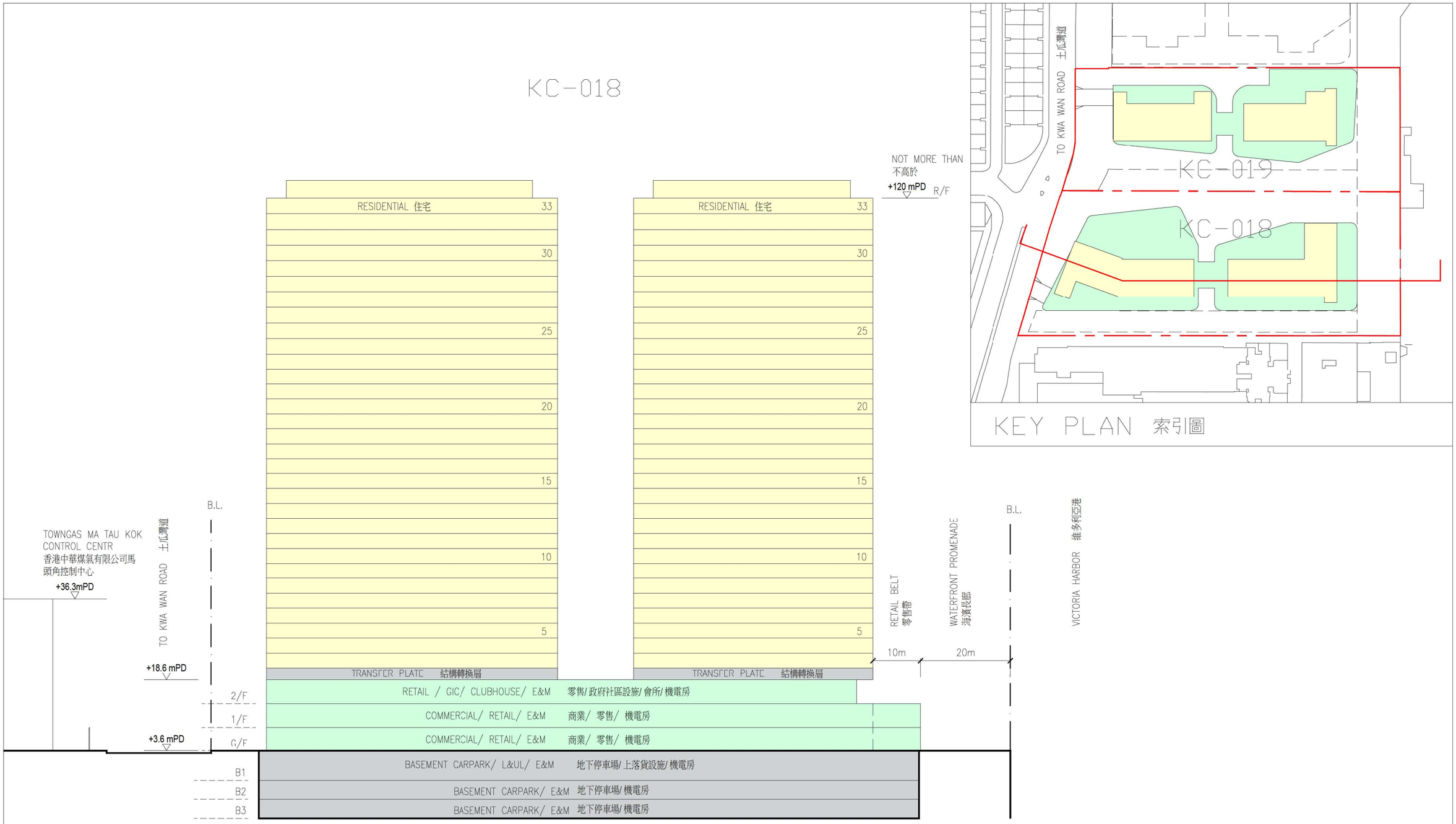
市區重建局
URBAN RENEWAL AUTHORITY

URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Schematic Section

FIGURE 1.2
NOT TO SCALE

KC-018



(Notional layout subject to detailed design and liaison with relevant government departments upon DSP approval)

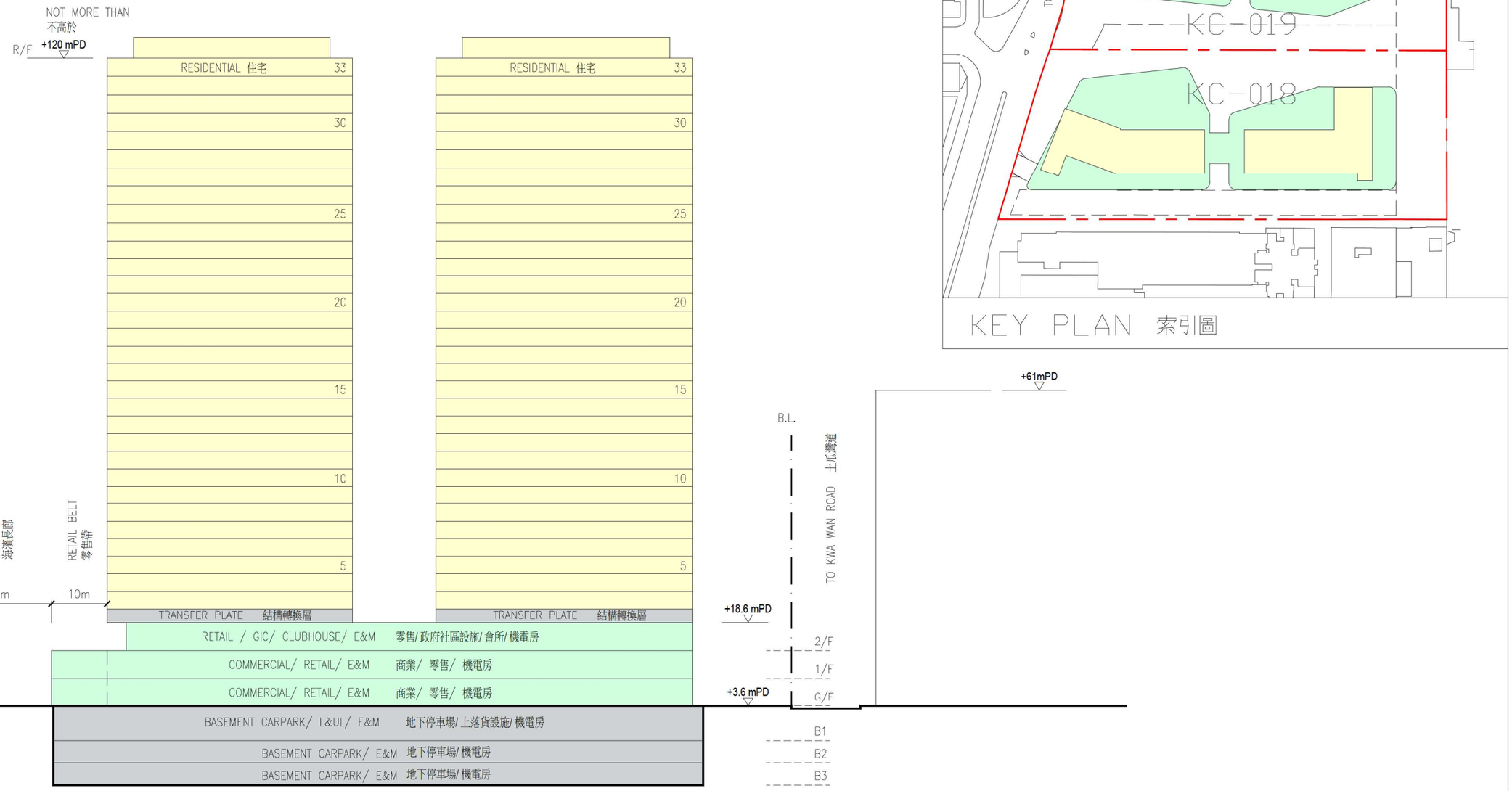
市區重建局
URBAN RENEWAL AUTHORITY

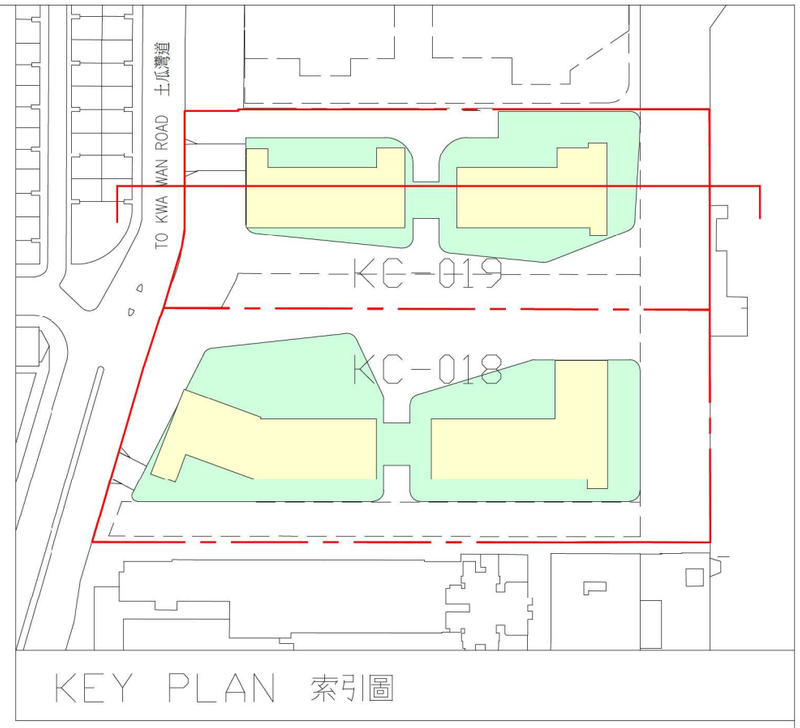
URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Schematic Section

FIGURE 1.3
NOT TO SCALE

KC-019





(Notional layout subject to detailed design and liaison with relevant government departments upon DSP approval)

市區重建局
URBAN RENEWAL AUTHORITY

URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Schematic Section

FIGURE 1.4
NOT TO SCALE

Appendix 2 Detailed Drainage Impact Assessment Calculations

KC018 & KC019
Table 1 - Proposed Catchment Areas and Run-off (1 in 200 year)

$$Q_p = 0.278\ C\ i\ A$$

where Q_p = peak runoff in m^3/s
C = runoff coefficient (dimensionless)
i = rainfall intensity in mm/hr
A = catchment area in km^2

Surface Characteristics	*Runoff coefficient, C**
Asphalt	0.70 - 0.95
Concrete	0.80 - 0.95
Brick	0.70 - 0.85
Grassland (heavy soil**)	
Flat	0.13 - 0.25
Steep	0.25 - 0.35
Grassland (sandy soil)	
Flat	0.05 - 0.15
Steep	0.15 - 0.20

Notes:
Site Area (KC-018) 11,430 m^2
Site Area (KC-019) 8,759 m^2

Catchments are small, so Rational Method is appropriate

1 in 200-year (according to Table 3 of DSD Manual)
a= 429.5
b= 2.05
c= 0.295

	Catchment	Discharge Manhole	Paved	Unpaved	Run-off at	Area	Levels (mPD)		Fall	Overland, L	Fall, H	Overland t_c	t_0	Total t_f[1]	Total t_c[2]	Intensity	Weighted Runoff Coefficient	Run-off
						(m^2)	Upstream	Downstream	(m)	(m)	(m/100m)	(min)	(min)	(min)	(min)	(mm/h)		(m^3/s)
Existing	KC-018	-	100%	0%	-	11,430				138.4	0.3	10.4	10.4	0.00	10.37	204	0.95	0.617
	KC-019	-	100%	0%	-	8,759				124.4	0.3	9.6	9.6	0.00	9.58	208	0.95	0.482
					Overall	**20,189**												**1.098**
Future	**Proposed Site**																	
	KC-018	DT1A	80%	20%	D7	11,430				138.4	0.3	10.4	10.4	0.00	10.37	204	0.79	0.513
	KC-019	DT1B	80%	20%	P1	8,759				124.4	0.3	9.6	9.6	0.00	9.58	208	0.79	0.401
					Overall	**20,189**												**0.913**

Remarks:
1. Assumed Time of Concentration through stream flow
2. Assumed Time of Concentration
3. GA-2 is included in MFR-9
4. GA-4a is included in MFR-5
5. GA-4b is included in MFR-4

KC018 & KC019
Hydraulic Calculations of Existing and Proposed Drainage System

Table 2 - 1 in 200 year Runoff of Future Catchments (m^3/s)

Runoff at	KC-018	KC-019	Total
D7	0.513		**0.51**
P1		0.401	**0.40**

Table 3a - Hydraulic Capacities for Existing Drainage System

Segment	Manhole Reference	Manhole Reference	Type of Channel	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k_s	s	Gradient	v	V	Area	Q	Q_{silt}[1]
				mm	m	mPD	mPD	m/s^2	m		1 in	m^2/s	m/s	m^2	m^3/s	m^3/s
P1 - OF1	SMH4068640	SNF4000520	Circular	1125	35.3	0.87	0.09	9.81	0.0003	0.022	45	0.000001	5.76	0.99	5.72	5.15

Table 3b - Hydraulic Capacities for Proposed Box Culvert from DSD

Segment		Shape	Width (W)	Height (H)	Pipe Length (L)	Invert Level 1	Invert Level 2	Slope/s	Manning's roughness coefficient	Cross Section Area	Wetted Perimeter	Hydraulic Radius (R)	V	Q	Q_{silt}[1]
			m	m	m	mPD	mPD			m^2	m	m	m/s	m^3/s	m^3/s
SMH4030512	SMH4030513	Box Culvert	2.30	2.20	13.7	0.920	0.910	0.001	0.016	5.06	9.00	0.562	1.15	5.83	5.25
SMH4030513	SMH4030514	Box Culvert	2.30	2.20	9.7	0.910	0.835	0.008	0.016	5.06	9.00	0.562	3.75	18.95	17.06
SMH4030514	SMH4030490	Box Culvert	2.30	2.20	10.0	0.835	0.830	0.000	0.016	5.06	9.00	0.562	0.95	4.81	4.33
SMH4030490	SKH4067540	Box Culvert	2.30	2.20	25.5	0.830	0.390	0.017	0.016	5.06	9.00	0.562	5.59	28.29	25.46
SKH4067540	SKH4067541	Box Culvert	3.60	1.60	22.2	0.390	0.380	0.000	0.016	5.76	10.40	0.554	0.89	5.15	4.63
SKH4067541	SMH4030491	Box Culvert	3.60	1.60	11.0	0.380	0.370	0.001	0.016	5.76	10.40	0.554	1.27	7.31	6.58
SMH4030491	SMH4067721	Box Culvert	3.60	1.60	13.6	0.370	0.360	0.001	0.016	5.76	10.40	0.554	1.14	6.58	5.92
SMH4067721	SMH4003980	Box Culvert	3.60	1.60	8.5	0.360	0.355	0.001	0.016	5.76	10.40	0.554	1.02	5.89	5.30
SMH4003980	SMH4030493	Box Culvert	3.00	1.60	20.8	0.355	0.350	0.000	0.016	4.80	9.20	0.522	0.63	3.02	**2.71**
SMH4030493	SMH4067722	Box Culvert	3.00	1.60	16.4	0.350	0.030	0.020	0.016	4.80	9.20	0.522	5.66	27.18	24.47

Table 3c - Hydraulic Capacities for Proposed Box Culvert

Segment		Shape	Width (W)	Height (H)	Pipe Length (L)	Invert Level 1	Invert Level 2	Slope/s	Manning's roughness coefficient	Cross Section Area	Wetted Perimeter	Hydraulic Radius (R)	V	Q	Q_{silt}[1]
			m	m	m	mPD	mPD			m^2	m	m	m/s	m^3/s	m^3/s
D1	D2	Box Culvert	2.30	2.20	17.1	0.92	0.88	0.002	0.016	5.06	9.00	0.562	2.06	10.42	9.38
D2	D3	Box Culvert	2.30	2.20	47.7	0.88	0.82	0.001	0.016	5.06	9.00	0.562	1.51	7.64	**6.88**
D3	D4	Box Culvert	2.30	2.20	16.9	0.82	0.78	0.002	0.016	5.06	9.00	0.562	2.07	10.48	9.43
D4	D5	Box Culvert	3.60	1.60	99.7	0.78	0.55	0.002	0.016	5.76	10.40	0.554	2.02	11.66	10.50
D5	D6	Box Culvert	3.60	1.60	27.9	0.55	0.52	0.001	0.016	5.76	10.40	0.554	1.38	7.96	7.16
D6	D7	Box Culvert	3.00	1.60	36.9	0.52	0.03	0.013	0.016	4.80	9.20	0.522	4.67	22.40	20.16

Table 3d - Hydraulic Capacities for Proposed Drains from the Terminal Manhole of the Proposed Development

Segment	Manhole Reference	Manhole Reference	Type of Channel	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k_s	s	Gradient	v	V	Area	Q	Q_{silt}[1]
				mm	m	mPD	mPD	m/s^2	m		1 in	m^2/s	m/s	m^2	m^3/s	m^3/s
DT1A - D7	-	-	Circular	675	-	-	-	9.81	0.0003	0.007	150	0.000001	2.30	0.36	0.82	0.74
DT1B - P1	-	-	Circular	600	-	-	-	9.81	0.0003	0.007	150	0.000001	2.14	0.28	0.61	0.55

Table 4a - Comparison of Runoff from Proposed Catchments and Hydraulic Capacities of Existing Drainage System

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Q_{silt}[1]	Catchment Involved	Runoff	Occupancy	Sufficient Capacity?	Runoff [2]	Occupancy	Sufficient Capacity?	Runoff [3]	Occupancy	Sufficient Capacity?
			mm	m^3/s		m^3/s			m^3/s			m^3/s		
P1 - OF1	SMH4068640	SNF4000520	1125	5.15	KC-019	0.40	7.8%	YES	0.44	8.6%	YES	0.45	8.8%	YES

Table 4b - Comparison of Runoff from Proposed Development and Hydraulic Capcities of Proposed Drains

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Q_{silt}[1]	Catchment Involved	Runoff	Occupancy	Sufficient Capacity?	Runoff [2]	Occupancy	Sufficient Capacity?	Runoff [3]	Occupancy	Sufficient Capacity?
			mm	m^3/s		m^3/s			m^3/s			m^3/s		
DT1A - D7	-	-	675	0.74	KC018	0.51	69.1%	YES	0.57	76.3%	YES	0.58	78.3%	YES
DT1B - P1	-	-	600	0.55	KC019	0.40	73.5%	YES	0.44	81.1%	YES	0.45	83.3%	YES

Remarks:
1. Qsilt: 10% reduction in flow for gradient is not greater than 1 in 25, 5% reduction in flow for gradient greater than 1 in 25.
2. Cross Section Area of Circular Pipe: D^2 × PI / 4
3. Perimeter of Circular Pipe: (D × 2 × PI) / 2

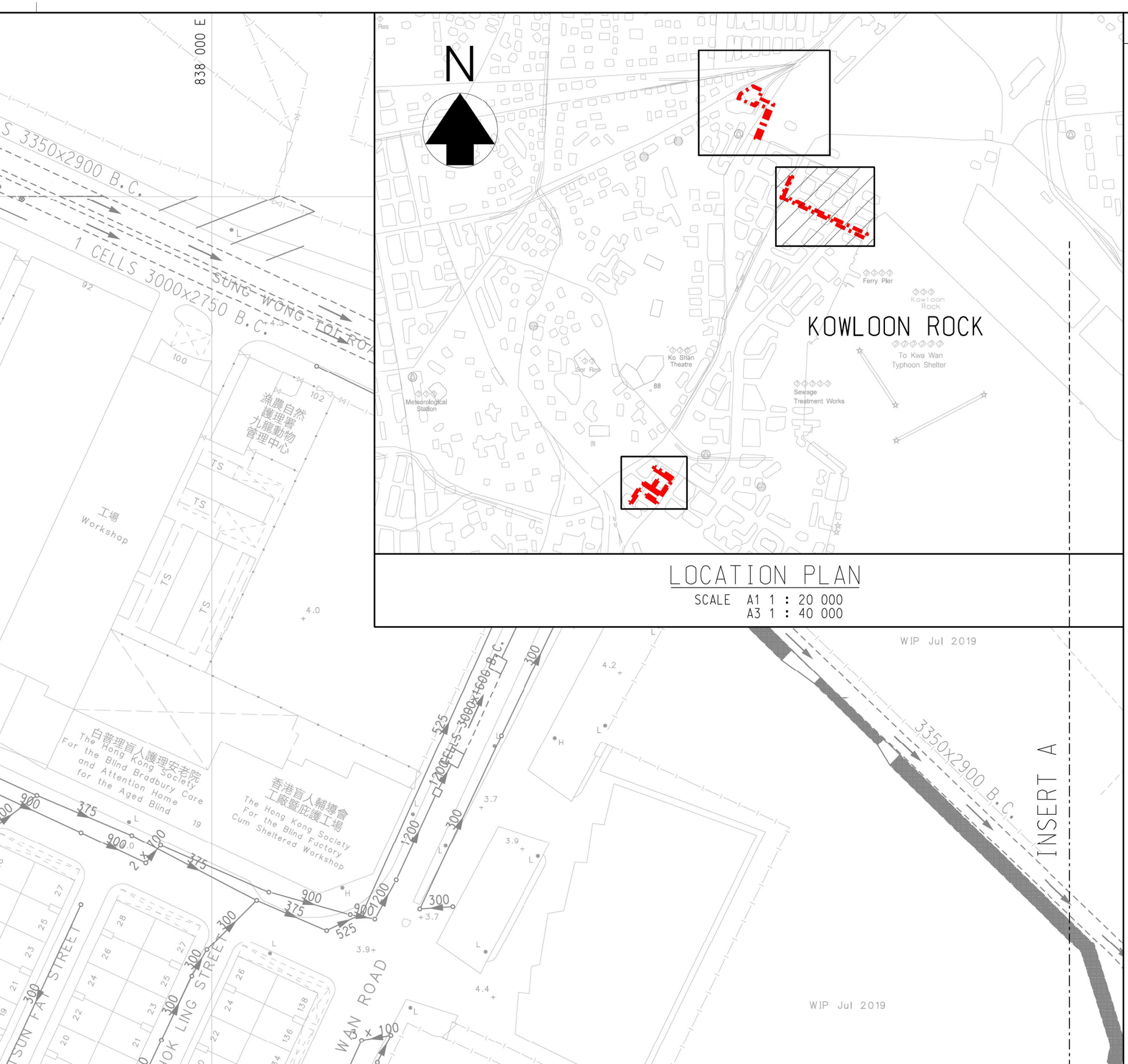
Appendix 3 Agreement of No. CE 42/2018 (DS) obtained from Drainage Services Department

NOTES:

1. ALL GRIDS ARE HONG KONG METRIC GRID 1980.
2. ALL LEVELS ARE IN METRES ABOVE PRINCIPAL DATUM (P.D.) OF HONG KONG UNLESS SHOWN OTHERWISE.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.

LEGEND:

	PROJECT BOUNDARY
	EXISTING BOX CULVERT
225	EXISTING STORMWATER DRAIN AND MANHOLE
600 (300)	EXISTING 300mm DIAMETER STORMWATER DRAIN TO BE UPGRADED TO 600mm DIAMETER DRAIN
SMH4045331	EXISTING STORMWATER MANHOLE TO BE MODIFIED OR UPGRADED
600	PROPOSED STORMWATER DRAIN FOR SIZE SMALLER THAN OR EQUAL TO 900mm DIAMETER
1500	PROPOSED STORMWATER DRAIN FOR SIZE GREATER THAN 900mm DIAMETER
3000x1600 B.C. (2400x1650 B.C.)	EXISTING 1 CELL 2400mm x 1650mm STORMWATER BOX CULVERT TO BE UPGRADED TO 1 CELL 3000mm x 1650mm STORMWATER BOX CULVERT



LOCATION PLAN

SCALE A1 1 : 20 000
A3 1 : 40 000

Prepared for

Urban Renewal Authority

Prepared by

Ramboll Hong Kong Limited

TWO DEVELOPMENT SCHEMES - MING LUN STREET/ MA TAU KOK ROAD (KC-018) AND TO KWA WAN ROAD/ MA TAU KOK ROAD (KC-019)

SEWERAGE IMPACT ASSESSMENT

Date	**September 2022**
Prepared by	**Miko Wan** **Assistant Environmental Consultant**
Signed	
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Signed	
Project Reference	**URAKCAA2EI01**
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CHAPTERS

TABLES

FIGURES

APPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 Under a holistic planning approach, the URA has proposed two Development Schemes at Ming Lun Street / Ma Tau Kok Road (KC-018) and To Kwa Wan Road / Ma Tau Kok Road (KC-019) (the Schemes). URA's intention is to implement the 2 Schemes as 1 inclusive redevelopment. A comprehensive notional scheme is prepared considering the 2 connecting sites as one redevelopment.

1.1.2 This Sewerage Impact Assessment is prepared to support the two draft Development Scheme Plans (DSPs) submission to the Town Planning Board (TPB) under Section 25 of the Urban Renewal Authority Ordinance. This Report covers and supports both Schemes as one comprehensive redevelopment.

1.1.3 Ramboll Hong Kong Limited has been appointed by URA to conduct this Sewerage Impact Assessment which would evaluate any overall potential impact on sewerage arising from the proposed development and other planned development.

1.1.4 Architectural drawings and technical information of the redevelopment are provided by the project architect (Ho & Partners Architects Engineers & Development Consultants Limited (HPA)).

1.2 The Schemes and its Environs

1.2.1 The Schemes has a total gross site area of 20,189m^2 (11,430m^2 for KC-018 site and 8,759m^2 for KC-019 site). It is situated in Kowloon City area and about bounded by Hong Kong Housing Society's reserved site for Dedicated Rehousing Estate (DRE) to the north, To Kwa Wan Road to the west, existing Grand Waterfront (residential use) to the south and Ma Tau Kok waterfront to the east. **Figure 1** shows the location of the Schemes.

1.2.2 Existing roads including Ming Lun Street, Chung Sun Street, Hing Yin Street, Hing Yan Street and Ma Tau Kok Road fall within the Schemes. In addition, the Schemes is occupied by ageing residential buildings (more than 60 years) of 7 to 8 storeys with street shops and Newport Centre (industrial building). The street shops include restaurants, retail shop, garage, shops for auto parts, auto cleaning service, hardware store, etc. Newport Centre (Phase 1 & 2) currently occupied for offices, storage, workshops, showrooms and retail services use.

1.2.3 "13-Street" to the northwest is currently occupied by ageing residential buildings (about 60 years) of 6 to 7 storeys with street shops. The "13-Street" area falls within a "*Proposed Redevelopment Priority Area*" under DURF. The site is currently zoned as "CDA" under the approved Ma Tau Kok OZP No. S/K10/28 gazetted on 25 March 2022. According to the OZP, the planning intention of this "CDA" zone is for comprehensive re-/development of the area for residential and/or commercial uses with the provision of open space and other supporting facilities. In order to account the possible scenarios where the surrounding site would undergo similar redevelopment in future, a sensitivity study is also conducted (Section 2.7 refers).

1.2.4 Grand Waterfront with 5 residential towers erected on top of a retail podium building is situated to the immediate south. Ma Tau Kok Gas Work North Plant is situated on the opposite side of To Kwa Wan Road. Developments further away include Cattle Depot Art Park and Artiest Village, To Kwa Wan Recreation Ground, a number of industrial/commercial buildings (e.g. Merit Industrial Centre, Kapok Industrial Building, New Lee Wah Centre) along To Kwa Wan Road, Wyler Gardens (residential uses) and a ferry pier.

1.3 Proposed Redevelopment

1.3.1 The Proposed Redevelopment at the Schemes consists of 4 residential towers with 3 lowest floors for retail/GIC/clubhouse purpose and 31 domestic storeys above. There will be a total of 1,276 flat units provided at KC-018 site and 950 flat units provided at KC-019 site after development. Total number of units is 2,226.

1.3.2 The tentative completion dates of the proposed redevelopment at both KC-018 site and KC-019 site are 2033.

1.3.3 The Master Layout Plan (MLP), typical floor plan and section of the Proposed Development are shown in **Appendix 1.**

2. SEWERAGE IMPACT ASSESSMENT

2.1 Scope of Work

2.1.1 The aim of this Sewerage Impact Assessment (SIA) is to assess whether the capacity of the existing sewerage network serving the Schemes is sufficient to cope with the sewage flow from the proposed redevelopment.

2.2 Assessment Criteria and Methodology

2.2.1 Environmental Protection Department's (EPD's) Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning, Version 1 (GESF) has been referred to for the purposes of estimating the quantity of the sewage generated from the proposed development and the existing catchment area. Sewage flow parameters and global peaking factors in this document have been adopted for this SIA.

2.2.2 Based on the building types in the area, the following unit flow factors are used in the SIA calculation:

- Residents: 0.27 m^3/person/day (Private R2)
- Clubhouse & G/IC Staff: 0.28 m^3/employee/day (J11 - Community, Social & Personal Services)
- Commercial Employee (Retail): 0.28 m^3/employee/day (J4 - Wholesale & Retail)
- Commercial Employee (F&B): 1.58 m^3/employee/day (J10 – Restaurants & Hotels)

2.2.3 The catchment inflow factor, PCIF of 1.00 (Central Kowloon), is adopted in catchment calculations.

2.3 Existing and Future Sewerage System

2.3.1 According to the Drainage Record Plans obtained from DSD, there is an existing Ø1500mm sewer along To Kwa Wan Road. The sewage of existing developments at KC-018 Site and KC-019 Site is currently discharged to this sewer. It is then connected to a Ø1650mm sewer, and then to To Kwa Wan Preliminary Treatment Works (TKWPTW) over 800m to the south. According to the latest update from DSD, it is understood that the existing Ø1500mm sewer is already overloaded. The existing sewer nearby the Schemes is shown in **Figure 2**.

2.3.2 Besides, a recently built To Kwa Wan Road Pumping Station (TKWRPS) is located on northern side of the Schemes. TKWRPS is designed for the planned Kai Tak Development. As clarified with EPD, it is understood that TKWRPS does not have spare capacity to cater flow from the Scheme.

2.3.3 As discussed above, the existing Ø1500mm sewer is already overloaded. Therefore, despite that existing sewage is discharged to this sewer, it is proposed to construct a new Ø600mm sewer and connect from the site to further downstream manhole of this Ø1500mm sewer about 370m apart. In addition to future developments at KC-018 Site and KC-019 Site, the new sewer may also serve other redevelopment site nearby in future given that the existing Ø1500mm sewer is of no or limited spare capacity. The connection is shown in **Figure 2**. It is URA's intention to implement the two sites as one inclusive redevelopment. In any case that the whole redevelopment cannot be implemented in-one-go owing to land acquisition or other issues, the two Schemes may follow separate development programmes, and the new sewer can still serve either KC-018 Site or KC-019 Site separately. The alignment of the proposed new sewer will subject to detailed design and liaison with relevant government departments.

2.3.4 The proposed sewer works would be implemented by the applicant.

2.4 Wastewater Generated by the Proposed Development

2.4.1 Wastewater arising from the proposed development will be primarily contributed by the residents, clubhouse staff and commercial employees.

2.4.2 Detailed calculation for the proposed development is given in **Table 2.1** below.

Table 2.1 Estimated Peak Flow

Site	Development Parameters	Usage				
		Residential Units	Clubhouse	G/IC	Commercial Area (Retail)	Commercial Area (F&B)
KC-018	Area (m^3)	-	2,729	1,000	5,248	5,248
	Number of Residential Units	1,276	-	-	-	-
	Average Household Size	2.7(1)	-	-	-	-
	Assumed Population	2935	90	33	183	268
	Design Flow (m^3/person/day)	0.27(2)	0.28(3)	0.28(3)	0.28(5)	1.58(6)
	Flow Rate (m^3/day)	**792.4**	**25.2**	**9.2**	**51.2**	**423.4**
KC-019	Area (m^3)	-	2,032	500	3,908	3,908
	Number of Residential Units	950	-	-	-	-
	Average Household Size	2.9(1)	-	-	-	-
	Assumed Population	2185	67	17	137	199
	Design Flow (m^3/person/day)	0.27(2)	0.28(3)	0.28(3)	0.28(5)	1.58(6)
	Flow Rate (m^3/day)	**590.0**	**18.8**	**4.6**	**38.4**	**314.4**
	Total Flow Rate (m^3/day)	**2267.9**				
	Peak Flow (L/s)	**55.9**				

Remarks:

(1) Assumption of population per flat (PPF) of 2.3 is adopted from HKPSG Chapter 2. The anticipated residential population of 2,935 in KC-018 and 2,185 in KC-019 are assumed based on the assumption of population per flat (PPF) of 2.3, which is in reference to HKPSG Ch.2. A more conservative approach is also carried out for +17% variation of population increase, which is about 2.7 as the same as the average domestic household size of Kowloon City District in 2021 Population Census. The results demonstrated that it will not incur major deviation from the current assessment.

(2) Refer to Table T-1 of GESF – Public Rental

(3) Refer to Table T-2 of GESF - J11

(4) Refer to Table T-1 of GESF – Private R2

(5) Refer to Table T-2 of GESF – J4

(6) Refer to Table T-2 of GESF – J10

2.5 Assessment of Sewerage Impact

2.5.1 **Appendix 2** shows the detailed calculation on the estimated hydraulic capacity of the existing sewer sections and the calculation of the amount of the sewage entering each segment of the said sewer network.

2.6 Discussion

2.6.1 The potential sewerage impact due to the proposed development has been quantitatively addressed. Sewage generation rate from the proposed development is estimated to be 2267.9 m^3/day (i.e. peak flow 55.9 litre/sec).

2.6.2 According to Table 4 of **Appendix 2** showing the sewage generation rate from the proposed development and surrounding catchment areas, it is found that 3 number of existing Ø 1500mm pipe segments (i.e. Segment S1-S4) along Kwei Chow Street are found with inadequate capacity.

2.6.3 The proposed upgrading works are summarized in below.

Table 2.2 Proposed Upgrading Works

Segment	Length (m)	Original Size (Ø) (mm)	Upgraded Size (Ø) (mm)
S1-S2	15.6	1500	1650
S2-S3	42.3	1500	1650
S3-S4	65.0	1500	1650

2.6.4 The proposed sewer upgrading works between Segment S1-S4 (i.e. between FMH4025360 and FMH4025760) would be implemented by the applicant. With the proposed upgrading works in place, the sewerage system will have adequate capacity to cater for the proposed development and the nearby catchments.

2.6.5 It is worth noted that with sewage from KC-018 Site and KC-019 Site diverted from the existing Ø 1500mm sewer and further upgrading of the segment along Kwei Chow Street upgraded, the overloading situated can be relieved in certain extent which is considered a benefit to the district area as well.

2.7 Further Sensitivity Study

2.7.1 In order to account the possible scenarios where the surrounding sites would undergo similar redevelopments in future, a sensitivity study is conducted.

2.7.2 The study takes into account the planned development at 13-street site and further assume increase of 15% GFA of residential portion. The two scenarios are described as below:

- Scenario 1

Residential	4,408 flats
Non - domestic	48,990 sq.m GFA (assume +15% of existing OZP permitted Non-domestic GFA)

- Scenario 2

Residential	5,070 flats (assume no. of flats: 4,408+15%)

Non - domestic	48,990 sq.m GFA (same with scenario 1)

2.7.3 Detailed calculation for sewerage generation rates of both Scenario 1 and Scenario 2 can be found in Table 3c and 3d of **Appendix 2**. As shown in the calculation, the newly proposed Ø 600mm sewer and downstream pipes with proposed upgrading works are of adequate capacity to cater for future development at 13-street site even with further increase of residential GFA.

3. OVERALL CONCLUSION

3.1 Conclusion

3.1.1 A residential development is proposed to be redeveloped for the Schemes (comprising KC-018 site and KC-019 site) in Kowloon City.

3.1.2 Based on the sewerage impact assessment results, it is found that the capacity of the existing sewerage system serving the area would not be sufficient to cater for the sewerage generation from the Schemes and nearby catchment areas. Construction of a new sewer of about 370m length along To Kwa Wan Road and upgrading works of a total of 4 numbers of sewers further downstream along Kwei Chow Street will be required.

3.1.3 Under the assumed scenario where the GFA of 13-street site would be adopted and with increase of 15% of residential GFA, the proposed new sewer and upgrading work would be sufficient to cater for the sewage generation in future.

3.1.4 With the proposed new sewer construction and upgrading works, this study confirms the feasibility of the proposed redevelopment in terms of impacts to the public drainage and sewerage system.

Figures

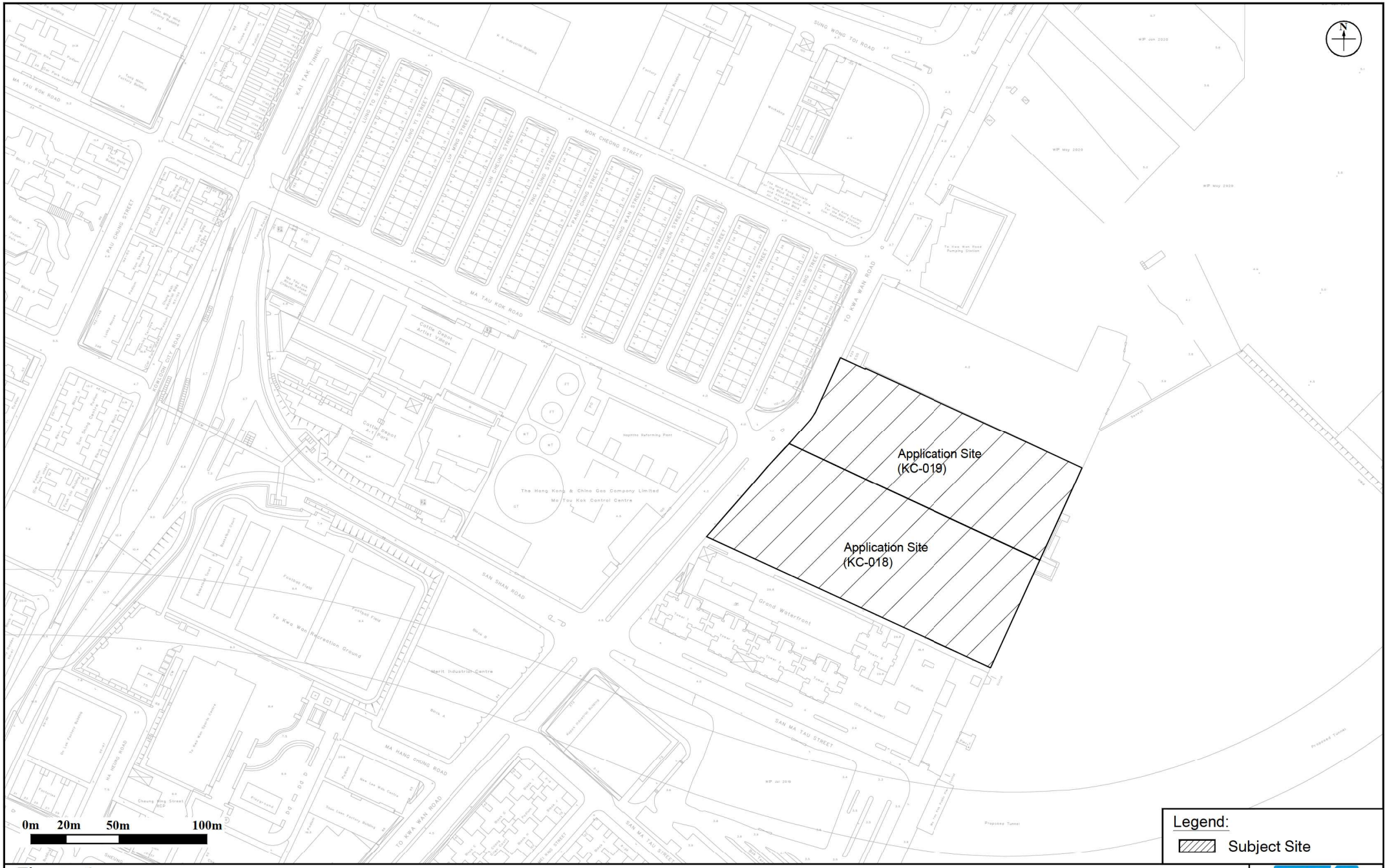

Figure: 1

Title: Location of Subject Site and Its Environs

Project: TWO DEVELOPMENT SCHEMES - MING LUN STREET/ MA TAU KOK ROAD (KC-018) AND TO KWA WAN ROAD/ MA TAU KOK ROAD (KC-019)

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Checked by:	CC
Rev.:	1.1
Date:	Jul 2022

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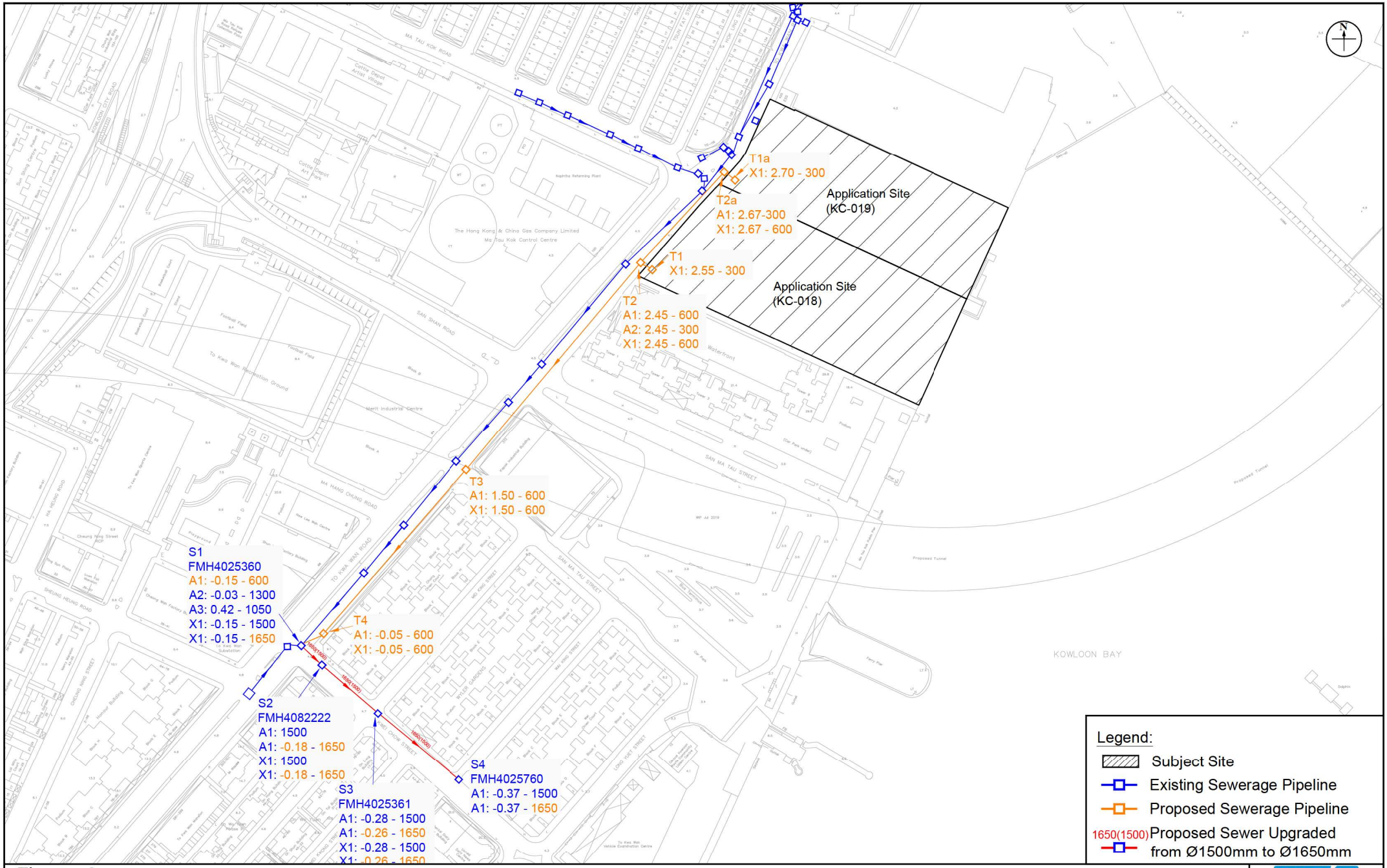

Figure: 2

Title: Existing and Proposed Sewerage System in the Vicinity of the Application Site

Project: TWO DEVELOPMENT SCHEMES - MING LUN STREET/ MA TAU KOK ROAD (KC-018) AND TO KWA WAN ROAD/ MA TAU KOK ROAD (KC-019)

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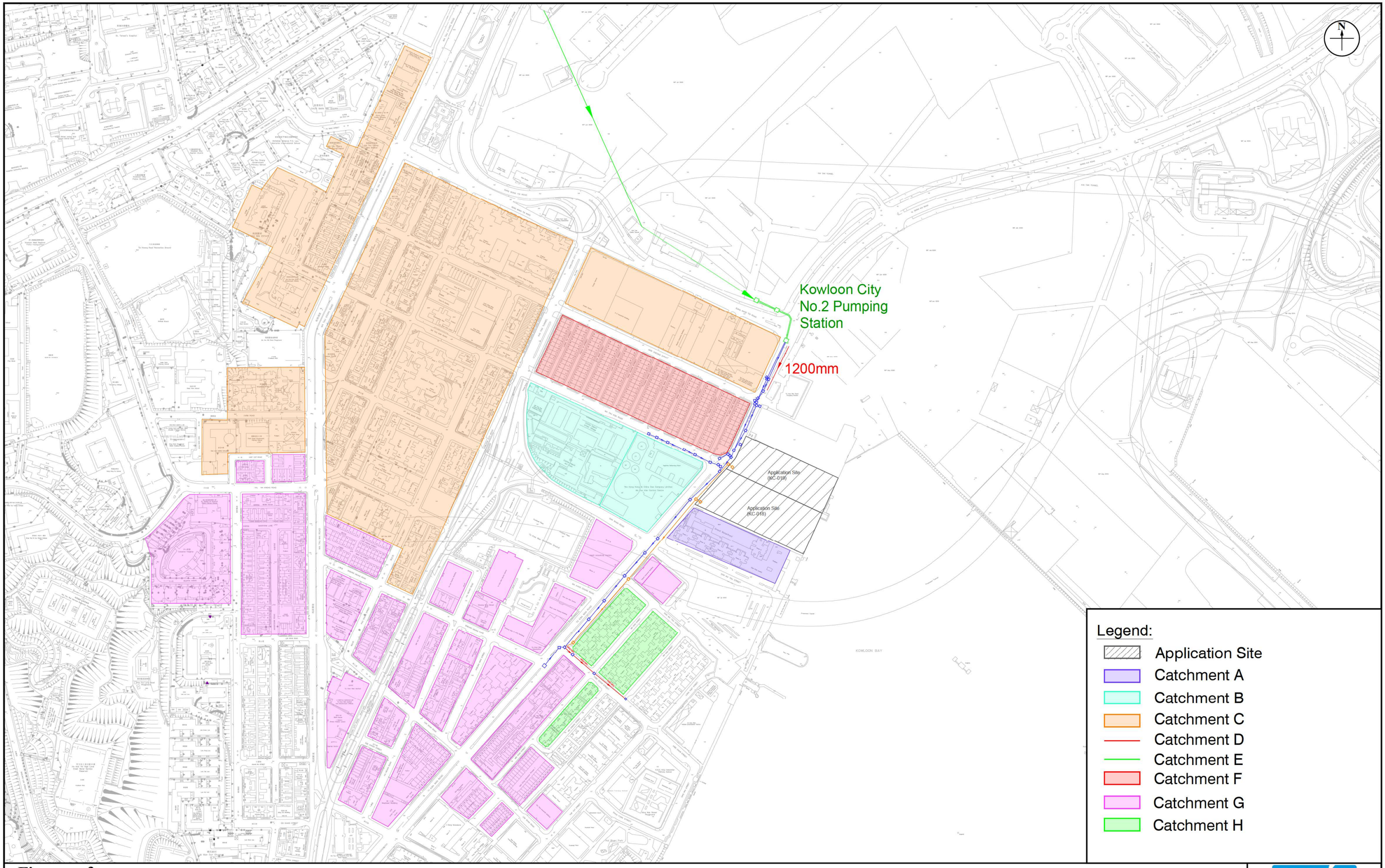

Figure: 3

Title: Catchment Areas in the Vicinity of the Application Site

Project: TWO DEVELOPMENT SCHEMES - MING LUN STREET/ MA TAU KOK ROAD (KC-018) AND TO KWA WAN ROAD/ MA TAU KOK ROAD (KC-019)

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Rev.:	1.2
Date:	Sep 2022

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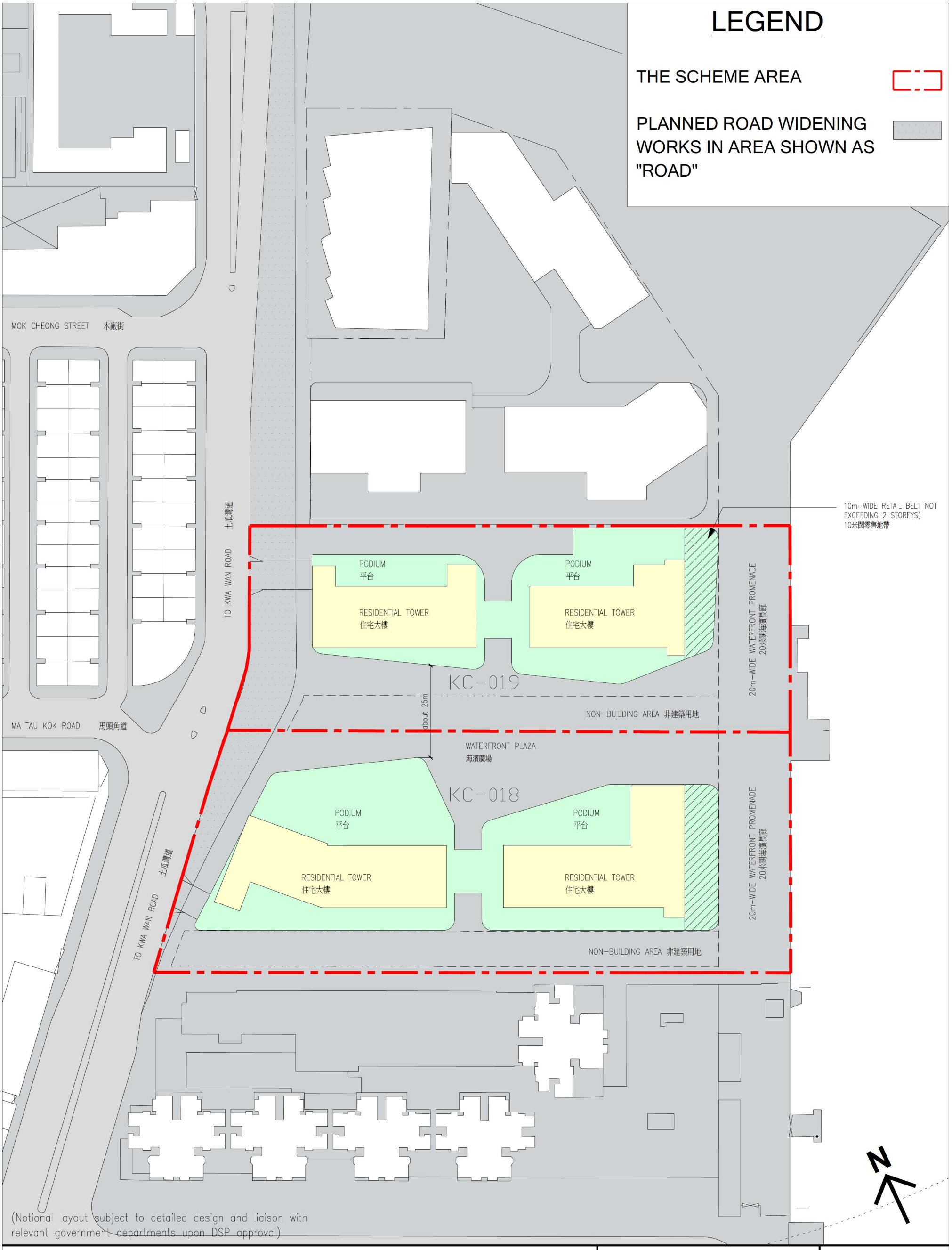
Appendix 1 Tentative Layout Plan

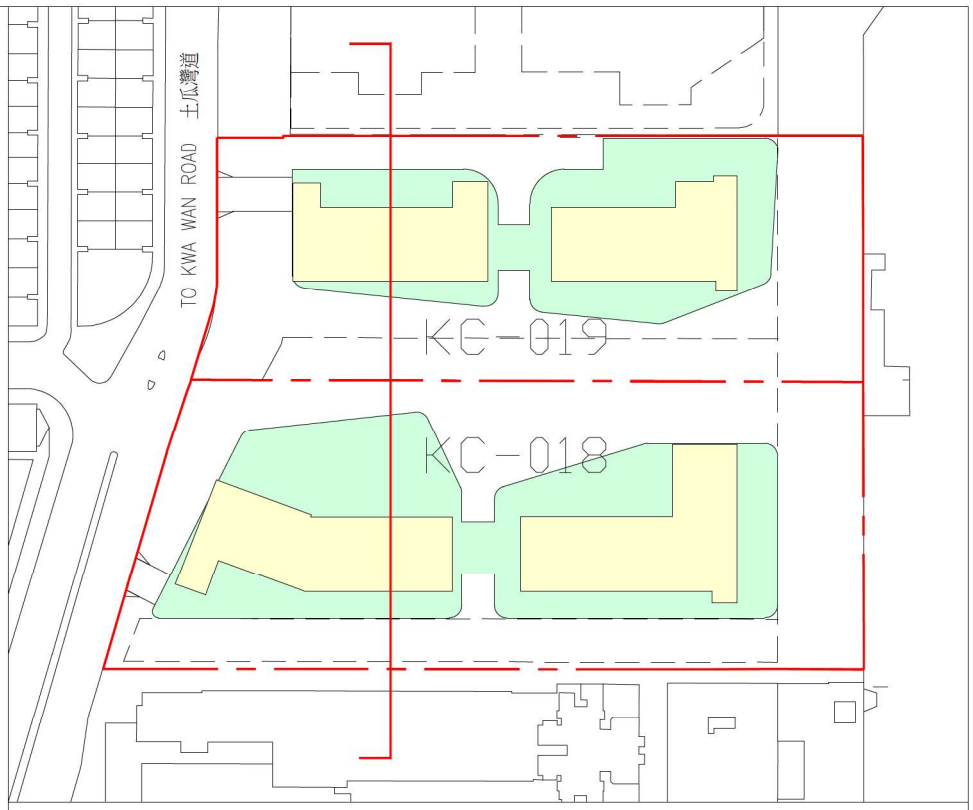


URBAN RENEWAL AUTHORITY 市區重建局

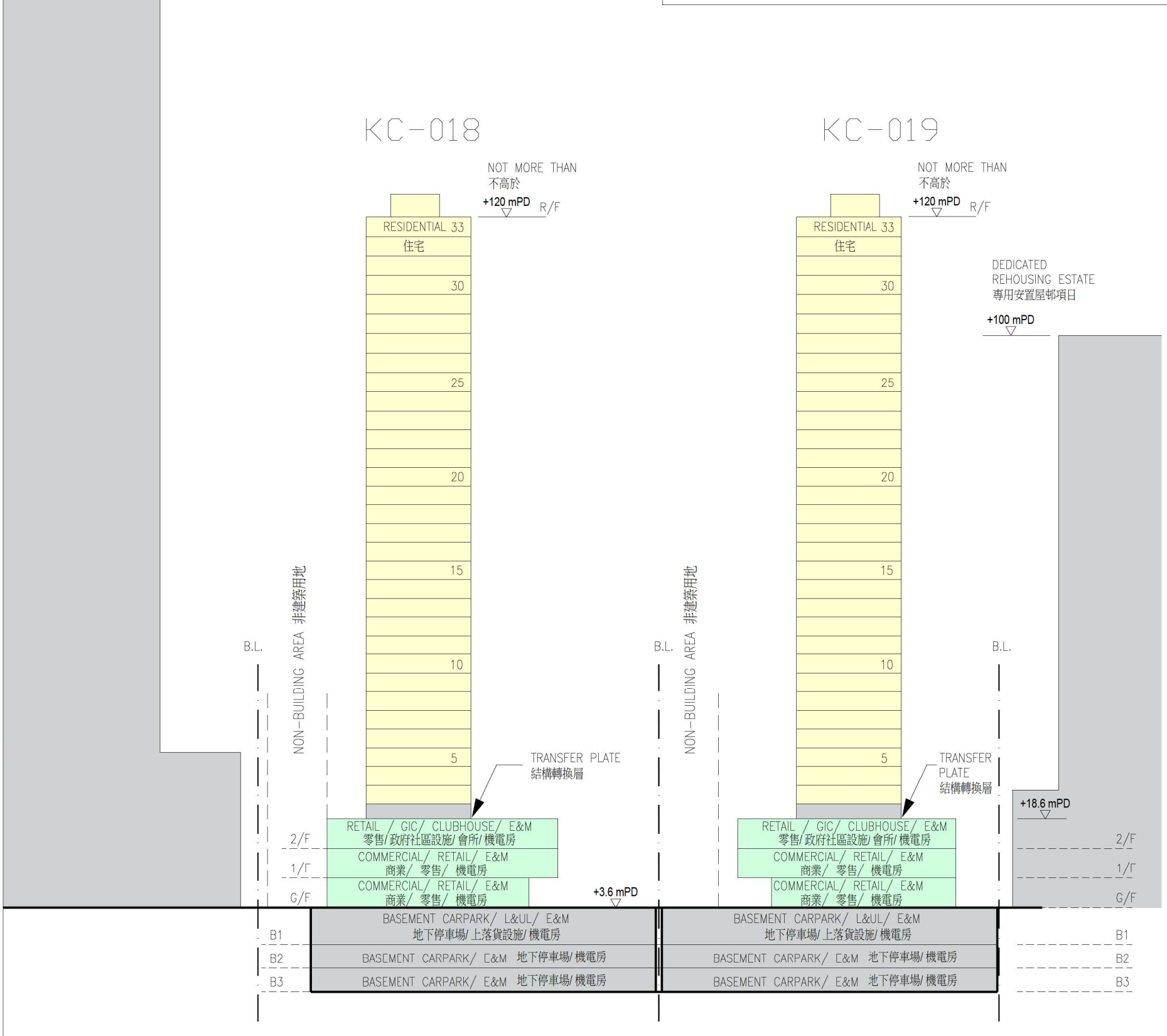
URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Block Plan

FIGURE 1.1
NOT TO SCALE



KEY PLAN 索引圖



(Notional layout subject to detailed design and liaison with relevant government departments upon DSP approval)

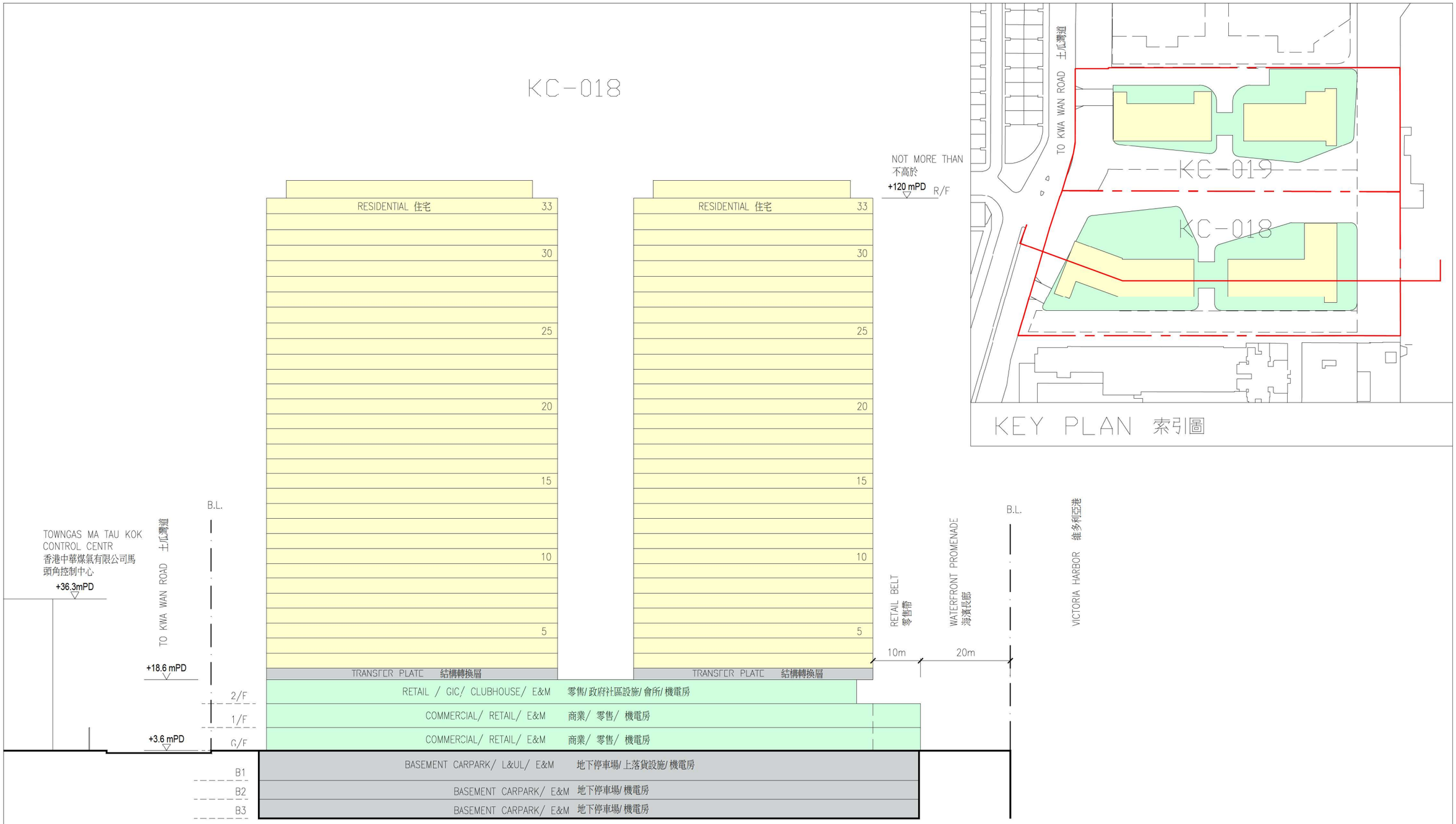
市區重建局
URBAN RENEWAL AUTHORITY

URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Schematic Section

FIGURE 1.2
NOT TO SCALE

KC-018



(Notional layout subject to detailed design and liaison with relevant government departments upon DSP approval)

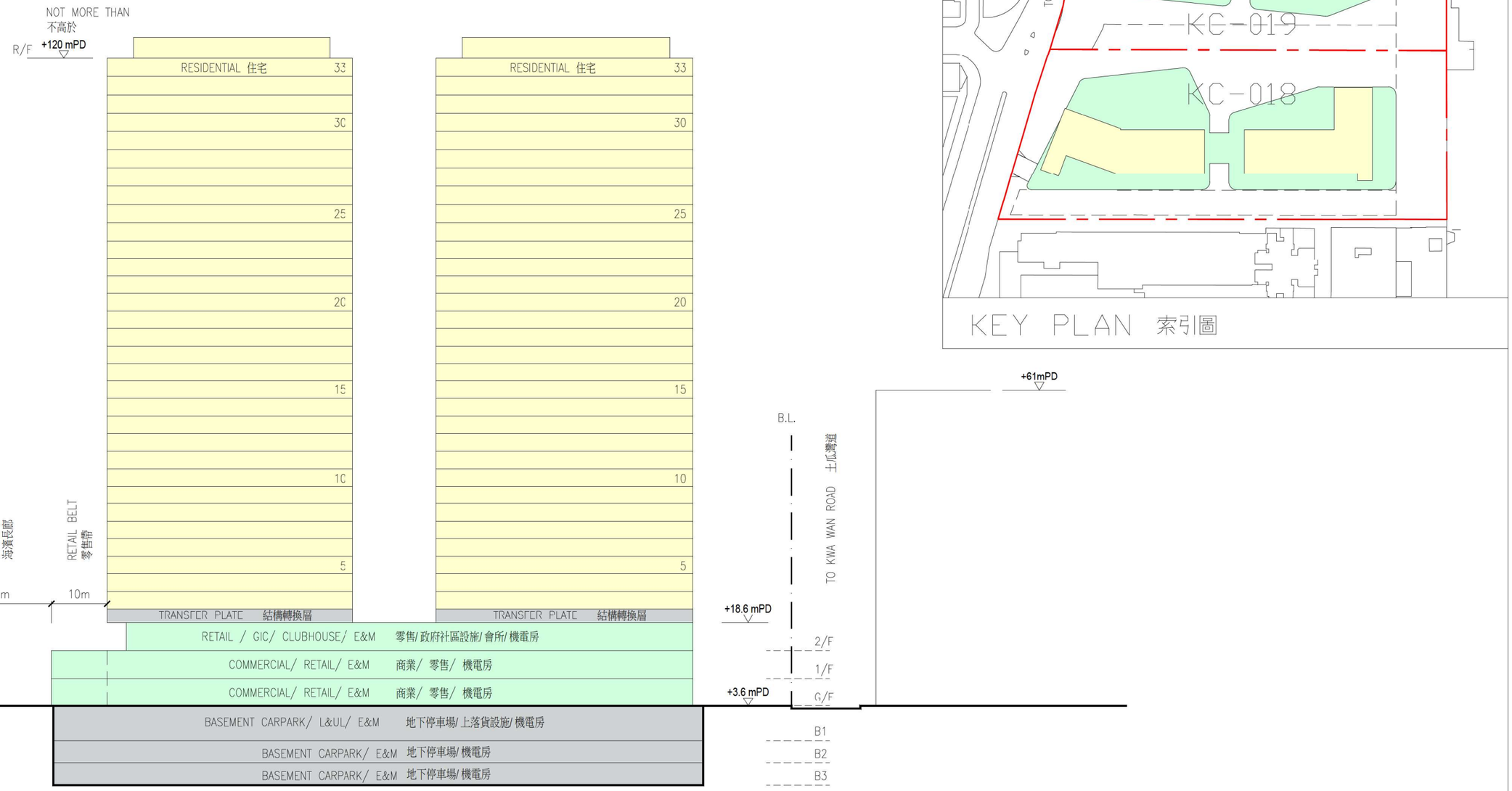
市區重建局
URBAN RENEWAL AUTHORITY

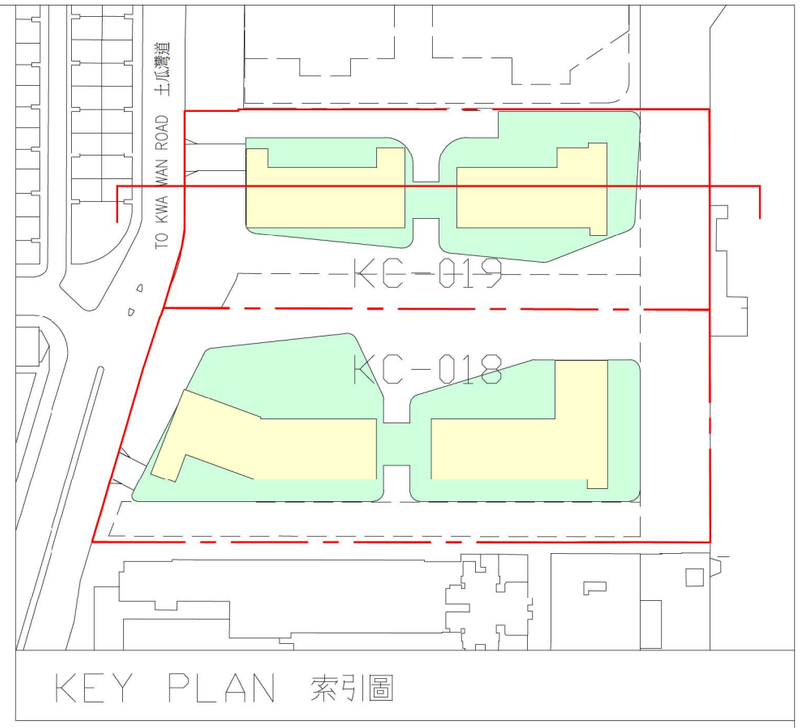
URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Schematic Section

FIGURE 1.3
NOT TO SCALE

KC-019





(Notional layout subject to detailed design and liaison with relevant government departments upon DSP approval)

市區重建局
URBAN RENEWAL AUTHORITY

URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Schematic Section

FIGURE 1.4
NOT TO SCALE

Appendix 2 Detailed Sewerage Impact Assessment Calculations

Table 1a Calculation for Sewage Generation Rate of the Proposed Development at the Subject Site

KC-018

1. Residential Tower

1a. Total number of residential units	=	1276	units
1b. Total number of residents	=	2935	people -- (2021 Population Census: Average Household Size of 2.7 in Kowloon City[(1)])
1c. Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
1d. Sewage Generation rate	=	**792.4**	m^3/day

2. Clubhouse

2a. Assumed Area	=	2729	m^2
2b. Assumed floor area per employee	=	30.3	m^2 per worker -- (refer to Table 8 of CIFSUS - Community, Social & Personal Services)
2c. Total number of employees	=	90	employees
2d. Design flow for commercial activities	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J11)
2e. Sewage Generation rate	=	**25.2**	m^3/day

3. Commercial Area (Retail)

3a. Assumed Area	=	5248	m^2
3b. Assumed floor area per employee	=	28.6	m^2 per worker -- (refer to Table 8 of CIFSUS - Retail Trade)
3c. Total number of employees	=	183	employees
3d. Design flow for commercial activities	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF J4 - Wholesale & Retail)
3e. Sewage Generation rate	=	**51.4**	m^3/day

4. Commercial Area (F&B)

4a. Assumed Area	=	5248	m^2
4b. Assumed floor area per employee	=	19.6	m^2 per worker -- (refer to Table 8 of CIFSUS - Restaurants)
4c. Total number of employees	=	268	employees
4d. Design flow for commercial activities	=	1.58	m3/employee/day -- (refer to Table T-2 of GESF J10 - Restaurants & Hotels)
4e. Sewage Generation rate	=	**423.1**	m^3/day

4. Commercial Area (GIC)

4a. Assumed Area	=	1000	m^2
4b. Assumed floor area per employee	=	30.3	m^2 per worker -- (refer to Table 8 of CIFSUS - Community & Social Services)
4c. Total number of employees	=	33	employees
4d. Design flow for commercial activities	=	0.28	m3/employee/day -- (refer to Table T-2 of GESF J10 - Restaurants & Hotels)
4e. Sewage Generation rate	=	**9.2**	m^3/day

Total Flow from Proposed Development

Flow Rate	=	1301.3	m^3/day
Flow Rate with PCIF	=	1301.3	m^3/day
Contributing Population	=	4820	people
Peaking factor	=	4	Refer to Table T-5 of GESF for population 1,000-5,000 incl. stormwater allowance
Peak Flow	=	**60.2**	litre/sec

KC-019

1. Residential Tower

1a. Total number of residential units	=	950	units
1b. Total number of residents	=	2185	people -- (2021 Population Census: Average Household Size of 2.7 in Kowloon City[(1)])
1c. Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
1d. Sewage Generation rate	=	**590.0**	m^3/day

2. Clubhouse

2a. Assumed Area	=	2032	m^2
2b. Assumed floor area per employee	=	30.3	m^2 per worker -- (refer to Table 8 of CIFSUS - Community, Social & Personal Services)
2c. Total number of employees	=	67	employees
2d. Design flow for commercial activities	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J11)
2e. Sewage Generation rate	=	**18.8**	m^3/day

3. Commercial Area (Retail)

3a. Assumed Area	=	3908	m^2
3b. Assumed floor area per employee	=	28.6	m^2 per worker -- (refer to Table 8 of CIFSUS - Retail Trade)
3c. Total number of employees	=	137	employees
3d. Design flow for commercial activities	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF J4 - Wholesale & Retail)
3e. Sewage Generation rate	=	**38.3**	m^3/day

4. Commercial Area (F&B)

4a. Assumed Area	=	3908	m^2
4b. Assumed floor area per employee	=	19.6	m^2 per worker -- (refer to Table 8 of CIFSUS - Restaurants)
4c. Total number of employees	=	199	employees
4d. Design flow for commercial activities	=	1.58	m3/employee/day -- (refer to Table T-2 of GESF J10 - Restaurants & Hotels)
4e. Sewage Generation rate	=	**315.0**	m^3/day

4. Commercial Area (GIC)

4a. Assumed Area	=	500	m^2
4b. Assumed floor area per employee	=	30.3	m^2 per worker -- (refer to Table 8 of CIFSUS - Community & Social Services)
4c. Total number of employees	=	17	employees
4d. Design flow for commercial activities	=	0.28	m3/employee/day -- (refer to Table T-2 of GESF J10 - Restaurants & Hotels)
4e. Sewage Generation rate	=	**4.6**	m^3/day

Total Flow from Proposed Development

Flow Rate	=	966.6	m^3/day
Flow Rate with PCIF	=	966.6	m^3/day
Contributing Population	=	3580	people
Peaking factor	=	5	Refer to Table T-5 of GESF for population 1,000-5,000 incl. stormwater allowance
Peak Flow	=	**55.9**	litre/sec

Remark:

(1):A more conservative approach is also carried out for +17% variation of population increase, which is about 2.7 as the same as the average domestic household size of Kowloon City District in 2021 Population Census. The results demonstrated that it will not incur major deviation from the current assessment.

Table 2a Hydraulic Capacity of Existing Sewers at To Kwa Wan Road, Ma Tau Kok

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k_s	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s^2	m		m^2/s	m/s	m^2	m^3/s	L/s
S1-S2	FMH4025360	FMH4082222	1500	15.6	-0.15	-0.18	9.81	0.00300	0.002	0.000001	1.44	1.77	2.55	2546
S2-S3	FMH4082222	FMH4025361	1500	42.3	-0.18	-0.27	9.81	0.00300	0.002	0.000001	1.67	1.77	2.95	2948
S3-S4	FMH4025361	FMH4025760	1500	65.0	-0.28	-0.37	9.81	0.00300	0.001	0.000001	1.32	1.77	2.33	2326

Table 2a Hydraulic Capacity of Existing Sewers at To Kwa Wan Road, Ma Tau Kok (Upgrade)

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k_s	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s^2	m		m^2/s	m/s	m^2	m^3/s	L/s
S1-S2	FMH4025360	FMH4082222	1650	15.6	-0.15	-0.18	9.81	0.00030	0.0019	0.000001	2.12	2.14	4.54	4539
S2-S3	FMH4082222	FMH4025361	1650	42.3	-0.18	-0.26	9.81	0.00030	0.0018	0.000001	2.04	2.14	4.36	4358
S3-S4	FMH4025361	FMH4025760	1650	65.0	-0.26	-0.37	9.81	0.00030	0.0018	0.000001	2.04	2.14	4.35	4355

Table 2a Hydraulic Capacity of Existing Sewers at To Kwa Wan Road, Ma Tau Kok

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k_s	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s^2	m		m^2/s	m/s	m^2	m^3/s	L/s
T1a-T2a	-	-	300	4.4	2.70	2.67	9.81	0.00030	0.0068	0.000001	1.41	0.07	0.10	100
T2a-T2	-	-	600	68.2	2.67	2.45	9.81	0.00030	0.0032	0.000001	1.48	0.28	0.42	419
T1-T2	-	-	300	3.9	2.55	2.45	9.81	0.00030	0.0256	0.000001	2.75	0.07	0.19	194
T2-T3	-	-	600	153.6	2.45	1.50	9.81	0.00030	0.0062	0.000001	2.06	0.28	0.58	583
T3-T4	-	-	600	121.3	1.50	-0.05	9.81	0.00030	0.0128	0.000001	2.98	0.28	0.84	841
T4-S1	-	FMH4025360	600	9.3	-0.05	-0.15	9.81	0.00030	0.0108	0.000001	2.73	0.28	0.77	772

Notes: (1) T1 is the proposed manhole as shown in Figure 2 of the SIA report. The exact invert level of the proposed manhole is subject to change during detailed design stage.
(2) According to DSD Drainage Records, invert level 2 of S3-S4 is not avaliable. Therefore, it is estimated by assuming the slope of S3-S4 equals to slope of S2-S3.

Remarks: (1) g=gravitational acceleration; k_s=equivalent sand roughness; s=gradient; v=kinematic viscosity of water; V=mean velocity
(2) Table 2a: The value of k_s = 0.6mm and k_s = 2.47mm is used for the calculation of slimed clayware sewer, poor condition (based on Table 5: Recommended roughness values in Sewerage Manual)
(3) Table 2b: The value of k_s = 0.3mm is used for the calculation of slimed polyethelyene for the proposed sewers, poor condition (based on Table 5: Recommended roughness values in Sewerage Manual)
(4) The value of velocity (V) is referred to the Tables for the hydraulic design of pipes, sewers and channels (8th edition)
(5) Equation used: $V = -\sqrt{(8gDs)}\log\left(\frac{k_s}{3.7D} + \frac{2.51v}{D\sqrt{(2gDs)}}\right)$

Table 3a Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment A-F)

Catchment A

1. Grand Waterfront

1a. Total number of residential units	=	1782	units
1b. Total number of residents	=	4990	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
1c. Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
1d. Sewage Generation rate	=	**1347.2**	m^3/day

2. Grand Waterfront Plaza (Retail)

2a. Assumed Area	=	1568	m^2
2b. Assumed floor area per employee	=	28.6	m^2 per worker -- (refer to Table 8 of CIFSUS - Retail Trade)
2c. Total number of employees	=	55	employees
2d. Design flow for commercial activities	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF J4 - Wholesale & Retail)
2e. Sewage Generation rate	=	**15.3**	m^3/day

3. Grand Waterfront Plaza (F&B)

2a. Assumed Area	=	941	m^2
2b. Assumed floor area per employee	=	19.6	m^2 per worker -- (refer to Table 8 of CIFSUS - Restaurants)
2c. Total number of employees	=	48	employees
2d. Design flow for commercial activities	=	1.58	m^3/employee/day -- (refer to Table T-2 of GESF J10 - Restaurants & Hotels)
2e. Sewage Generation rate	=	**75.8**	m^3/day

Total Flow Rate in Catchment A	=	**1438.4**	m^3/day
Total Flow Rate in Catchment A with PCIF	=	**1438.4**	m^3/day
Contributing Population	=	**5328**	people
Peaking Factor	=	**5**	
Peak Flow	=	**83.2**	litre/sec

Catchment B

1. The Hong Kong & China Gas Cimmpany Ltd.

2a. Assumed Area	=	861	m^2
2b. Assumed floor area per employee	=	18.2	m^2 per employee -- (refer to Table 8 of CIFSUS - Business Services)
2c. Total number of employees	=	47	employees
2d. Design flow for commercial employee	=	0.08	m^3/employee/day -- (refer to Table T-2 of GESF - J6)
2e. Sewage Generation rate	=	**3.8**	m^3/day

2a. Assumed Area	=	1812	m^2
2b. Assumed floor area per employee	=	43.5	m^2 per employee -- (refer to Table 8 of CIFSUS - Manufacturing)
2c. Total number of employees	=	42	employees
2d. Design flow for commercial employee	=	0.33	m^3/employee/day -- (refer to Table T-2 of GESF - J2)
2e. Sewage Generation rate	=	**13.8**	m^3/day

2. Cattle Depot Artist Village

13a. Assumed Area	=	2214	m^2
13b. Assumed floor area per employee	=	30.3	m^2 per employee -- (refer to Table 8 of CIFSUS - Community & Social Services)
13c. Total number of employees	=	73	employees
13d. Design flow for commercial employee	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J11)
13e. Sewage Generation rate	=	**20.5**	m^3/day

Total Flow Rate in Catchment B	=	**38.0**	m^3/day
Total Flow Rate in Catchment B with PCIF	=	**38.0**	m^3/day
Contributing Population	=	**141**	people
Peaking Factor	=	**6**	
Peak Flow	=	**2.6**	litre/sec

Table 3a Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment A-F)

Catchment C (FMH4025382) (upstream from To Kwa Wan) (IAL9MCSTEI00)

1a. Existing Residential Population (Private)	=	22466	residents
1b. Downtown 38, 38 Pak Tai Street	=	448	residents
1c. 喜築, 93 Pau Chung Street	=	585	residents
1d. The Zutten, 50 Ma Tau Kok Road	=	840	residents
1e. Tak Shing Mansion, 50 Tam Kung Road	=	140	residents
1f. Kingsgate, 178 Pau Chung Street	=	123	residents
1g. Metropolitan Rise, 28 Ma Tau Kok Road	=	806	residents
1h. Lucky Building, 142-144B Pau Chung Street	=	339	residents
1i. Homing Terrace, 151 Kowloon City Road	=	218	residents
1j. Fok On Court/Building, 90-108 Ma Tau Chung Road	=	585	residents
1k. Sun Cheong Building, 171-173 Kowloon City Road	=	101	residents
1l. 60-66 Ma Tau Chung Road (Work in Progress)	=	482	residents
1m. Horae Place, 209 Ma Tau Wai Road	=	470	residents
1n. Rich Court, 71-73 Pak Tai Street	=	95	residents
1o. Fortune Building, 111 Pak Tai Street	=	109	residents
1p. Lucky Court, 38 Mok Cheong Street	=	76	residents
1q. My Place, 123 Pak Tai Street	=	470	residents
1r. Siu Fung Court, 92-100 Tam Kung Road	=	218	residents
1s. 179-183c Kowloon City Road	=	238	residents
1t. View Court, 82 Pau Chung Street	=	109	residents
1u. Harmony Garden, 55-61 Kowloon City Road	=	314	residents
1v. One Elegance, 189 Ma Tau Wai Road	=	106	residents
1w. 191-199 Ma Tau Wai Road	=	81	residents
1x. Kam Wah Building, 111-127 Ma Tau Wai Road	=	314	residents
1y.Wai Tak House, 129-131 Ma Tau Wai Road	=	56	residents
1z. Design Flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
1aa. Existing Residential Population (Public - Ma Tau Wai Estate)	=	5367	residents
1ab. Design Flow		0.19	m^3/person/day -- (refer to Table T-1 of GESF - Public rental)
1ac. Sewage Generation Rate	=	**9063.2**	m^3/day

2. Warehouse/Storage: Chung Wah Industrial Building (153-155 Kowloon City Road) & Tung Nam Factory Building (40 Ma Tau Kok Road)

2a. Assumed Gross Floor Area	=	16370	m^2
2b. Assumed floor area per employee	=	250	m^2 per employee -- (refer to Table 8 of CIFSUS - Storage)
2c. Assumed number of employees	=	65	employees
2d. Design Flow	=	0.18	m^3/employee/day -- (refer to Table T-2 of GESF - J3)
2e. Sewage Generation Rate	=	**11.8**	m^3/day

3. Manufacturing/Workshop: Luen Ming Hing Factory Building (36 Mok Cheong Street)

3a. Assumed Gross Floor Area	=	5642	m^2
3b. Assumed floor area per employee	=	43	m^2 per employee -- (refer to Table 8 of CIFSUS - Manufacturing)
3c. Assumed number of employees	=	130	employees
3d. Design Flow	=	0.63	m^3/person/day -- (refer to Table T-3 of GESF - Manufacturing)
3e. Sewage Generation Rate	=	**81.8**	m^3/day

4. Cruise Hotel, 188 Pau Chung Street

4a. Numer of hotel rooms	=	161	rooms
4b. Assumed number of employees	=	48	employees -- (assume 3 workers per 10 rooms)
4c. Design Flow	=	1.58	m^3/employee/day -- (refer to Table T-2 of GESF J10 - Restaurants & Hotels)
4d. Sewage Generation Rate	=	**76.3**	m^3/day

5. Harbour Plaza 8 Degrees Hotel, 199 Kowloon City Road

5a. Numer of hotel rooms	=	704	rooms
5b. Assumed number of employees	=	211	employees -- (assume 3 workers per 10 rooms)
5c. Design Flow	=	1.58	m^3/employee/day -- (refer to Table T-2 of GESF J10 - Restaurants & Hotels)
5d. Sewage Generation Rate	=	**333.7**	m^3/day

6. Le Hoteru, 103 Tam Kung Road

6a. Numer of hotel rooms	=	10	rooms
6b. Assumed number of employees	=	3	employees -- (assume 3 workers per 10 rooms)
6c. Design Flow	=	1.58	m^3/employee/day -- (refer to Table T-2 of GESF J10 - Restaurants & Hotels)
6d. Sewage Generation Rate	=	**4.7**	m^3/day

7. Emmanuel Primary School, 36-38 Shing Tak Street

7a. Total number of teachers & staff	=	70	teachers & staff (from the website)
7c. Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
7b. Total number of students	=	311	students (from the website)
7d. Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
7e. Sewage Generation rate	=	**32.0**	m^3/day

8. Farm Road Government Primary School, 8 Farm Road

8a. Total number of teachers & staff	=	51	teachers & staff (from the website)
8c. Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
8b. Total number of students	=	600	students (from the website)
8d. Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
8e. Sewage Generation rate	=	**38.3**	m^3/day

9. New Asia Middle School, 6 Farm Road

9a. Total number of teachers & staff	=	70	teachers & staff (from the website)
9c. Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
9b. Total number of students	=	792	students (from the website)
9d. Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
9e. Sewage Generation rate	=	**51.3**	m^3/day

Table 3a Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment A-F)

10. Kowloon Women's Welfare Club Nursery School, 42 Shing Tak Street

10a. Total number of teachers & staff	=	8	teachers & staff (from the website)
10c. Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
10b. Total number of students	=	101	students (from the website)
10d. Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
10e. Sewage Generation rate	=	**6.3**	m^3/day

12. The Hong Kong Federation of Trade Unions Worker's Club, 42-50 Ma Tau Chung Road

12a. Assumed Gross Floor Area	=	4832	m^2
12b. Assumed floor area per employee	=	30.3	m^2 per employee -- (refer to Table 8 of CIFSUS - Community)
12c. Assumed number of employees	=	159	employees
12d. Design Flow	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J11 Community, Socia & Personal Services)
12e. Sewage Generation Rate	=	**44.6**	m^3/day

18a. Ma Tau Kok Government Office / Immigration Detention Centre, 1 Ma Tau Kok Road

18b. Number of detainees	=	87	detainees
18c. Assumed number of staff	=	100	employees
18d. Design flow for commercial employee	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J11 Community, Socia & Personal Services)
18e. Sewage Generation rate	=	**52.4**	m^3/day

19. Ma Tau Chung Fire Station, 109 Ma Tau Wai Chung Road

19a. Total number of employees	=	20	employees
19b. Design flow for commercial activities	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J11 Community, Socia & Personal Services)
19c. Sewage Generation rate	=	**5.6**	m^3/day

20. Ma Tau Chung Ambulance Depot and Quarters, 53 Shing Tak Street

20a. Total number of employees	=	20	employees
20b. Design flow for commercial activities	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J11 Community, Socia & Personal Services)
20c. Total no. of residents	=	78	residents
20d. Design Flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
20c. Sewage Generation rate	=	**26.8**	m^3/day

21. The Hong Kong Society for the Blind Factory

RCHE

22a. Total number of beds / population	=	304	people
22b. Design flow	=	0.37	m^3/person/day -- (refer to Table T-1 of GESF - Private R3)
22c. Sewage Generation rate	=	**112.5**	m^3/day
22d. Assumed number of employees	=	28	employees
22e. Design flow for commercial employee	=	0.28	m^3/employee/day -- (refer to the information provided by the applicant)
22f. Sewage Generation rate	=	**7.8**	m^3/day

Total Flow Rate in Catchment C	=	10041.7	m^3/day
Total Flow Rate in Catchment C with P_{CIF}	=	**10041.7**	m^3/day
Contributing Population	=	37192	people
Peaking factor	=	4	
Peak Flow	=	**464.9**	litre/sec

Table 3a Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment A-F)

Catchment D (FWD4026622)(upstream from Kowloon City)

1a. Assumed Pipe Capacity	=	100	%
1b. Pipe Diameter	=	1200	mm
1c. Pipe Length	=	99.8	m
1d. Invert Level 1	=	1.23	mPD
1e. Invert Level 2	=	1.13	mPD
1g. Gravitational Acceleration	=	9.81	ms^{-2}
1h. Equivalent Sand Roughness	=	0.00600	m
1i. Gradient	=	0.0010	
1j. Kinematic Viscosity of Water	=	0.000001	m^2/s
1k. Mean Velocity	=	0.88	m/s
1l. Cross Sectional Area of the Pipe	=	1.13	m^2
1m. Velocity of the Concerned Pipe	=	1.00	m^3/s
1n. Estimated Capacity	=	1094.7	litre/sec

Sub-total Catchment D

Peak Flow	=	1094.7	litre/sec
Peaking factor	=	3.70	Refer to Table T-5 of GESF for population >50,000 incl. stormwater allowance
Contributing Population	=	94681	people
Equivalent Flow Rate	=	25563.7	m^3/day
Equivalent Flow Rate with PCIF	=	**25563.7**	m^3/day

Catchment E (FWD4026622) (upstream from Kowloon City)
Kowloon City No.2 Sewage Pumping Station

ADWF	=	**50976.0**	m^3/day
Peak	=	**1.77**	m^3/s

Table 3a Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment A-F)

Catchment F

1. 13 Street

1a. Total number of residential units	=	2660	units
1b. Total number of residents	=	9075	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
1c. Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
1d. Sewage Generation rate	=	**2450.3**	m^3/day

Retail

2a. Assumed Area	=	19314.3	m^2
2b. Assumed floor area per employee	=	45.5	m^2 per employee -- (refer to Table 8 of CIFSUS - Manufacturing)
2c. Total number of employees	=	425.0	employees
2d. Design flow for commercial employee	=	0.63	m^3/employee/day -- (refer to Table T-3 of GESF - Manufacturing)
2e. Sewage Generation rate	=	**267.8**	m^3/day

Total Flow Rate	=	**2718.0**	m^3/day
Total Flow Ratr wuth PCIF	=	**2718.0**	m^3/day

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

Catchment G1

Merit Industrial Centre

Assumed Area	=	56310	m^2
Assumed floor area per employee	=	25	m^2 per employee (worker densities refer to Table 2 in Chapter 5 of HKPSG)
Total number of employees	=	2253	employees
Design flow for commercial activities	=	0.63	m^3/employee/day -- (refer to Table T-3 of GESF J1 - Cental Kowloon)
Sewage Generation rate	=	**1419.4**	m^3/day

New Lee Wah Centre (Commercial)

Assumed Area	=	14033	m^2
Assumed floor area per employee	=	25	m^2 per employee (worker densities refer to Table 2 in Chapter 5 of HKPSG)
Total number of employees	=	561	employees
Design flow for commercial activities	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - Commercial Employee)
Sewage Generation rate	=	**157.2**	m^3/day

Shun Luen Factory Building

Assumed Area	=	10783	m^2
Assumed floor area per employee	=	25	m^2 per employee (worker densities refer to Table 2 in Chapter 5 of HKPSG)
Total number of employees	=	431	employees
Design flow for commercial activities	=	0.63	m^3/employee/day -- (refer to Table T-3 of GESF J1 - Cental Kowloon)
Sewage Generation rate	=	**271.7**	m^3/day

Kapok Industrial Building

Assumed Area	=	7263	m^2
Assumed floor area per employee	=	25	m^2 per employee (worker densities refer to Table 2 in Chapter 5 of HKPSG)
Total number of employees	=	291	employees
Design flow for commercial activities	=	0.63	m^3/employee/day -- (refer to Table T-3 of GESF J1 - Cental Kowloon)
Sewage Generation rate	=	**183.0**	m^3/day

Lucky House

Assumed Area	=	18117	m^2
Assumed floor area per employee	=	18.2	m^2 per worker -- (refer to Table 8 of CIFSUS - Financial, Insurance, Real Estate & Busines
Total number of employees	=	996	employees
Design flow for commercial activities	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - Commercial Employee)
Sewage Generation rate	=	**279.0**	m^3/day

Total Flow Rate in Catchment G1	=	**2310.3**	m^3/day
Total Flow Rate in Catchment G1 with PCIF	=	**2310.3**	m^3/day
Contributing Population	=	**8557**	people
Peaking Factor	=	**6**	
Peak Flow	=	**160.4**	litre/sec

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

Catchment G2

To Kwa Wan Sport Centre

Total number of employees	=	20	employees
Design flow for commercial employee	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J11 - Community, Social & Personal Se
Sewage Generation rate	=	**5.6**	m^3/day

Kiu Shing Building

Total number of residential units	=	107	units
Total number of residents	=	300	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**80.9**	m^3/day

Kiu Shing Building

Total number of residential units	=	134	units
Total number of residents	=	375	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**101.3**	m^3/day

Cheung Wan Building

Total number of residential units	=	80	units
Total number of residents	=	224	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**60.5**	m^3/day

Full Moon (Ming Yuet) Building

Total number of residential units	=	42	units
Total number of residents	=	118	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**31.8**	m^3/day

Wah Fat Building

Total number of residential units	=	134	units
Total number of residents	=	375	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**101.3**	m^3/day

Wah Fat Building Plaza

Assumed Area	=	1010	m^2
Assumed floor area per employee	=	28.6	m^2 per employee -- (refer to Table 8 of CIFSUS - Retail Trade)
Total number of employees	=	35	employees
Design flow for commercial employee	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J4 - Wholeasle & Retail)
Sewage Generation rate	=	**9.9**	m^3/day

Po Kwong Building

Total number of residential units	=	162	units
Total number of residents	=	454	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**122.5**	m^3/day

Pak Tai Mansion

Total number of residential units	=	108	units
Total number of residents	=	302	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**81.6**	m^3/day

One Elegance

Total number of residential units	=	38	units
Total number of residents	=	106	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**28.7**	m^3/day

Yuet Fai House

Total number of residential units	=	20	units
Total number of residents	=	56	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**15.1**	m^3/day

Tak Sun Building

Total number of residential units	=	47	units
Total number of residents	=	132	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**35.5**	m^3/day

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

Ma Tau Wai Road

440 Ma Tau Wai Road	=	4	units
438 Ma Tau Wai Road	=	5	units
434 Ma Tau Wai Road	=	4	units
432 Ma Tau Wai Road	=	4	units
410 Ma Tau Wau Road	=	4	units
408 Ma Tau Wai Road	=	4	units
406 Ma Tau Wai Road	=	4	units
404 Ma Tau Wai Road	=	4	units
378 Ma Tau Wai Road	=	4	units
368 Ma Tau Wai Road	=	3	units
366 Ma Tau Wai Road	=	3	units
356 Ma Tau Wai Road	=	5	units
452 Ma Tau Wai Road	=	6	units
454 Ma Tau Wai Road	=	6	units
456 Ma Tau Wai Road	=	6	units
458 Ma Tau Wai Road	=	6	units
460 Ma Tau Wai Road	=	6	units
462 Ma Tau Wai Road	=	6	units
Total number of residential units	=	84	units
Total number of residents	=	235	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**63.5**	m^3/day

Kam Wah Mansion

Total number of residential units	=	8	units
Total number of residents	=	22	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**6.0**	m^3/day

Maid Shine Court

Total number of residential units	=	39	units
Total number of residents	=	109	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**29.5**	m^3/day

Goldtone Court

Total number of residential units	=	24	units
Total number of residents	=	67	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**18.1**	m^3/day

Dlight Court

Total number of residential units	=	40	units
Total number of residents	=	112	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**30.2**	m^3/day

Ocean Mansion

Total number of residential units	=	40	units
Total number of residents	=	112	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**30.2**	m^3/day

Lucky Mansion

Total number of residential units	=	56	units
Total number of residents	=	157	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**42.3**	m^3/day

Lok Shan Road

1A Lok Shan Road	=	4	units
1B Lok Shan Road	=	4	units
72-76 Lok Shan Road	=	21	units
70 Lok Shan Road	=	10	units
68 Lok Shan Road	=	7	units
66 Lok Shan Road	=	7	units
64 Lok Shan Road	=	7	units
62 Lok Shan Road	=	7	units
60 Lok Shan Road	=	7	units
58 Lok Shan Road	=	7	units
1K - 1N Lok Shan Road	=	21	units
1P Lok Shan Road	=	7	units
1S Lok Shan Road	=	7	units
1R Lok Shan Road	=	7	units
1T Lok Shan Road	=	11	units
9A Lok Shan Road	=	13	units
9 Lok Shan Road	=	8	units
Total number of residential units	=	155	units
Total number of residents	=	434	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**117.2**	m^3/day

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

Maidstone Apartments

Total number of residential units	=	110	units
Total number of residents	=	308	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**83.2**	m^3/day

Mega Building

Total number of residential units	=	72	units
Total number of residents	=	202	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**54.4**	m^3/day

Maxim Mansion

Total number of residential units	=	18	units
Total number of residents	=	50	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**13.6**	m^3/day

Maidstone Road

44 Maidstone Road	=	5	units
42Maidstone Road	=	5	units
40 Maidstone Road	=	5	units
38 Maidstone Road	=	5	units
32 Maidstone Road	=	6	units
30 Maidstone Road	=	6	units
28 Maidstone Road	=	6	units
26 Maidstoen Road	=	6	units
24 Maidstone Road	=	5	units
22 Maidstone Road	=	5	units
20 Maidstone Road	=	5	units
18 Maidstone Road	=	5	units
16 Maidstone Road	=	6	units
14 Maidstone Road	=	6	units
21-25 Maidstone Road	=	15	units
Total number of residential units	=	91	units
Total number of residents	=	255	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**68.8**	m^3/day

Maisy Building

Total number of residential units	=	24	units
Total number of residents	=	67	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**18.1**	m^3/day

Kau Pui Lung Road

85 Kau Pui Lung Road	=	5	units
87 Kau Pui Lung Road	=	5	units
89 Kau Pui Lung Road	=	5	units
91 Kau Pui Lung Road	=	5	units
93 Kau Pui Lung Road	=	6	units
95 Kau Pui Lung Road	=	6	units
97 Kau Pui Lung Road	=	6	units
99 Kau Pui Lung Road	=	6	units
107 Kau Pui Lung Road	=	6	units
109 Kau Pui Lung Road	=	5	units
111 Kau Pui Lung Road	=	5	units
113 Kau Pui Lung Road	=	5	units
115 - 115A Kau Pui Lung Road	=	12	units
117 Kau Pui Lung Road	=	6	units
119 Kau Pui Lung Road	=	6	units
83 Kau Pui Lung Road	=	5	units
85 Kau Pui Lung Road	=	5	units
Total number of residential units	=	99	units
Total number of residents	=	277	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**74.8**	m^3/day

Grand New Court

Total number of residential units	=	10	units
Total number of residents	=	28	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**7.6**	m^3/day

Fu Yu Court

Total number of residential units	=	36	units
Total number of residents	=	101	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**27.2**	m^3/day

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

Hillville Terrace

Total number of residential units	=	86	units
Total number of residents	=	241	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**65.0**	m^3/day

Tin Kwing Building

Total number of residential units	=	18	units
Total number of residents	=	50	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**13.6**	m^3/day

Joy Take Court

Total number of residential units	=	26	units
Total number of residents	=	73	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**19.7**	m^3/day

Shung Wah Court

Total number of residential units	=	32	units
Total number of residents	=	90	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**24.2**	m^3/day

Maidstine Lane

15 Maidstone Lane	=	3	units
13 Maidstine Lane	=	3	units
7 Maidstone Lane	=	3	units
5 Maidstone Lane	=	3	units
3 Maidstone Lane	=	3	units
1 Maidstone Lane	=	3	units
Total number of residential units	=	18	units
Total number of residents	=	50	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**13.6**	m^3/day

Wallsend House

Total number of residential units	=	18	units
Total number of residents	=	50	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**13.6**	m^3/day

Tin kwong Road

46 Tin Kwong Road	=	6	units
43 Tin Kwong Road	=	6	units
41 Tin Kwong Road	=	6	units
39 Tin Kwong Road	=	6	units
4 - 12 Tin Kwong Road	=	14	units
Total number of residential units	=	38	units
Total number of residents	=	106	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**28.7**	m^3/day

Hop Yat Road

5 Hop Yat Road	=	6	units
3 Hop Yat Road	=	6	units
1 Hop Yat Road	=	6	units
Total number of residential units	=	18	units
Total number of residents	=	50	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**13.6**	m^3/day

Comfort

Total number of residential units	=	20	units
Total number of residents	=	56	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**15.1**	m^3/day

Amity Home

Total number of residential units	=	20	units
Total number of residents	=	56	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**15.1**	m^3/day

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

Prosperity Court

Total number of residential units	=	20	units
Total number of residents	=	56	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**15.1**	m^3/day

Celestrial Heights

Total number of residential units	=	939	units
Total number of residents	=	2629	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**709.9**	m^3/day

St. EugeneDe Mazened Oblate Primary School

Total number of teachers & staff	=	45	teachers & staff (from the website)
Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
Total number of students	=	476	students (from the website)
Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
Sewage Generation rate	=	**31.6**	m^3/day

Tang King Po School

Total number of teachers & staff	=	71	teachers & staff (from the website)
Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
Total number of students	=	784	students (from the website)
Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
Sewage Generation rate	=	**51.2**	m^3/day

The Amoy College

Total number of teachers & staff	=	5	teachers & staff (from the website)
Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
Total number of students	=	25	students (from the website)
Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
Sewage Generation rate	=	**2.4**	m^3/day

Tang King Po School

Total number of teachers & staff	=	71	teachers & staff (from the website)
Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
Total number of students	=	784	students (from the website)
Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
Sewage Generation rate	=	**51.2**	m^3/day

Heep Yunn Primary School

Total number of teachers & staff	=	39	teachers & staff (from the website)
Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
Total number of students	=	573	students (from the website)
Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
Sewage Generation rate	=	**33.8**	m^3/day

Heep Yunn School

Total number of teachers & staff	=	92	teachers & staff (from the website)
Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
Total number of students	=	1032	students (from the website)
Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
Sewage Generation rate	=	**67.0**	m^3/day

The Chinese Christian Church of AMOY

Assumed Area	=	401	m^2
Assumed floor area per employee	=	30.3	m^2 per employee -- (refer to Table 8 of CIFSUS - Community & Social Services)
Total number of employees	=	13	employees
Design flow for commercial employee	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J11)
Sewage Generation rate	=	**3.7**	m^3/day

Sunview Garden

Total number of residential units	=	42	units
Total number of residents	=	118	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**31.8**	m^3/day

Tip Top Mansion

Total number of residential units	=	38	units
Total number of residents	=	106	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**28.7**	m^3/day

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

Arch Court

Total number of residential units	=	36	units
Total number of residents	=	101	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**27.2**	m^3/day

Sheung Shing Court

Total number of residential units	=	24	units
Total number of residents	=	67	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**18.1**	m^3/day

Everwell Garden

Total number of residential units	=	161	units
Total number of residents	=	451	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**121.7**	m^3/day

Total Flow Rate in Catchment	=	**2700.7**	m^3/day
Total Flow Rate in Catchment with PCIF	=	**2700.7**	m^3/day
Contributing Population	=	**10003**	people
Peaking Factor	=	**6**	
Peak Flow	=	**187.6**	litre/sec

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

Catchment G3

Yik Yin Building

Total number of residential units	=	72	units
Total number of residents	=	202	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**54.4**	m^3/day

Chiap Thong Building

Total number of residential units	=	72	units
Total number of residents	=	202	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**54.4**	m^3/day

In House

Total number of residential units	=	96	units
Total number of residents	=	269	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**72.6**	m^3/day

To Kwa Wan Building

Total number of residential units	=	189	units
Total number of residents	=	529	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**142.9**	m^3/day

244 - 279 To Kwa Wan Road

Total number of residential units	=	119	units
Total number of residents	=	333	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**90.0**	m^3/day

Tung Hing Building

Total number of residential units	=	106	units
Total number of residents	=	297	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**80.1**	m^3/day

Mei King Street

9 Mei King Street	=	11	units
11 - 31 Mei King Street	=	77	units
Total number of residential units	=	88	units
Total number of residents	=	246	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**66.5**	m^3/day

Kiu Yu Mansion

Total number of residential units	=	281	units
Total number of residents	=	787	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**212.4**	m^3/day

Mei King Mansion Phase 2

Total number of residential units	=	345	units
Total number of residents	=	966	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**260.8**	m^3/day

Mei King Mansion Phase 1

Total number of residential units	=	701	units
Total number of residents	=	1963	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**530.0**	m^3/day

Merit Industrial Centre

Assumed Area	=	15554	m^2
Assumed floor area per employee	=	25	m^2 per employee (worker densities refer to Table 2 in Chapter 5 of HKPSG)
Total number of employees	=	623	employees
Design flow for commercial activities	=	0.63	m^3/employee/day -- (refer to Table T-3 of GESF J1 - Manufacturing)
Sewage Generation rate	=	**392.5**	m^3/day

Kiu Fat Mansion

Total number of residential units	=	364	units
Total number of residents	=	1019	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**275.2**	m^3/day

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

68A- 76B To Kwa Wan Road			
68A To Kwa Wan Road	=	16	units
68B To Kwa Wan Road	=	16	units
68C To Kwa Wan Road	=	16	units
70 To Kwa Wan Road	=	19	units
70A To Kwa Wan Road	=	16	units
70B To Kwa Wan Road	=	16	units
70C To Kwa Wan Road	=	16	units
72 To Kwa Wan Road	=	16	units
72A To Kwa Wan Road	=	16	units
72B To Kwa Wan Road	=	16	units
72C To Kwa Wan Road	=	16	units
74 To Kwa Wan Road	=	16	units
74A To Kwa Wan Road	=	16	units
74B To Kwa Wan Road	=	16	units
76 To Kwa Wan Road	=	16	units
76A To Kwa Wan Road	=	16	units
76B To Kwa Wan Road	=	16	units
Total number of residents	=	275	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**74.3**	m^3/day
Lok Shan Road			
72-76 Lok Shan Road	=	21	units
70 Lok Shan Road	=	10	units
68 Lok Shan Road	=	7	units
66 Lok Shan Road	=	7	units
64 Lok Shan Road	=	7	units
62 Lok Shan Road	=	7	units
60 Lok Shan Road	=	7	units
58 Lok Shan Road	=	7	units
Total number of residents	=	73	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**19.7**	m^3/day
Ha Heung Road			
20 Ha Heung Road	=	7	units
18 Ha Heung Road	=	7	units
29 Ha Heung Road	=	8	units
31 Ha Heung Road	=	16	units
33 Ha Heung Road	=	8	units
33A Ha Heung Road	=	8	units
Total number of residents	=	54	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**14.6**	m^3/day
Mei Wa Street			
1 Mei Wa Street	=	7	units
3 Mei Wa Street	=	7	units
5 Mei Wa Street	=	7	units
7 Mei Wa Street	=	7	units
9 Mei Wa Street	=	7	units
Total number of residents	=	35	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**9.5**	m^3/day
iclub Ma Tau Wai Hotel			
No. of Hotel Room	=	340	Rooms
Assumed floor area per employee	=	3.3	m^2 per employee -- (refer to Table 8 of CIFSUS - Hotels and Boarding Houses)
Totla number of employee	=	102	employees
Design flow for commercial employee	=	1.58	m^3/employee/day -- (refer to Table T-2 of GESF - J10 - Restaurants & Hotels)
Sewage Generation rate	=	**161.2**	m^3/day
Wearbest Building			
Assumed Area	=	25423	m^2
Assumed floor area per employee	=	43	m^2 per worker -- (refer to Table 8 of CIFSUS - Manufacturing)
Total number of employees	=	585	employees
Design flow for commercial activities	=	0.63	m^3/employee/day -- (refer to Table T-3 of GESF J1 - Manufacturing)
Sewage Generation rate	=	**368.6**	m^3/day
City Hub			
Total number of residential units	=	175	units
Total number of residents	=	490	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**132.3**	m^3/day
Yick Man Building			
Total number of residential units	=	72	units
Total number of residents	=	202	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**54.4**	m^3/day

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

On Hing Mansion

Total number of residential units	=	61	units
Total number of residents	=	171	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**46.1**	m^3/day

Sze Chuen Street

3 Sze Chuen Street	=	9	units
2 Sze Chuen Street	=	8	units
4 Sze Cheun Street	=	8	units
8 Sze Chuen Street	=	8	units
Total number of residential units	=	33	units
Total number of residents	=	92	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**24.9**	m^3/day

Kowloon City Road

32A Kowloon City Road	=	8	units
32B Kowloon City Road	=	8	units
32 Kowloon City Road	=	8	units
30 Kowloon City Road	=	8	units
28 Kowloon City Road	=	8	units
26 Kowloon City Road	=	8	units
24 Kowloon City Road	=	8	units
22 Kowloon City Road	=	8	units
20 Kowloon City Road	=	8	units
18 Kowloon City Road	=	9	units
5 Kowloon City Road	=	33	units
11 Kowloon City Road	=	10	units
13 Kowloon City Road	=	8	units
15 Kowloon City Road	=	8	units
17 Kowloon City Road	=	8	units
19 Kowloon City Road	=	8	units
21 Kowloon City Road	=	9	units
25 Kowloon City Road	=	17	units
33 Kowloon City Road	=	3	units
39 Kowloon City Road	=	8	units
41 Kowloon City Road	=	5	units
Total number of residential units	=	198	units
Total number of residents	=	554	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**149.7**	m^3/day

Luen Yip Building

Total number of residential units	=	60	units
Total number of residents	=	168	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**45.4**	m^3/day

Hung Ying House

Total number of residential units	=	52	units
Total number of residents	=	146	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**39.3**	m^3/day

O' Hotel

No. of Hotel Room	=	151	Rooms
Assumed floor area per employee	=	3.3	m^2 per employee -- (refer to Table 8 of CIFSUS - Hotels and Boarding Houses)
Totla number of employee	=	45	employees
Design flow for commercial employee	=	1.58	m^3/employee/day -- (refer to Table T-2 of GESF - J10 - Restaurants & Hotels)
Sewage Generation rate	=	**71.6**	m^3/day

Kam Wo Building

Total number of residential units	=	70	units
Total number of residents	=	196	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**52.9**	m^3/day

Hill Main Massion

Total number of residential units	=	96	units
Total number of residents	=	269	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**72.6**	m^3/day

Goldfall Centre

Assumed Area	=	1289	m^2
Assumed floor area per employee	=	43	m^2 per worker -- (refer to Table 8 of CIFSUS - Manufacturing)
Total number of employees	=	30	employees
Design flow for commercial activities	=	0.63	m^3/employee/day -- (refer to Table T-3 of GESF J1 - Manufacturing)
Sewage Generation rate	=	**18.9**	m^3/day

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

BMW House

Assumed Area	=	13043	m^2
Assumed floor area per employee	=	18.2	m^2 per worker -- (refer to Table 8 of CIFSUS - Financial, Insurance, Real Estate & Busines
Total number of employees	=	717	employees
Design flow for commercial activities	=	0.08	m^3/employee/day -- (refer to Table T-2 of GESF J6 - Financial, Insurance, Real Estate & B
Sewage Generation rate	=	**57.4**	m^3/day

Tokwawan Market and Government Office
土瓜灣街市熟食中心

Assumed Area	=	1133	m^2
Assumed floor area per employee	=	19.6	m^2 per worker -- (refer to Table 8 of CIFSUS - Restaurants)
Total number of employees	=	58	employees
Design flow for commercial activities	=	1.58	m^3/employee/day -- (refer to Table T-2 of GESF - J10)
Sewage Generation rate	=	**91.3**	m^3/day

Governmnet Office

Assumed Area	=	9715	m^2
Assumed floor area per employee	=	18.2	m^2 per worker -- (refer to Table 8 of CIFSUS - Financial, Insurance, Real Estate & Busines
Total number of employees	=	534	employees
Design flow for commercial activities	=	0.08	m^3/employee/day -- (refer to Table T-2 of GESF J6 - Financial, Insurance, Real Estate & B
Sewage Generation rate	=	**42.7**	m^3/day

SKH Good Shepherd Primary School

Total number of teachers & staff	=	31	teachers & staff (from the website)
Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
Total number of students	=	336	students (from the website)
Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
Sewage Generation rate	=	**22.1**	m^3/day

ELCHK Hung Hom Lutheran Primary School

Total number of teachers & staff	=	36	teachers & staff (from the website)
Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
Total number of students	=	256	students (from the website)
Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
Sewage Generation rate	=	**20.3**	m^3/day

Po Leung Kuk Madam Chan Wai Chow Memorial School

Total number of teachers & staff	=	31	teachers & staff (from the website)
Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
Total number of students	=	200	students (from the website)
Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
Sewage Generation rate	=	**16.7**	m^3/day

Northcote College of Education Past Students' Association School

Total number of teachers & staff	=	31	teachers & staff (from the website)
Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
Total number of students	=	200	students (from the website)
Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
Sewage Generation rate	=	**16.7**	m^3/day

Po Leung Kuk Lam Man Chan English Primary School

Total number of teachers & staff	=	96	teachers & staff (from the website)
Design flow for teachers & staff	=	0.28	m^3/person/day (refer to Table T-2, Commercial Employee)
Total number of students	=	788	students (from the website)
Design flow for students	=	0.04	m^3/person/day (refer to Table T-2, School Student)
Sewage Generation rate	=	**58.4**	m^3/day

May Court

Total number of residential units	=	54	units
Total number of residents	=	151	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**40.8**	m^3/day

Shing Yip Building

Total number of residential units	=	15	units
Total number of residents	=	42	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**11.3**	m^3/day

Wing Kin Building

Total number of residential units	=	15	units
Total number of residents	=	42	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**11.3**	m^3/day

Fortune Views

Total number of residential units	=	18	units
Total number of residents	=	50	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**13.6**	m^3/day

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

Pau Chung Street

32 Pau Chung Street	=	2	units
20 Pau Chung Street	=	2	units
18 Pau Chung Street	=	8	units
14-16 Pau Chung Street	=	12	units
12 Pau Chung Street	=	5	units
10 Pau Chung Street	=	5	units
8 Pau Chung Street	=	5	units
6 Pau Chung Street	=	7	units
Total number of residential units	=	46	units
Total number of residents	=	129	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**34.8**	m^3/day

ATC2006 Ascendancy Tutorial Centre

Assumed Area	=	81	m^2
Assumed floor area per employee	=	30.3	m^2 per employee -- (refer to Table 8 of CIFSUS - Community & Social Services)
Total number of employees	=	3	employees
Design flow for commercial employee	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J11)
Sewage Generation rate	=	**0.7**	m^3/day

Yen Cheong Building

Total number of residential units	=	17	units
Total number of residents	=	48	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**12.9**	m^3/day

Yen Che Building

Total number of residential units	=	36	units
Total number of residents	=	101	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**27.2**	m^3/day

Granada Building

Total number of residential units	=	22	units
Total number of residents	=	62	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**16.6**	m^3/day

30 Sheung Heung Road

Total number of residential units	=	5	units
Total number of residents	=	14	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**3.8**	m^3/day

Riches Court

Total number of residential units	=	40	units
Total number of residents	=	112	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**30.2**	m^3/day

Cheong Hing Building

Total number of residential units	=	40	units
Total number of residents	=	112	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**30.2**	m^3/day

Hong Fu Mansion

Total number of residential units	=	39	units
Total number of residents	=	109	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**29.5**	m^3/day

Wah Keung Building

Total number of residential units	=	91	units
Total number of residents	=	255	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**68.8**	m^3/day

Wah King Mansion

Total number of residential units	=	115	units
Total number of residents	=	322	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**86.9**	m^3/day

Merry Mansion

Total number of residential units	=	110	units
Total number of residents	=	308	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**83.2**	m^3/day

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

Cheung Ning Street			
35A Cheung Ning Street	=	4	units
35B Cheung Ning Street	=	4	units
29 Cheung Ning Street	=	8	units
27 Cheung Ning Street	=	8	units
17 Cheung Ning Street	=	5	units
15 Cheung Ning Street	=	5	units
13 Cheung Ning Street	=	10	units
11 Cheung Ning Street	=	7	units
Total number of residential units	=	51	units
Total number of residents	=	143	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**38.6**	m^3/day
Besthing Garden			
Total number of residential units	=	57	units
Total number of residents	=	160	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**43.1**	m^3/day
Lai Ming Court			
Total number of residential units	=	40	units
Total number of residents	=	112	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**30.2**	m^3/day
Ling Nam Building			
Total number of residential units	=	73	units
Total number of residents	=	204	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**55.2**	m^3/day
Honour Building			
Total number of residential units	=	863	units
Total number of residents	=	2416	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**652.4**	m^3/day
Total Flow Rate in Catchment	=	**5218.4**	m^3/day
Total Flow Rate in Catchment with PCIF	=	**5218.4**	m^3/day
Contributing Population	=	**19328**	people
Peaking Factor	=	**6**	
Peak Flow	=	**362.4**	litre/sec

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

Catchment G4

Commercial (Cheong Wan Factory Building)

Assumed used Area for commercial	=	7571	m^2
Assumed floor area per employee	=	25.0	m^2 per employee (worker densities refer to Table 2 in Chapter 5 of HKPSG)
Total number of employees	=	303	employees
Design flow for commercial activities	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - Commercial Employee)
Sewage generation rate (Commercial)	=	**84.8**	m^3/day
Assumed used Area for industrial uses	=	1440	m^2
Assumed floor area per employee	=	25	m^2 per employee (worker densities refer to Table 2 in Chapter 5 of HKPSG)
Total number of employees	=	58	employees
Design flow for industrial employee	=	0.63	m^3/employee/day -- (refer to Table T-3 of GESF J1 - Cental Kowloon)
Sewage generation rate (Industrial)	=	**36.5**	m^3/day

Office Building (Brill Plaza)

Assumed used Area	=	11880	m^2
Assumed floor area per employee	=	25	m^2 per employee (worker densities refer to Table 2 in Chapter 5 of HKPSG)
Total number of employees	=	475	employees
Design flow for commercial activities	=	0.08	m^3/employee/day -- (refer to Table T-2 of GESF J12 - Public Administration)
Sewage generation rate (Commercial)	=	**38.0**	m^3/day

Industrial Building (Luen Fat Mansion)

Assumed used area for industrial uses	=	2214	m^2
Assumed floor area per employee	=	25	m^2 per employee (worker densities refer to Table 2 in Chapter 5 of HKPSG)
Total number of employees	=	89	employees
Design flow for industrial employee	=	0.63	m^3/employee/day -- (refer to Table T-3 of GESF J1 - Cental Kowloon)
Sewage generation rate (Industrial)	=	**56.1**	m^3/day

Industrial Buildings (Factories at 21 - 31 Sheung Heung Road)

Assumed used area for industrial uses	=	1341	m^2
Assumed floor area per employee	=	25	m^2 per employee (worker densities refer to Table 2 in Chapter 5 of HKPSG)
Total number of employees	=	54	employees
Design flow for industrial employee	=	0.63	m^3/employee/day -- (refer to Table T-3 of GESF J1 - Cental Kowloon)
Sewage generation rate (Industrial)	=	34.0	m^3/day
Assumed used area for warehouse	=	12067	m^2
Assumed floor area per employee	=	250	m^2 per employee (worker densities refer to Table 8 of CIFSUS - Storage)
Total number of employees	=	48	employees
Design flow for warehouse employee	=	0.18	m^3/employee/day -- (refer to Table T-2 of GESF J3 - Transport, Storage & Communication
Sewage generation rate (Warehouse)	=	8.7	m^3/day
Sewage generation rate (this industrial building)		**42.7**	m^3/day

Residential (1 - 17A Sheung Heung Road, 2 - 29 Wing Yiu Street, 1 - 35 Hung Kwong Street)

Total number of units	=	611	units
Total number of residents	=	1711	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	190	litre/person/day -- (Private R1 in Table T-1 of GESF)
Sewage Generation rate	=	**325.1**	m^3/day

Residential (Ka Wai Court & Fung Yue Mansion, 46-48 & 54-56 Pau Chung Street, 43-45 Kowloon City Road)

Total number of units	=	105	units
Total number of residents	=	294	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	190	litre/person/day -- (Private R1 in Table T-1 of GESF)
Sewage Generation rate	=	**55.9**	m^3/day

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

Industrial Building (On Lok Factory Building)			
Assumed used area for warehouse (34 Units)	=	11397	m^2
Assumed floor area per employee	=	250	m^2 per employee (worker densities refer to Table 8 of CIFSUS - Storage)
Total number of employees	=	46	employees
Design flow for warehouse employee	=	0.18	m^3/employee/day -- (refer to Table T-2 of GESF J3 - Transport, Storage & Communication
Sewage generation rate for warehouse	=	8.2	m^3/day
Assumed used area for commercial (6 Units)	=	2011	m^2
Assumed floor area per employee	=	25	m^2 per employee (worker densities refer to Table 2 in Chapter 5 of HKPSG)
Total number of employees	=	80	employees
Design flow for commercial employee	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF J3 - General Territorial Average)
Sewage generation rate for commercial	=	22.5	m^3/day
Assumed used area for industrial (4 Units)	=	1341	m^2
Assumed floor area per employee	=	25	m^2 per employee (worker densities refer to Table 2 in Chapter 5 of HKPSG)
Total number of employees	=	54	employees
Design flow for industrial employee	=	0.63	m^3/employee/day -- (refer to Table T-3 of GESF J1 - Cental Kowloon)
Sewage generation rate for industrial	=	33.8	m^3/day
Total from On Lok Factory Building	=	**64**	m^3/day
Artisan Garden			
Total number of units	=	294	units
Total number of residents	=	823	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	190	litre/person/day -- (Private R1 in Table T-1 of GESF)
Sewage Generation rate (residential)	=	156.4	m^3/day
Sewage generation rate of this Development	=	**156.4**	m^3/day
Yick Fu Building & Full Yuet Court			
Total number of units	=	116	units
Total number of residents	=	325	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	190	litre/person/day -- (Private R1 in Table T-1 of GESF)
Sewage Generation rate	=	**61.7**	m^3/day
Wah King Mansion & Merry Mansion			
Total number of units	=	225	units
Total number of residents	=	630	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	190	litre/person/day -- (Private R1 in Table T-1 of GESF)
Sewage Generation rate	=	**119.7**	m^3/day
Total Flow Rate in Catchment	=	**1041.4**	m^3/day
Total Flow Rate in Catchment with PCIF	=	**1041.4**	m^3/day
Contributing Population	=	**3857**	people
Peaking Factor	=	**6**	
Peak Flow	=	**72.3**	litre/sec

Table 3b Calculation for Sewage Generation Rate of the Existing Surrounding Building (Catchment G-H)

Catchment H

Wyler Gardens - Chong Chien Court			
Total number of units	=	780	units
Total number of residents	=	2184	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**589.7**	m^3/day
Wyler Gardens - Chong Chien Court			
Total number of units	=	520	units
Total number of residents	=	1456	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**393.1**	m^3/day
On Ping Building			
Total number of residential units	=	126	units
Total number of residents	=	353	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**95.3**	m^3/day
On Hong Building			
Total number of residential units	=	104	units
Total number of residents	=	291	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**78.6**	m^3/day
On Lung Building			
Total number of residential units	=	104	units
Total number of residents	=	291	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**78.6**	m^3/day
On Tai Building			
Total number of residential units	=	104	units
Total number of residents	=	291	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**78.6**	m^3/day
On Shun Building			
Total number of residential units	=	104	units
Total number of residents	=	291	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**78.6**	m^3/day
On Fook Building			
Total number of residential units	=	104	units
Total number of residents	=	291	people -- (2019 Population Census: Average Household Size of 2.8 in Kowloon City)
Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
Sewage Generation rate	=	**78.6**	m^3/day
Total Flow Rate in Catchment	=	**1471.2**	m^3/day
Total Flow Rate in Catchment with PCIF	=	**1471.2**	m^3/day
Contributing Population	=	**5449**	people
Peaking Factor	=	***6***	
Peak Flow	=	**102.2**	litre/sec

Table 3c Calculation for Sewage Generation Rate - Scenario 1

1. 13 Street (Future) (Scenario 1)

1a. Total number of residential units	=	4408	units
1b. Total number of residents	=	11902	people -- (2021 Population Census: Average Household Size of 2.7 in Kowloon City[(1)])
1c. Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
1d. Sewage Generation rate	=	**3213.4**	m^3/day

Rctail

2a. Assumed Area	=	24495.0	m^2
2b. Assumed floor area per employee	=	28.6	m^2 per employee -- (refer to Table 8 of CIFSUS - Retail Trade)
2c. Total number of employees	=	858.0	employees
2d. Design flow for commercial employee	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J2)
2e. Sewage Generation rate	=	**240.2**	m^3/day

F&B

3a. Assumed Area	=	24495.0	m^2
3b. Assumed floor area per employee	=	19.6	m^2 per employee -- (refer to Table 8 of CIFSUS - Restaurants)
3c. Total number of employees	=	1250	employees
2d. Design flow for commercial employee	=	1.58	m^3/employee/day -- (refer to Table T-2 of GESF - J2)
2c. Sewage Generation rate	=	**1975.0**	m^3/day

Total Flow Rate	=	**5428.7**	m^3/day
Total Flow Ratr wuth PCIF	=	**5428.7**	m^3/day

Remark:

(1):A more conservative approach is also carried out for +17% variation of population increase, which is about 2.7 as the same as the average domestic household size of Kowloon City District in 2021 Population Census. The results demonstrated that it will not incur major deviation from the current assessment.

Table 3d Calculation for Sewage Generation Rate - Scenario 2

1. 13 Street (Future) (Scenario 2)

1a. Total number of residential units	=	5070	units
1b. Total number of residents	=	13689	people -- (2021 Population Census: Average Household Size of 2.7 in Kowloon City[(1)])
1c. Design flow	=	0.27	m^3/person/day -- (refer to Table T-1 of GESF - Private R2)
1d. Sewage Generation rate	=	**3696.0**	m^3/day

Retail

2a. Assumed Area	=	24495.0	m^2
2b. Assumed floor area per employee	=	28.6	m^2 per employee -- (refer to Table 8 of CIFSUS - Retail Trade)
2c. Total number of employees	=	858.0	employees
2d. Design flow for commercial employee	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J2)
2e. Sewage Generation rate	=	**240.2**	m^3/day

F&B

3a. Assumed Area	=	24495.0	m^2
3b. Assumed floor area per employee	=	19.6	m^2 per employee -- (refer to Table 8 of CIFSUS - Restaurants)
3c. Total number of employees	=	1250	employees
2d. Design flow for commercial employee	=	1.58	m^3/employee/day -- (refer to Table T-2 of GESF - J2)
2e. Sewage Generation rate	=	**1975.0**	m^3/day

GIC

2a. Assumed Area	=	17237	m^2
2b. Assumed floor area per employee	=	30.3	m^2 per worker -- (refer to Table 8 of CIFSUS - Community & Social Services)
2c. Total number of employees	=	568.9	employees
2d. Design flow for commercial activities	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J11 Community, Social & Personal Services)
2e. Sewage Generation rate	=	**159.3**	m^3/day

Total Flow Rate	=	**5911.3**	m^3/day
Total Flow Ratr wuth PCIF	=	**5911.3**	m^3/day

Remark:

(1):A more conservative approach is also carried out for +17% variation of population increase, which is about 2.7 as the same as the average domestic household size of Kowloon City District in 2021 Population Census. The results demonstrated that it will not incur major deviation from the current assessment.

Table 4a Comparision of the Hydraulic Capacity of Existing Sewers for Sewerage generated from the Proposed Development and Surrounding Catchment Areas

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	ADWF (m^3/day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
S1-S2	1500	15.6	0.002	2546	103350.2	382779	3	0.0	3576.6	140.5%	Spill
S2-S3	1500	42.3	0.002	2948	104821.4	388227	3	0.0	3627.5	123.0%	Spill
S3-S4	1500	65.0	0.001	2326	104821.4	388227	3	0.0	3627.5	156.0%	Spill

Table 4b Comparision of the Hydraulic Capacity of Existing Sewers for Sewerage generated from the Proposed Development and Surrounding Catchment Areas (13st. Scenario 1)

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	ADWF (m^3/day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
S1-S2	1500	15.6	0.002	2546	107025.3	396390	3	0.0	3691.4	145.0%	Spill
S2-S3	1500	42.3	0.002	2948	108496.4	401839	3	1.0	3730.6	126.5%	Spill
S3-S4	1500	65.0	0.001	2326	108496.4	401839	3	0.0	3729.6	160.4%	Spill

Table 4c Comparision of the Hydraulic Capacity of Existing Sewers for Sewerage generated from the Proposed Development and Surrounding Catchment Areas (13st. Scenario 2)

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	ADWF (m^3/day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
S1-S2	1500	15.6	0.002	2546	107507.9	398177	3	0.0	3695.6	145.2%	Spill
S2-S3	1500	42.3	0.002	2948	108979.0	403626	3	0.0	3746.2	127.1%	Spill
S3-S4	1500	65.0	0.001	2326	108979.0	403626	3	0.0	3746.2	161.1%	Spill

Table 4d Comparision of the Hydraulic Capacity of Upgraded Sewers for Sewerage generated from the Proposed Development and Surrounding Catchment Areas

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	ADWF (m^3/day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
S1-S2	1650	15.6	0.002	4539	103350.2	382779	3	0.0	3576.6	78.8%	OK
S2-S3	1650	42.3	0.002	4358	104821.4	388227	3	0.0	3627.5	83.2%	OK
S3-S4	1650	65.0	0.002	4355	104821.4	388227	3	0.0	3627.5	83.3%	OK

Table 4e Comparision of the Hydraulic Capacity of Upgraded Sewers for Sewerage generated from the Proposed Development and Surrounding Catchment Areas (13st. Scenario 1)

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	ADWF (m^3/day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
S1-S2	1650	15.6	0.002	4539	107025.3	396390	3	0.0	3691.4	81.3%	OK
S2-S3	1650	42.3	0.002	4358	108496.4	401839	3	0.0	3729.6	85.6%	OK
S3-S4	1650	65.0	0.002	4355	108496.4	401839	3	0.0	3729.6	85.6%	OK

Table 4f Comparision of the Hydraulic Capacity of Upgraded Sewers for Sewerage generated from the Proposed Development and Surrounding Catchment Areas (13st. Scenario 2)

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	ADWF (m^3/day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
S1-S2	1650	15.6	0.002	4539	107507.9	398177	3	0.0	3695.6	81.4%	OK
S2-S3	1650	42.3	0.002	4358	108979.0	403626	3	0.0	3746.2	86.0%	OK
S3-S4	1650	65.0	0.002	4355	108979.0	403626	3	0.0	3746.2	86.0%	OK

Table 4g Comparision of the Hydraulic Capacity of Proposed Sewers from the Terminal Manhole of the Proposed Development for Sewage generated from the Proposed Development (13st. Scenario 1)

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	ADWF (m^3/day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
T1a-T2a	300	4.4	0.007	100	966.6	3580	6	0.0	67.1	67.5%	OK
T2a-T2	600	68.2	0.003	419	6395.3	23686	4	1.0	297.1	70.9%	OK
T1-T2	300	3.9	0.026	194	1301.3	4820	6	0.0	90.4	46.5%	OK
T2-T3	600	153.6	0.006	583	7696.6	28506	4	0.0	356.3	61.1%	OK
T3-T4	600	121.3	0.013	841	7696.6	28506	4	0.0	356.3	42.4%	OK
T4-S1	600	9.3	0.011	772	7696.6	28506	4	0.0	356.3	46.1%	OK

Table 4h Comparision of the Hydraulic Capacity of Proposed Sewers from the Terminal Manhole of the Proposed Development for Sewage generated from the Proposed Development (13st. Scenario 2)

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	ADWF (m^3/day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
T1a-T2a	300	4.4	0.007	100	966.6	3580	6	0.0	67.1	67.5%	OK
T2a-T2	600	68.2	0.003	419	6877.9	25474	4	0.0	318.4	75.9%	OK
T1-T2	300	3.9	0.026	194	1301.3	4820	6	0.0	90.4	46.5%	OK
T2-T3	600	153.6	0.006	583	8179.2	30293	4	0.0	378.7	64.9%	OK
T3-T4	600	121.3	0.013	841	8179.2	30293	4	0.0	378.7	45.0%	OK
T4-S1	600	9.3	0.011	772	8179.2	30293	4	0.0	378.7	49.0%	OK

Remarks: (1) The value of peaking factor = 6 is used for population 1,000-5,000 incl. stormwater allowance (refers to Table T-5 of GESF)
(2) The value of peaking factor = 4 is used for population 10,000-50,000 incl. stormwater allowance (refers to Table T-5 of GESF)
(3) The value of peaking factor = 3 is used for population 120,080 incl. stormwater allowance (refers to Table T-5 of GESF)

Appendix 8

Water Supply Impact Assessment (WSIA) Report

Prepared for

Urban Renewal Authority

Prepared by

Ramboll Hong Kong Limited

TWO DEVELOPMENT SCHEMES - MING LUN STREET/ MA TAU KOK ROAD (KC-018) AND TO KWA WAN ROAD/ MA TAU KOK ROAD (KC-019)

WATER SUPPLY IMPACT ASSESSMENT

Date	**September 2022**
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Signed	
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CHAPTERS

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APPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 Under a holistic planning approach, the URA has proposed two Development Schemes at Ming Lun Street / Ma Tau Kok Road (KC-018) and To Kwa Wan Road / Ma Tau Kok Road (KC-019) (the Schemes). URA's intention is to implement the 2 Schemes as 1 inclusive redevelopment. A comprehensive notional scheme is prepared considering the 2 connecting sites as one redevelopment.

1.1.2 This Water Supply Impact Assessment is prepared to support the two draft Development Scheme Plans (DSPs) submission to the Town Planning Board (TPB) under Section 25 of the Urban Renewal Authority Ordinance. This Report covers and supports both Schemes as one comprehensive redevelopment.

1.1.3 Ramboll Hong Kong Limited has been appointed by URA to conduct this Water Supply Impact Assessment which would evaluate any overall potential impact on water supply arising from the proposed development and other planned development.

1.1.4 Architectural drawings and technical information of the redevelopment are provided by the project architect (Ho & Partners Architects Engineers & Development Consultants Limited (HPA)).

1.2 The Schemes and its Environs

1.2.1 The Schemes has a total gross site area of 20,189m^2 (11,430m^2 for KC-018 site and 8,759m^2 for KC-019 site). It is situated in Kowloon City area and about bounded by Hong Kong Housing Society's reserved site for Dedicated Rehousing Estate (DRE) to the north, To Kwa Wan Road to the west, existing Grand Waterfront (residential use) to the south and Ma Tau Kok waterfront to the east. **Figure 1.1** shows the location of the Schemes.

1.2.2 Existing roads including Ming Lun Street, Chung Sun Street, Hing Yin Street, Hing Yan Street and Ma Tau Kok Road fall within the Schemes. In addition, the Schemes is occupied by ageing residential buildings (more than 60 years) of 7 to 8 storeys with street shops and Newport Centre (industrial building). The street shops include restaurants, retail shop, garage, shops for auto parts, auto cleaning service, hardware store, etc. Newport Centre (Phase 1 & 2) is currently occupied for offices, storage, workshops, showrooms and retail services use.

1.2.3 "13-Street" to the northwest is currently occupied by ageing residential buildings (about 60 years) of 6 to 7 storeys with street shops. The "13-Street" area falls within a "Proposed Redevelopment Priority Area" under DURF. The site is currently zoned as "CDA" under the approved Ma Tau Kok OZP No. S/K10/28 gazetted on 25 March 2022. According to the OZP, the planning intention of this "CDA" zone is for comprehensive re-/development of the area for residential and/or commercial uses with the provision of open space and other supporting facilities. In order to account the possible scenarios where the surrounding site would undergo similar redevelopment in future, a sensitivity study is also conducted to consider the impact on water supply should the nearby "13-Street" will also be redeveloped.

1.2.4 Grand Waterfront with 5 residential towers erected on top of a retail podium building is situated to the immediate south. Ma Tau Kok Gas Work North Plant is situated on the opposite side of To Kwa Wan Road. Developments further away include Cattle Depot Art Park and Artiest Village, To Kwa Wan Recreation Ground, a number of industrial/commercial buildings (e.g. Merit Industrial Centre, Kapok Industrial Building,

New Lee Wah Centre) along To Kwa Wan Road, Wyler Gardens (residential uses) and a ferry pier.

1.3 Proposed Redevelopment

1.3.1 The Proposed Redevelopment at the Schemes consists of 4 residential towers with 3 lowest floors for retail/GIC/clubhouse purpose and 31 domestic storeys above. There will be a total of 1,276 flat units provided at KC-018 site and 950 flat units provided at KC-019 site after development. Total number of units is 2,226.

1.3.2 The tentative completion dates of the proposed redevelopment at both KC-018 site and KC-019 site are 2033.

1.3.3 The Master Layout Plan (MLP), typical floor plan and section of the Proposed Development are shown in **Appendix 1.1.**

2. WATER SUPPLY IMPACT ASSESSMENT

2.1 Scope of Work

2.1.1 The aim of this WSIA study is to assess the capacity of the existing water supply facilities serving the Schemes, and to project the water demands generated from the Proposed Scheme. Data and record plans from Water Supplies Department (WSD) were obtained to facilitate the WSIA.

2.2 Information Available for the Study

2.2.1 Reference has been made to the WSD's Departmental Instruction 1308 (where available), as well as Environmental Protection Department's (EPD's) Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (GESF). In addition, Planning Department's (PlanD) Commercial and Industrial Floor Space Utilization Survey (CIFSUS) have also been used.

2.3 Assessment Criteria and Methodology

2.3.1 The Schemes is currently served by the Ma Tau Wai Fresh Water Service Reservoir (FWSR) and Lok Fu Salt Water Service Reservoir (SWSR).

2.3.2 The FWSR has a capacity of 24,140m^3 and with daily consumption of 36,000 m^3/day.

2.3.3 Flushing water (saltwater) is supplied via Tai Wan Salt Water Pumping Station with daily delivery of 85000 m^3/day and Lok Fu Salt Water Service Reservoir with capacity of 8597m^3.

2.3.4 The KC-018 site is occupied by dilapidated buildings (over 60 years of age) with residential cum commercial uses, while KC-019 site is occupied by Newport Centre which is of industrial use. The original uses of the Schemes will be used as a baseline from which to assess the potential impacts of the Proposed Scheme. This report assesses the overall impact due to development at the Schemes (comprising KC-018 & KC-019 site) and also takes into account the possible future 13-Street redevelopment as a sensitivity study in accordance with the Kowloon City DURF Study and as shown on the current OZP. Therefore, the original uses of 13-Street Area is also considered as part of the baseline case.

2.3.5 WSD Departmental Instruction 1309 sets out the design criteria for water supplies in Hong Kong and includes unit water demands for various classes of consumer, including different types of residential density zones and commercial consumers. Apart from the above, EPD's GESF includes unit sewage flow factors for various commercial activities.

2.3.6 For this WSIA, WSD's data from DI 1309 has been referenced to provide unit water demands for the various population categories, with the relevant EPD GESF unit sewage flow factors to determine overall unit water demand factors. PlanD's CIFSUS has also been referenced for calculation of the population density where necessary.

2.3.7 These unit water demands have been combined with the relevant Site and development parameters to assess baseline and future water demands, from which the potential impacts have been assessed. Calculations for the water demands of the Indicative Scheme are included in **Appendix 2.2**.

2.4 Assessment of Water Supply Impact

2.4.1 An overall summary is tabulated below to show the freshwater and salt water demand before and after development.

Table 2-1 Summary of Fresh and Salt Water Demand

	Fresh Water demand (m^3/day)		Salt Water Demand (m^3/day)	
	Before Development	After Development	Before Development	After Development
KC-018	892.7	1199.7	149.6	251.1
KC-019	3971.1	933.0	1851.1	187.1
Total	4863.8	2132.7	2000.8	438.2

2.4.2 As shown in **Appendix 2.2**, the freshwater demand at KC-018 Site is expected to be 1199.7 m^3/day whereas 251.1 m^3/day for saltwater demand after development. For the baseline scenario (existing demand), the freshwater demand at the Site is 892.7 m^3/day whereas the saltwater demand is 149.6 m^3/day. The future daily freshwater demand is equivalent to about 5% of the capacity of the freshwater service reservoir (MTWFWSR) whereas future daily saltwater demand is equivalent to about 3% of saltwater service reservoir (LFSWSR).

2.4.3 The freshwater demand at KC-019 Site is expected to be 933.0 m^3/day whereas 187.1 m^3/day for saltwater demand after development. For the baseline scenario (existing demand), the freshwater demand at the Site is 3971.1 m^3/day whereas the saltwater demand is 1851.1 m^3/day. The future daily freshwater demand is equivalent to about 4% of the capacity of the freshwater service reservoir (MTWFWSR) whereas future daily saltwater demand is equivalent to about 2.2% of saltwater service reservoir (LFSWSR).

2.4.4 Overall speaking, there would be reduction of freshwater and salt water demand after development.

2.4.5 There are existing water mains running along the northeast and southwest of KC-018 site and southwest of KC-019 site which would have adequate capacity to cater for the future water demand. No impact is expected for the Proposed Redevelopment with decreased demand. No adverse water supply impact is anticipated. Connections will be made to the existing watermains. The existing connection points will be used where feasible.

Sensitivity Study: The Schemes and 13-Street Area (neighbouring future redevelopment site)

2.4.6 With respect to the Schemes (KC-018 & KC-019 site) and 13-Street area, as shown in **Appendix 2.2**, the overall freshwater demand is expected to be 6425.9 m^3/day whereas 1295.2 m^3/day for saltwater demand after development.

2.4.7 For the baseline scenario (existing demand), the freshwater demand at the Site is 7624.7 m^3/day whereas the saltwater demand is 2512.4 m^3/day.

2.4.8 Overall speaking, with consideration of 13-Street area, there would be reduction of freshwater and salt water demand after development.

2.4.9 A sensitivity testing for the future 13-Street area with an increase of about 15% in development intensity has also been included to assess the likely impacts. This sensitivity testing scenario and its impact in water supply is included in **Appendix 2.3**. It is concluded that no adverse water supply impact is anticipated for the sensitivity testing scenario.

3. OVERALL CONCLUSION

3.1.1 The existing dilapidated buildings and industrial building at the Schemes comprising KC-018 site and KC-019 site will be redeveloped into modern housing to help address the housing demand in Hong Kong. The proposed redevelopment at the Schemes will include 4 residential towers above commercial podium. The potential water supply impacts have been quantitatively addressed.

3.1.2 By considering the overall impact due to development of the Schemes and taking into account the sensitivity study of "13-Street" area, there will be decrease in fresh water and salt water demand. No adverse water supply impact is anticipated.

Figures

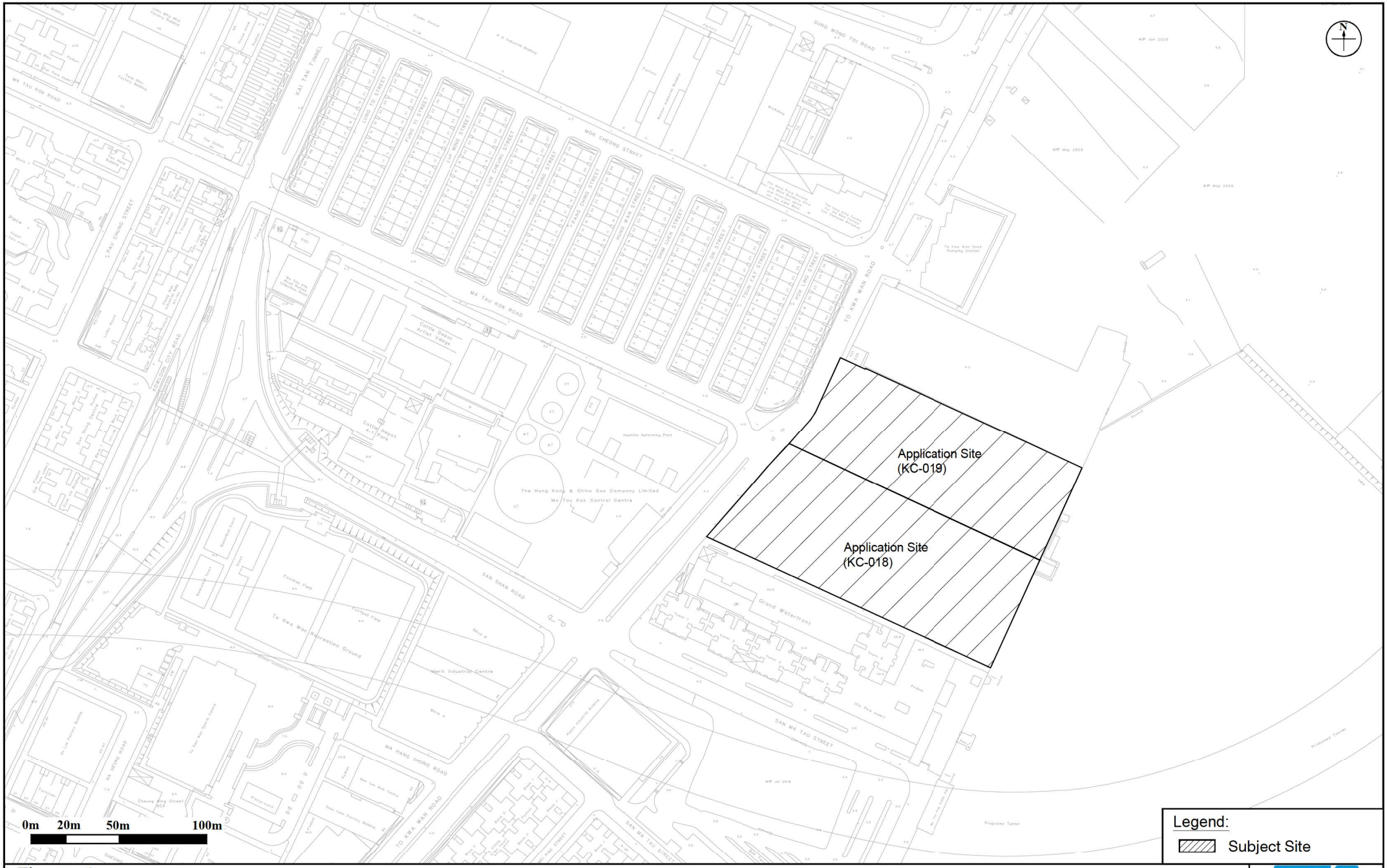

Figure: 1

Title: Location of Subject Site and Its Environs

Project: TWO DEVELOPMENT SCHEMES - MING LUN STREET/ MA TAU KOK ROAD (KC-018) AND TO KWA WAN ROAD/ MA TAU KOK ROAD (KC-019)

RAMBOLL

Drawn by:	AL
Checked by:	CC
Rev.:	1.1
Date:	Jul 2022

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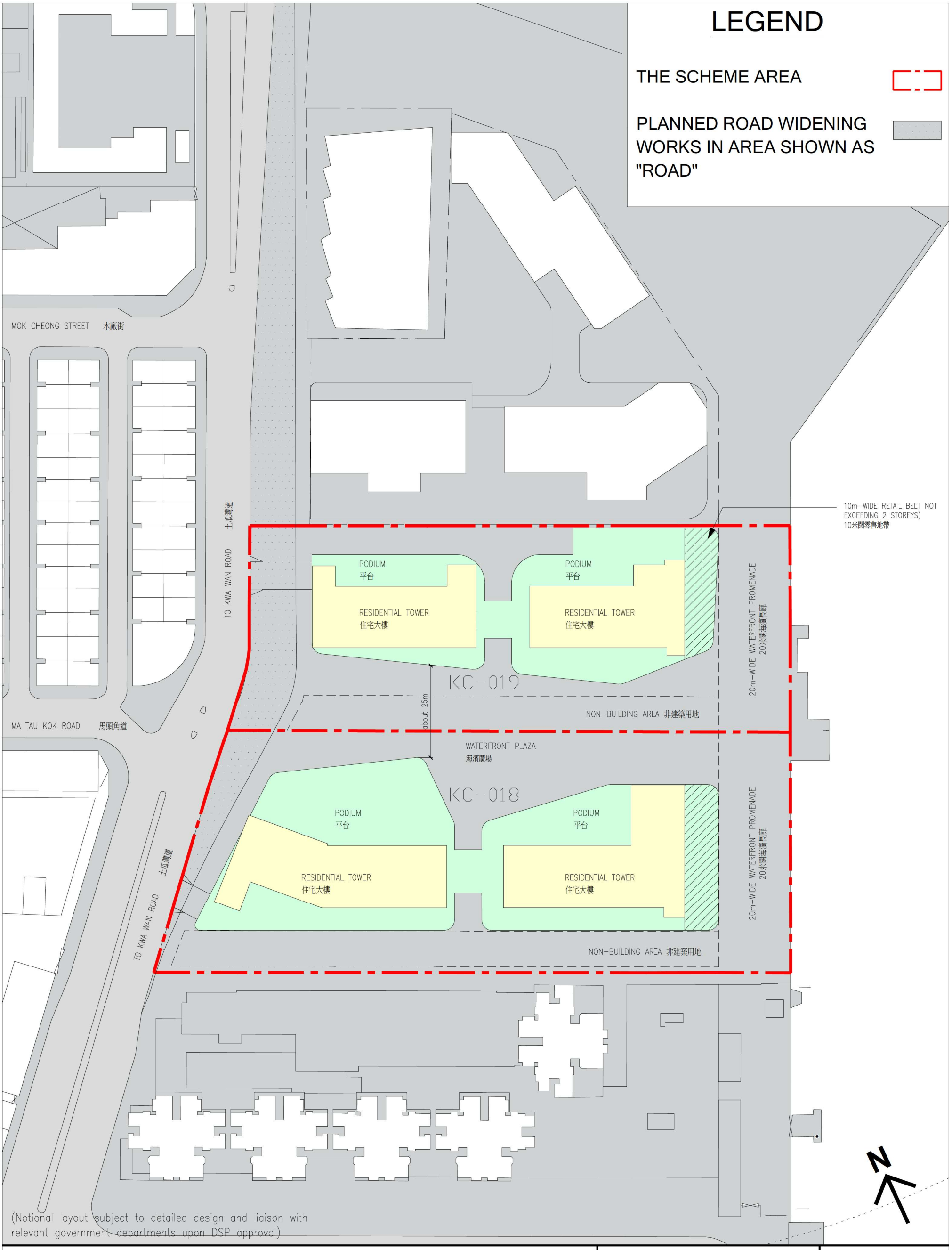
Appendix 1.1 Master Layout Plan of the Proposed Development

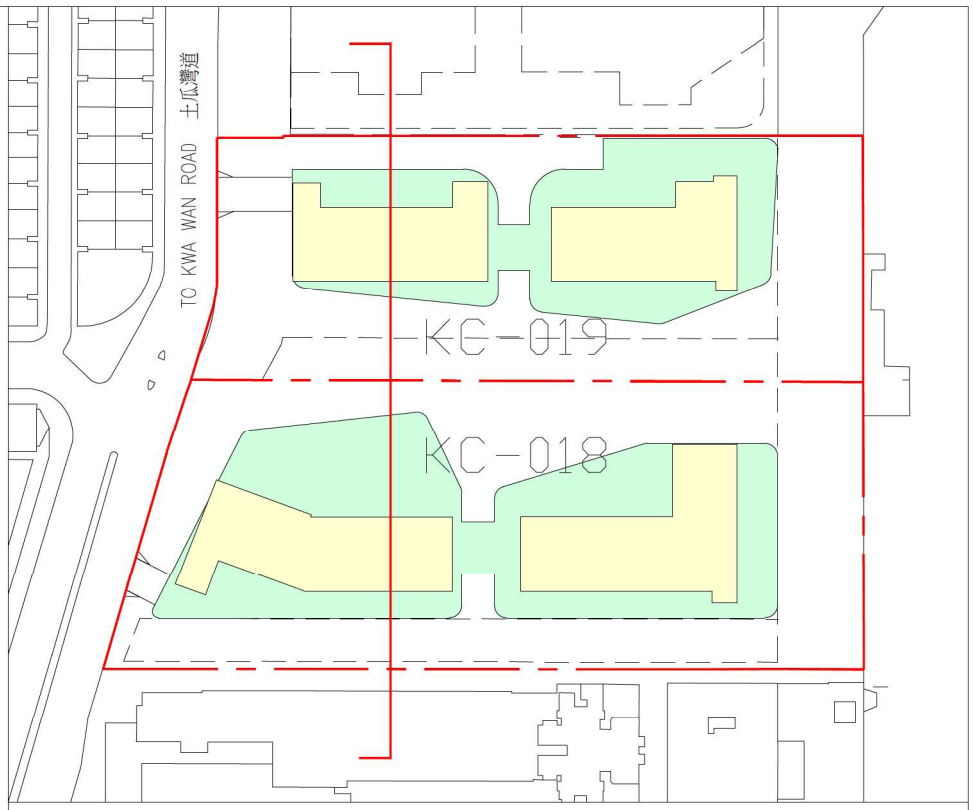


URBAN RENEWAL AUTHORITY 市區重建局

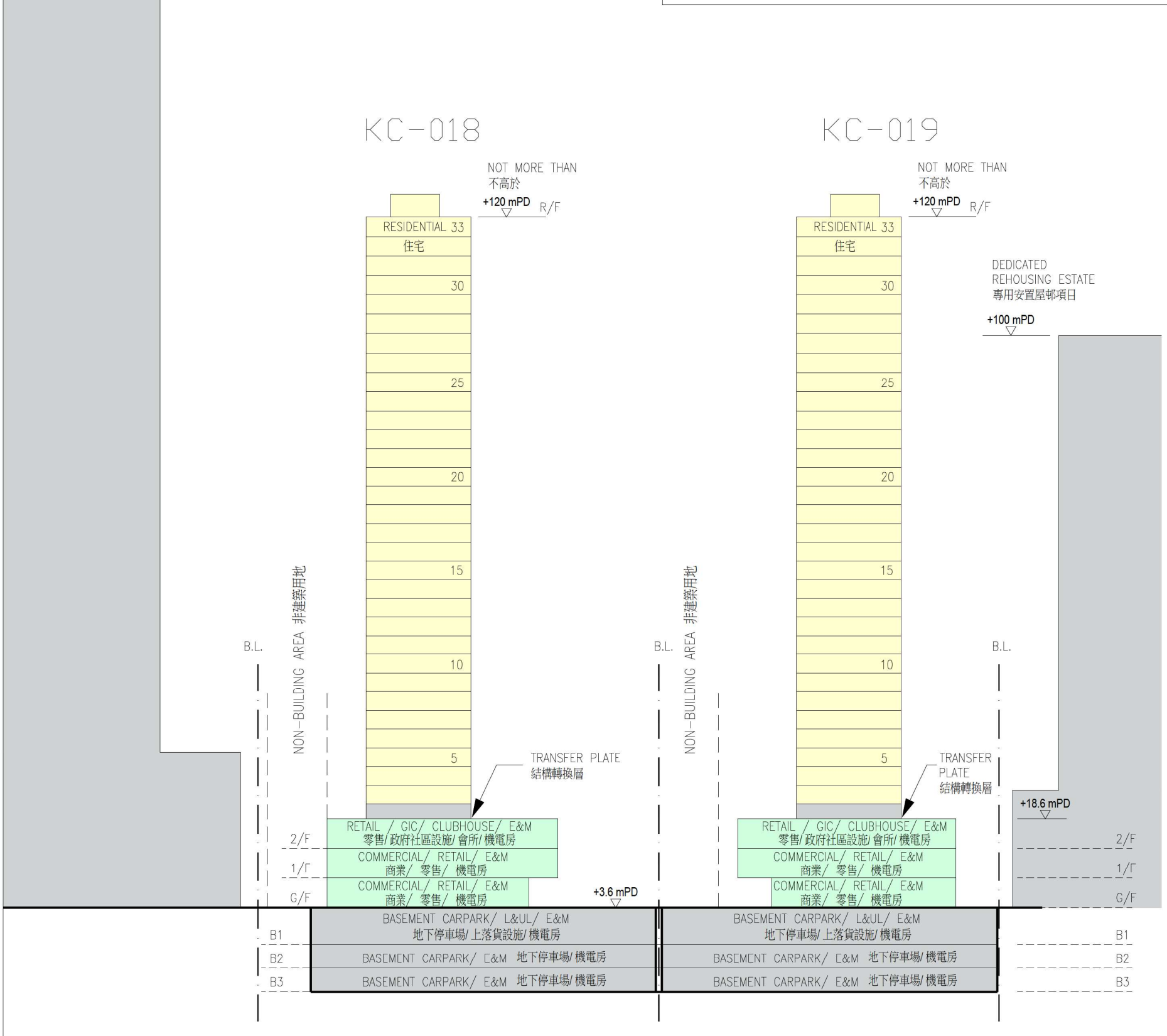
URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Block Plan

FIGURE 1.1
NOT TO SCALE



KEY PLAN 索引圖



(Notional layout subject to detailed design and liaison with relevant government departments upon DSP approval)

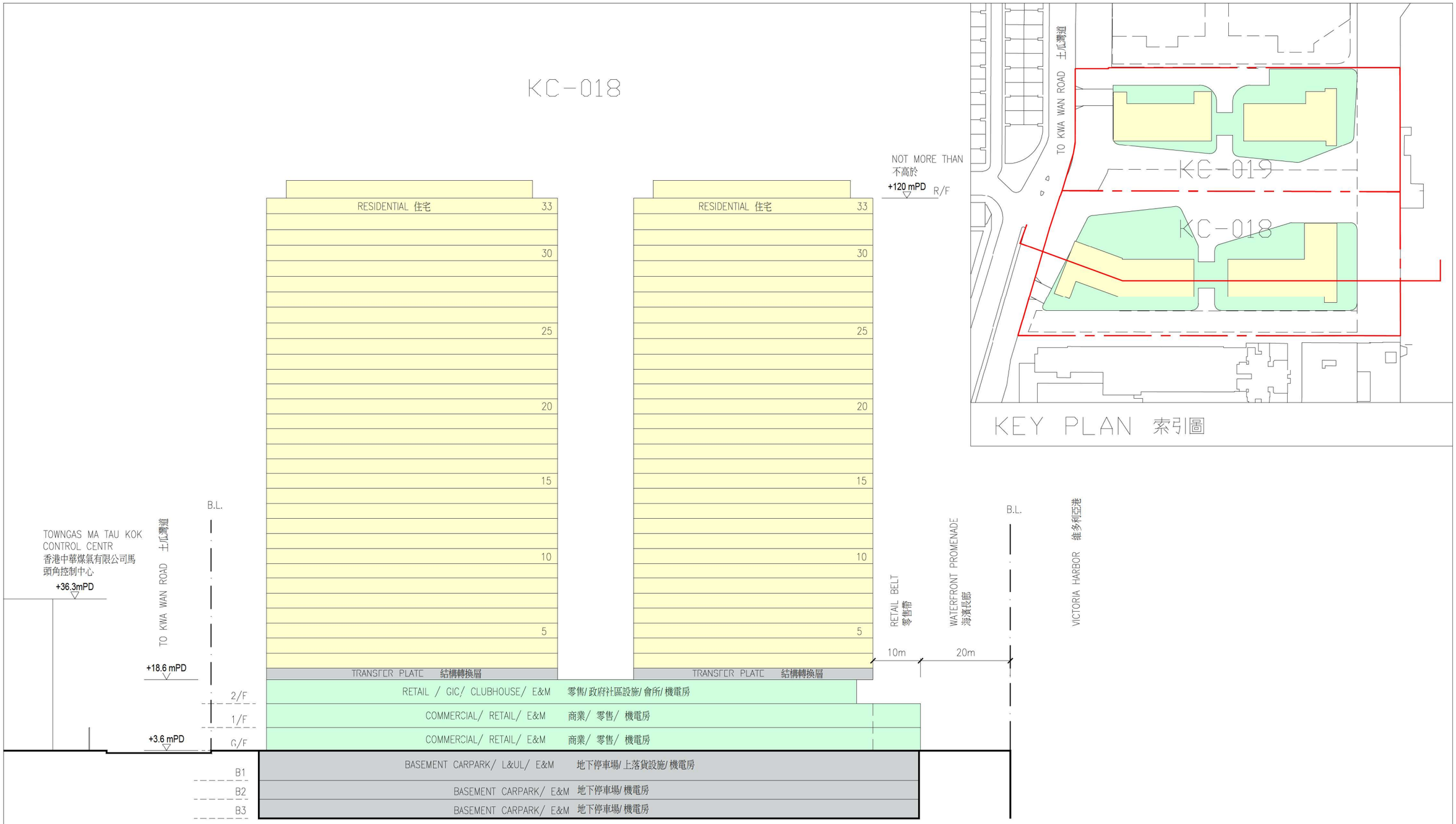
市區重建局
URBAN RENEWAL AUTHORITY

URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Schematic Section

FIGURE 1.2
NOT TO SCALE

KC-018



(Notional layout subject to detailed design and liaison with relevant government departments upon DSP approval)

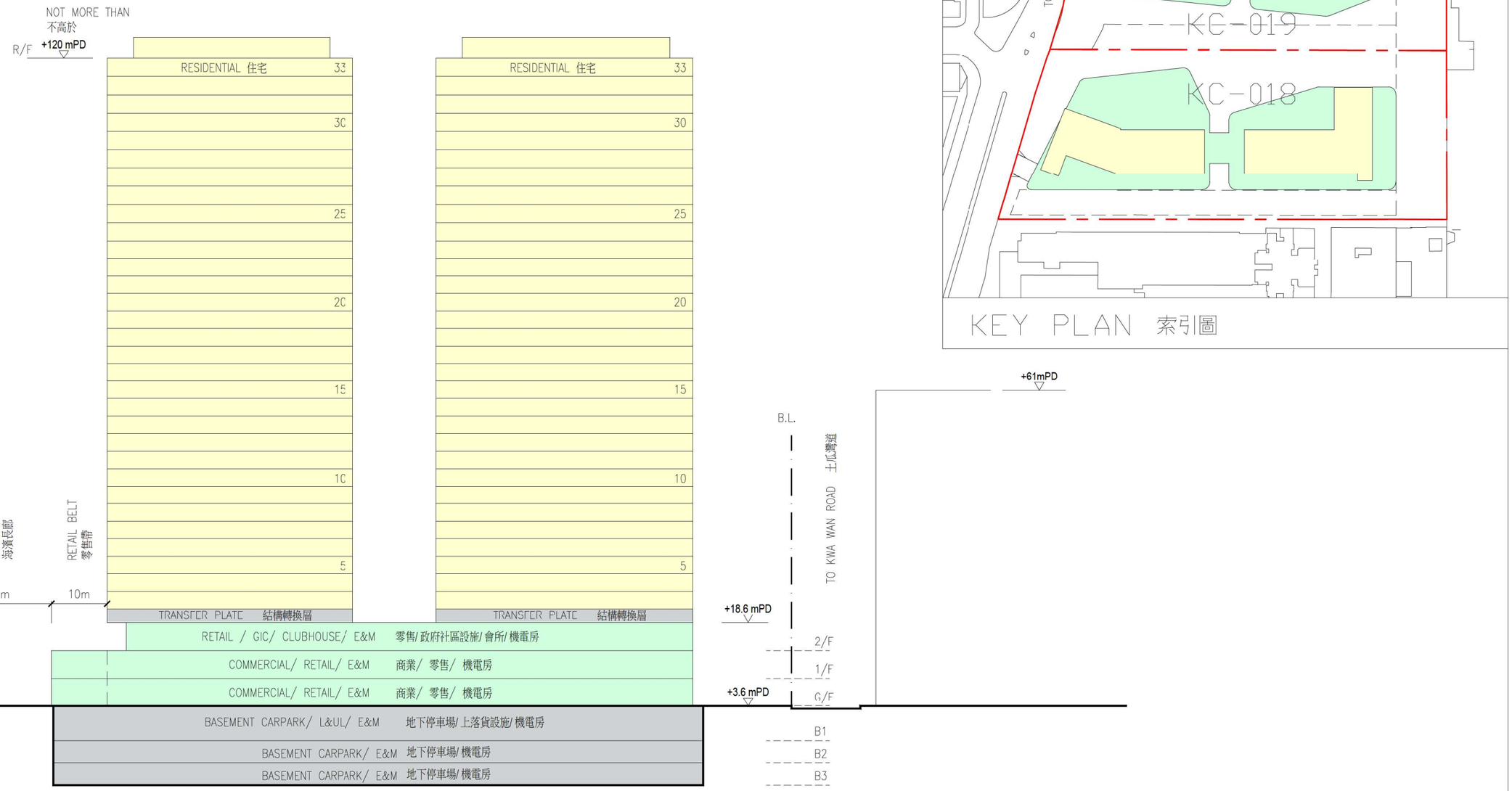
市區重建局
URBAN RENEWAL AUTHORITY

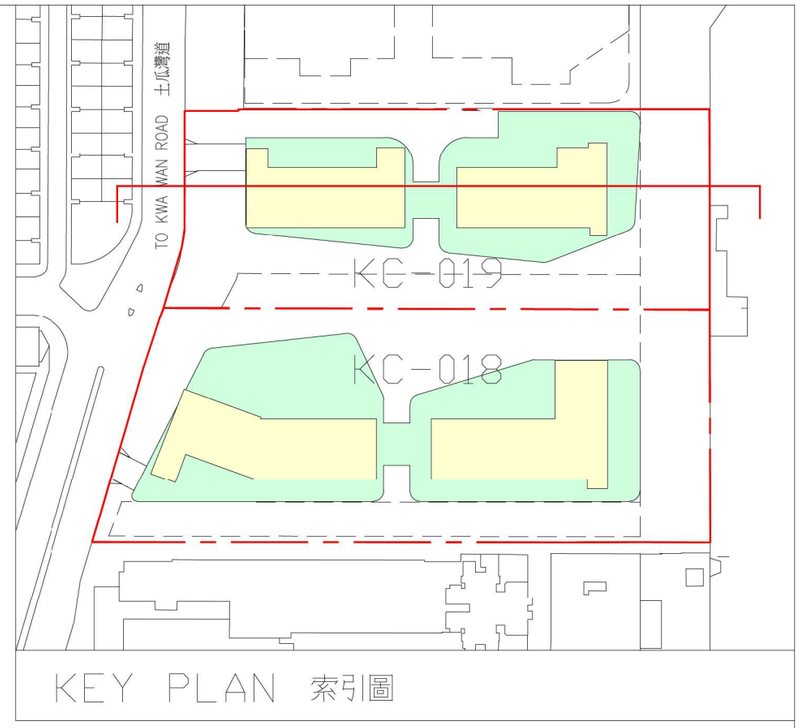
URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Schematic Section

FIGURE 1.3
NOT TO SCALE

KC-019





(Notional layout subject to detailed design and liaison with relevant government departments upon DSP approval)

市區重建局
URBAN RENEWAL AUTHORITY

URA Ming Lun Street/ Ma Tau Kok Road (KC-018)
&
To Kwa Wan Road/ Ma Tau Kok Road (KC-019)
Development Scheme

Notional Design - Schematic Section

FIGURE 1.4
NOT TO SCALE

Appendix 2.1 Records Obtained from Water Supplies Department

水 務 署
Water Supplies Department

長沙灣辦事處
Cheung Sha Wan Office
九龍長沙灣荔康街二號水務署九龍西區大樓
WSD Kowloon West Regional Building, 2 Lai Hong Street, Cheung Sha Wan, Kowloon

本署檔號 *Our ref.* : (2) in WSD/K 1728/103/80 Pt.3
來函檔號 *Your ref.* : 328000509_0_002411.19

電話 *Tel.* : 2360 6113
傳真 *Fax.* : 2386 7813

7 November 2019

Ramball Hong Kong Limited
21/F, BEA Harbour View Centre,
56 Gloucester Road,
Wan Chai, Hong Kong.

(Attn: Ms Kitty Wong)

Dear Ms Wong,

Request for Information
Ho Man Tin High Level Fresh Water Service Reservoir and Salt Water Service Reservoir at To Kwa Wan

I refer to your above quoted letter dated 26.9.2019.

I attach herewith, for your information, a plan showing the 2 fresh water service reservoirs for water supply to the area around your proposed development. The capacity of Ho Man Tin East Fresh Water Service Reservoir is 152,411 m3 with daily consumption of 123 mld. Ma Tau Wai Fresh Water Service Reservoir has a capacity of 24,140 m3 with daily consumption of 36 mld.

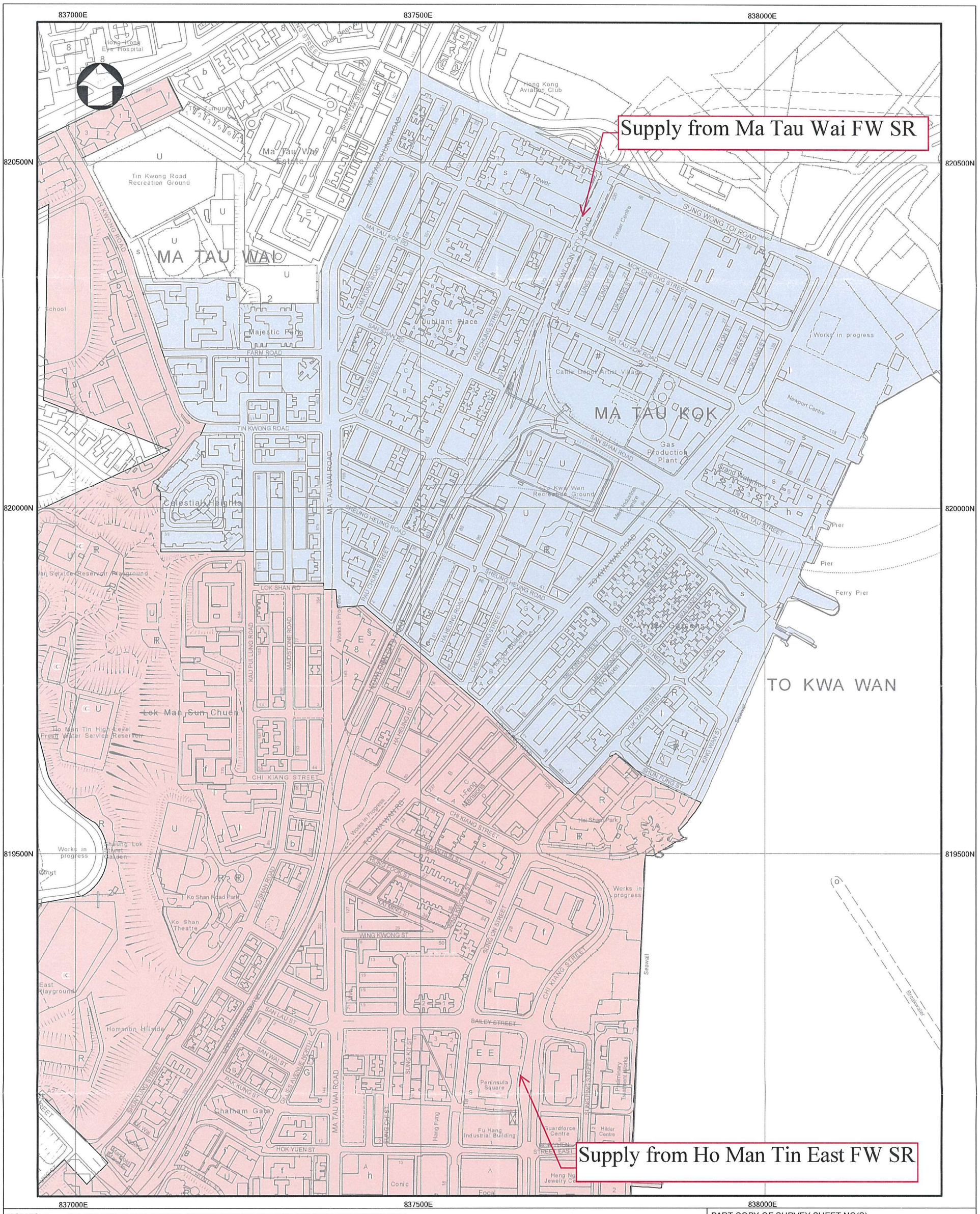
Flushing water will be supplied via Tai Wan Salt Water Pumping Station with daily delivery of 85 mld and Lok Fu Salt Water Service Reservoir with capacity of 8,597 m3 to the proposed development.

Yours faithfully,

(Thomas CHUNG)
for Chief Engineer/Kowloon
Water Supplies Department

Encl.

FRESH WATER



NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
2. ALL LEVELS ARE IN METRES ABOVE PRINCIPAL DATUM.
3. NO WSD SLOPES ARE AFFECTED IN THE VICINITY OF THE SITE.

PART COPY OF SURVEY SHEET NO(S).

11-NE-11C, 11D, 16B, 16D, 21A, 21B, 11-NW-15D, 20B, 20D & 25B

SHEET 1 OF 1 | SCALE 1:5000

水 務 署
Water Supplies Department

Appendix 2.2 Water Demand Calculations

Future Water Demands of Ming Lun Street/ Ma Tau Kok Road Development Scheme (KC-018)

					Freshwater			Saltwater			
		Type of Use	Population (head) [1]	Area (ha)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (m^3/day)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (m^3/day)	Reference
Future (Application Site)	Residential Development	Residential Density Zone R2	3,445	-	0.340	-	1171.30	0.070	-	241.15	WSD DI 1309
	Club House [2]	GIC	-	2.729	-	2.00	5.46	-	0.70	1.91	WSD DI 1309
	Retail	Commercial	-	10.496	-	2.00	20.99	-	0.70	7.35	WSD DI 1309
	Government, Institution or Community (GIC)	GIC	-	1.000	-	2.00	2.00	-	0.70	0.70	WSIA- CE 4/2004#
						TOTAL	**1199.7**			**251.1**	

*Overall Unit Demand includes 0.055 m^3/head/day for Service Trade
#Agreement No. CE 4/2004 (TP) South East Kowloon Development, Comprehensive Planning & Engineering Review Stage 1: Planning Review - Feasibility Study (from Planning Department). For details, please refer to the link below:

https://www.pland.gov.hk/pland_en/p_study/prog_s/sek_09/website_chib5_eng/english/TR1/Chapter%206.html

TOTAL FRESHWATER DEMAND (m^3/day) = 1199.7

TOTAL SALTWATER DEMAND (m^3/day) = 251.1

Remark: (1):A more conservative approach is also carried out for +17% variation of population increase, which is about 2.7 as the same as the average domestic household size of Kowloon City District in 2021 Population Census. The results demonstrated that it will not incur major deviation from the current assessment.

(2): Clibhouse area assumed 4% of domestic GFA

Baseline (Existing) Water Demands of Sites at Ming Lun Street/ Ma Tau Kok Road Development Scheme (KC-018)

							Freshwater			Flushing Water			
		Type of Use	Population (head)	Area (ha)	Laundry-washing unit (unit)	Laundry-Design flow for each washing unit (m3/kg/cycle)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (m^3/day)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (m^3/day)	Reference
Baseline (Existing Area)	No. 91-113 Ma Tau Kok Road, Ming Lun Street, Chung Sun Street, Hing Yin Street, Hing Yan Street	Residential Density Zone R3	1990	-	-	-	0.445	-	885.55	0.070	-	139.30	WSD DI 1309
		Commercial (Retail & Service)	-	3.492	-	-	-	2.00	6.98	-	0.70	2.44	WSD DI 1309
		Commercial (Restaurant)	5	0.096	-	-	-	2.00	0.19	1.580	-	7.90	WSD DI 1309 & EPD GESF
		Laundry	-	-	4	0.0173	-	-	0.0000692	-	-	-	WSD Survey
		*Overall Unit Demand includes 0.055 m^3/head/day for Service Trade						**TOTAL**	**892.7**			**149.6**	

TOTAL FRESHWATER DEMAND (m^3/day) = **892.7**

TOTAL SALTWATER DEMAND (m^3/day) = **149.6**

Future Water Demands of To Kwa Wan Road/ Ma Tau Kok Road Development Scheme (KC-019)

					Freshwater				Saltwater			
		Type of Use	Population (head) [1]	Area (ha)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (mm/day)	Daily Demand (m^3/day)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (m^3/day)	Reference
Future (Application Site)	Residential Development	Residential Density Zone R2	2,565	-	0.355	-		910.58	0.070	-	179.55	WSD DI 1309
	Club House [2]	GIC	-	2.032	-	2.00		4.06	-	0.70	1.42	WSD DI 1309
	Retail	Commercial	-	7.816	-	2.00		15.63	-	0.70	5.47	WSD DI 1309
	Government, Institution or Community (GIC)	GIC	-	1.000	-	2.00	-	2.00	-	0.70	0.70	WSIA- CE 4/2004#
						TOTAL		**933.0**			**187.1**	

*Overall Unit Demand includes 0.055 m^3/head/day for Service Trade

#Agreement No. CE 4/2004 (TP) South East Kowloon Development, Comprehensive Planning & Engineering Review Stage 1: Planning Review - Feasibility Study (from Planning Department). For details, please refer to the link below:

https://www.pland.gov.hk/pland_en/p_study/prog_s/sek_09/website_chib5_eng/english/TR1/Chapter%206.html

TOTAL FRESHWATER DEMAND (m^3/day) = 933.0

TOTAL SALTWATER DEMAND (m^3/day) = 187.1

Remark: (1):A more conservative approach is also carried out for +17% variation of population increase, which is about 2.7 as the same as the average domestic household size of Kowloon City District in 2021 Population Census. The results demonstrated that it will not incur major deviation from the current assessment.

(2): Clibhouse area assumed 4% of domestic GFA

Baseline (Existing) Water Demands of the Sites at To Kwa Wan Road/ Ma Tau Kok Road Development Scheme (KC-019)

					Freshwater			Flushing Water			
		Type of Use	Population (head)	Area (ha)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (m^3/day)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (m^3/day)	Reference
Baseline (Existing Area)	New Port Centre along Ma Tau Kok Road	Commercial	-	8.786	-	2.00	17.57	-	0.70	6.15	WSD DI 1309
		Industrial	-	8.786	-	450	3953.52	-	210	1844.98	WSD DI 1309
						TOTAL	**3971.1**			**1851.1**	

TOTAL FRESHWATER DEMAND (m^3/day) = **3971.1**
TOTAL SALTWATER DEMAND (m^3/day) = **1851.1**

Future Water Demands of Proposed Comprehensive Development at Kowloon City (13 St.)

					Freshwater			Saltwater			
		Type of Use	Population (head) [1]	Area (ha)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (m^3/day)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (m^3/day)	Reference
Future (Application Site)	Residential Development	Residential Density Zone R2	11,902	-	0.355	-	4225.07	0.070	-	833.11	WSD DI 1309
	Club House/ Retail	Commercial	-	34.044	-	2.00	68.09	-	0.70	23.83	WSD DI 1309
*Overall Unit Demand includes 0.055 m³/head/day for Service Trade						**TOTAL**	**4293.2**			**856.9**	

TOTAL FRESHWATER DEMAND (m³/day) = 4293.2

TOTAL SALTWATER DEMAND (m³/day) = 856.9

Remark: (1):A more conservative approach is also carried out for +17% variation of population increase, which is about 2.7 as the same as the average domestic household size of Kowloon City District in 2021 Population Census. The results demonstrated that it will not incur major deviation from the current assessment.

Baseline (Existing) Water Demands of the Sites at Kowloon City (13 St.)

							Freshwater			Flushing Water			
		Type of Use	Population (head)	Area (ha)	Laundry-washing unit (unit)	Laundry-Design flow for each washing unit (l/unit/day)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (m^3/day)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (m^3/day)	Reference
Baseline (Existing Area)	13 Streets	Residential Density Zone R3	6124	-	-	-	0.445	-	2725.18	0.070	-	428.68	WSD DI 1309
		Commercial (Retail & Service)	-	16.956	-	-	-	2.00	33.91	-	0.70	11.87	WSD DI 1309
		Commercial (Restaurant)	45	0.880	-	-	-	2.00	1.76	1.580	-	71.10	WSD DI 1309 & EPD GESF
								TOTAL	**2760.9**			**511.6**	

*Overall Unit Demand includes 0.055 m^3/head/day for Service Trade

TOTAL FRESHWATER DEMAND (m^3/day) = 2760.9
TOTAL SALTWATER DEMAND (m^3/day) = 511.6

Future Water Demands of the Application sites and its Vicinity

		Freshwater Daily Demand (m^3/day)	Saltwater Daily Demand (m^3/day)
Baseline (Existing Area)	Ming Lun Street/ Ma Tau Kok Road (KC-018)	892.7	149.6
	To Kwa Wan Road/ Ma Tau Kok Road (KC-019)	3971.1	1851.1
	13 Streets	2760.9	511.6
	Total (m^3/day)	**7624.7**	**2512.4**

		Freshwater Daily Demand (m^3/day)	Saltwater Daily Demand (m^3/day)
Future (Application Site)	Ming Lun Street/ Ma Tau Kok Road (KC-018)	1199.7	251.1
	To Kwa Wan Road/ Ma Tau Kok Road (KC-019)	933.0	187.1
	13 Streets	4293.2	856.9
	Total (m^3/day)	**6425.9**	**1295.2**

Appendix 2.3 Water Demands Calculations (Sensitivity Test)

Future Water Demands of Proposed Comprehensive Development at Kowloon City (13 St.)
- Sensitivity Test

					Freshwater				Saltwater			
		Type of Use	Population (head)	Area (ha)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (mm/day)	Daily Demand (m^3/day)	Daily Unit Demand (m^3/head/day)	Daily Unit Demand (m^3/ha/day)	Daily Demand (m^3/day)	Reference
Future (Application Site)	Residential Development	Residential Density Zone R2	13,689	-	0.355	-		4859.60	0.070	-	958.23	WSD DI 1309
	Club House	GIC	-	9.822	-	2.00		19.64	-	0.700	6.88	WSD DI 1309
	Retail	Commercial	-	42.125	-	2.00		84.25		0.700	29.49	
	Government, Institution or Community (GIC)	GIC	-	11.420	-	2.00	-	22.84	-	0.70	7.99	WSIA- CE 4/2004#
						TOTAL		**4986.3**			**1002.6**	

*Overall Unit Demand includes 0.055 m^3/head/day for Service Trade

#Agreement No. CE 4/2004 (TP) South East Kowloon Development, Comprehensive Planning & Engineering Review Stage 1: Planning Review - Feasibility Study (from Planning Department). For details, please refer to the link below:

https://www.pland.gov.hk/pland_en/p_study/prog_s/sek_09/website_chib5_eng/english/TR1/Chapter%206.html

TOTAL FRESHWATER DEMAND (m^3/day) = 4986.3
TOTAL SALTWATER DEMAND (m^3/day) = 1002.6

Future Water Demands of the Application sites and its Vicinity
- Sensitivity Test

		Freshwater Daily Demand (m^3/day)	Saltwater Daily Demand (m^3/day)
Baseline (Existing Area)	Ming Lun Street/ Ma Tau Kok Road (KC-018)	892.7	149.6
	To Kwa Wan Road/ Ma Tau Kok Road (KC-019)	3971.1	1851.1
	13 Streets	2760.9	511.6
	Total (m^3/day)	**7624.7**	**2512.4**

		Freshwater Daily Demand (m^3/day)	Saltwater Daily Demand (m^3/day)
Future (Application Site)	Ming Lun Street/ Ma Tau Kok Road (KC-018)	1199.74992	251.1
	To Kwa Wan Road/ Ma Tau Kok Road (KC-019)	933.0	187.1
	13 Streets	4986.3	1002.6
	Total (m^3/day)	**7119.0**	**1440.8**

Appendix 9

Qualitative Appraisal of Risk Impact- Technical Note

Prepared for

Urban Renewal Authority

Prepared by

Ramboll Hong Kong Limited

TWO DEVELOPMENT SCHEMES - MING LUN STREET / MA TAU KOK ROAD (KC-018) AND TO KWA WAN ROAD / MA TAU KOK ROAD (KC-019)

QUALITATIVE APPRAISAL OF RISK IMPACT DUE TO OPERATION OF MA TAU KOK GAS WORK NORTH PLANT

Date	**October 2022**
Prepared by	**Simon Lai** **Environmental Consultant**
Signed	
Approved by	**Calvin Chiu** **Senior Manager**
Signed	
Project Reference	**URAKCAA2EI01**
Document No.	**R8590_V1.2**

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CHAPTERS

TABLES

FIGURES

APPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 Under a holistic planning approach, the URA has proposed two Development Schemes at Ming Lun Street / Ma Tau Kok Road (KC-018) and To Kwa Wan Road / Ma Tau Kok Road (KC-019) (the Schemes). URA's intention is to implement the 2 Schemes as 1 inclusive redevelopment. A comprehensive notional scheme is prepared considering the 2 connecting sites as one redevelopment.

1.1.2 This Qualitative Appraisal of Risk Impact Report due to operation of Ma Tau Kok Gas Work North Plant (MTK Plant) is prepared to support the two draft Development Scheme Plans (DSPs) submission to the Town Planning Board (TPB) under Section 25 of the Urban Renewal Authority Ordinance.

1.1.3 Ramboll Hong Kong Limited has been appointed by URA to conduct this appraisal of risk impact due to existing MTK Plant on opposite side of To Kwa Wan Road with reference to previous quantitative risk assessment study.

1.1.4 Architectural drawings and technical information of the redevelopment are provided by the project architect (Ho & Partners Architects Engineers & Development Consultants Limited (HPA)).

1.2 The Schemes and its Environs

1.2.1 The Schemes have a total gross site area of 20,189m^2 (11,430m^2 for KC-018 site and 8,759m^2 for KC-019 site). It is situated in Kowloon City area and about bounded by Hong Kong Housing Society's reserved site for Dedicated Rehousing Estate (DRE) to the north, To Kwa Wan Road to the west, existing Grand Waterfront (residential use) to the south and Ma Tau Kok waterfront to the east. **Figure 1.1** shows the location of the Schemes.

1.2.2 Existing roads including Ming Lun Street, Chung Sun Street, Hing Yin Street, Hing Yan Street and Ma Tau Kok Road fall within the Schemes. In addition, the Schemes is occupied by ageing residential buildings (not less than 60 years) of 7 to 8 storeys with street shops and Newport Centre (industrial building). The street shops include restaurants, retail shop, garage, shops for auto parts, auto cleaning service, hardware store, etc. Newport Centre (Phase 1 & 2) is currently occupied for offices, storage, workshops, showrooms and retail services use.

1.2.3 "13-Street" to the northwest is currently occupied by ageing residential buildings (about 60 years) of 6 to 7 storeys with street shops. The "13-Street" area falls within a "*Proposed Redevelopment Priority Area*" under DURF. The site is currently zoned as "CDA" under the approved Ma Tau Kok OZP No. S/K10/28 gazetted on 25 March 2022. According to the OZP, the planning intention of this "CDA" zone is for comprehensive re-/development of the area for residential and/or commercial uses with the provision of open space and other supporting facilities.

1.2.4 Grand Waterfront with 5 residential towers erected on top of a retail podium building is situated to the immediate south. MTK Plant is situated on the opposite side of To Kwa Wan Road. Developments further away include Cattle Depot Art Park and Artiest Village, To Kwa Wan Recreation Ground, a number of industrial/commercial buildings (e.g. Merit Industrial Centre, Kapok Industrial Building, New Lee Wah Centre) along To Kwa Wan Road, Wyler Gardens (residential uses) and a ferry pier.

1.3 Proposed Redevelopment

1.3.1 The Proposed Redevelopment at the Schemes consists of 4 residential towers with 3 lowest floors (G/F to 2/F) for retail/GIC/clubhouse purpose and 31 domestic storeys above (3/F to 33/F). The residential storeys start at an elevation of 21.1mPD with floor-to-floor heights of 3.15m for 3/F to 29/F, 3.35m for 30/F, 3.5m for 31/F to 33/F. Carparking facilities will be provided in 3 basement floors. There is a maximum BH (measured at the main roof of the tower) of 120mPD. There will be a total of 2,226 flat units provided after development.

1.3.2 The tentative completion dates of the proposed redevelopment at both KC-18 site and KC-019 site are 2033.

2. APPRAISAL OF RISK IMPACT

2.1 Background

2.1.1 MTK Plant is classified as a potentially hazardous installation (PHI). It is surrounded by "13 Streets" area, "5 Streets" area, existing Grand Waterfront (high-rise residential development), Cattle Depot Artist Village/Art Park, To Kwa Wan Recreation Ground and industrial buildings.

2.1.2 In 2021, the CCPHI had endorsed the Quantitative Risk Assessments (QRA) report ("Approved QRA Report"), which had assessed the risk levels associated with the Ma Tau Kok Gas Works (MTKGW) arising from potential residential development (including development in DRE site of HKHS, "5-Street" and "13-Street"area) within the Consultation Zone of the PHI of the MTKGW. This Qualitative Appraisal of Risk Impact report only serves as an appraisal to review that the proposed development of the two Schemes is in line with the Approved QRA. The population variation analysis is prepared based on the same assumptions adopted in the Approved QRA.

2.1.3 In the Approved QRA, "13 Streets" area, "5 Streets" area adopted the following assumptions:

Table 1 Summary of Development Parameters of "5 Streets" area in the Approved QRA Report

	"5 Streets" area
Plot Ratio: Domestic / Non-Domestic	6.0 / 0.5
Number of flats	2,458
Residential Population (based on PPOF of 2.3)	5,653
Non-domestic GFA (commercial area)	9,156 sq.m
Commercial/Non-Domestic area (based on density of 20sq.m/person)	458
Temporal variation – residential – day time (0600-1800)	25%
Night time 1 (1800-0000)	100%
Night time 2 (0000-0600)	100%
Temporal variation – commercial – day time (0600-1800)	100%
Night time 1 (1800-0000)	10%
Night time 2 (0000-0600)	0.5%

2.1.4 According to the result of the Approved QRA (see **Appendix 2.1**), the societal risk level taking into account cumulative risk impact by considering population within the consultation zone (including but not limited to "13 Streets" area and "5 Streets" area) is within ACCEPTABLE and ALARP region. In addition, it is understood that individual risk levels at off-site areas including "13 Streets" area and "5 Streets" area are lower than 1E-05 per year as stipulated in ProPECC PN 2/94 "Potentially Hazardous Installations".

2.1.5 Regarding the societal risk level, it is noted that the FN curve is nearest to the UNACCEPTABLE region at the point of 1.00E-09 per year (F) for fatality of 1000 (N). For example, with the same probability of occurrence, in case the number of fatality increases further, it may encroach into the UNACCEPTABLE region.

2.2 Change of Proposed Development in "5 Streets" area

2.2.1 According to the current proposal, both KC-018 site and KC-019 site within the Schemes will have the plot ratio increased when compared to the development parameters in the Approved QRA report.

2.2.2 Plot ratio of domestic / non-domestic area will be increased from 6.0 / 0.5 to 6.5 / 1.0. In addition, GIC facilities will be provided. The proposed GIC facilities would operate during day time and mainly serving general public instead of vulnerable population. GIC facilities such as recreational centre, day care centre, etc., could be considered within the Schemes while GIC facilities serving vulnerable population such as elderly home, elderly day care centre, residential child care services, hostel for disabled persons etc., would be avoided, subject to further liaison with relevant government departments at detailed design stage. In addition, the GIC facilities proposed in the Schemes will be located away from Ma Tau Kok Gas Works as far as practicable.

Table 2 Proposed Change of Development Parameters of the Schemes ("5 Streets" area) when compared to the Approved QRA Report

	Approved QRA Report	Current Proposal
Plot Ratio: Domestic / Non-Domestic	6.0 / 0.5	6.5 / 1.0
Number of flats	2,458	2,226
Commercial area	9,156 sq.m	18,312 sq.m
Commercial/Non-domestic population (based on density of 20sq.m/person)	458	916
GIC use	No	Yes
GIC population	0	75

2.2.3 In particular, it is worth noted that the increase of domestic plot ratio would help to increase flat size so that the minimum flat size would not be smaller than 280 sq.ft (or 26 sq.m), echoing the recent government policy. Therefore, the increase in plot ratio would not necessarily result in increase of flat units. According to the current proposal, the total number of flat of the Schemes would be 2,226 numbers, and is reduced when compared to the Approved QRA report.

2.3 Evaluation of Any Increased Risk Impact

Individual Risk

2.3.1 According to the finding in the Approved QRA report, the individual risk contour of 10-5 per year with consideration of exposure factor of 30% is marginally confined within the site boundary of the MTK Plant.

2.3.2 The site location and boundary of the Schemes does not change. Therefore, same conclusion can be drawn that there is no change on the individual risk level at the Schemes. The risk level would be lower than 1E-05 per year as stipulated in ProPECC PN 2/94.

Societal Risk

2.3.3 The societal risk level depends on the offsite population. In addition, temporal variation of population is accounted in QRA to reflect the change of population in a day. In the Approved QRA report, temporal variation was assumed as tabulated in Table 1.

2.3.4 Moreover, as discussed in Section 2.1, the societal risk level in the Approved QRA report is close to UNACCEPTABLE region at 1.00E-09 per year (F)/1000 (N). In other words, if there is any increase of maximum population, it may more possibly lead to change of societal risk to encroach into the UNACCEPTABLE region. Considering the nature of population within the consultation zone (predominantly residential), maximum population within the consultation zone would usually occur during night time period when residential population is highest.

2.3.5 Therefore, the variation of population is further analysed.

2.3.6 The population variation analysis is prepared based on same PPOF (2.3) (with reference to HKPSG Ch.2) adopted in the Approved QRA study for a fair comparison. According to the 2021 population census, the average household size in Hong Kong is decreasing to 2.7 in 10 years. Upon completion of the development in 2033 tentatively, the average household size is expected to agree to the HKPSG. Moreover, since the nature of the development in the Approved QRA report and current proposal is the same (mainly residential with retail facilities), there is no significant change anticipated on pedestrian population. Other assumptions such as indoor fraction is assumed unchanged.

2.3.7 Given that the building height of the proposed development is increased in the current proposal, the separation of population from risk source (at low level) will increase in general so that the actual risk impact will decrease. Yet, this factor is not accounted in the population variation analysis as well.

Table 3 Variation of Population with "5 Streets" area when compared to the Approved QRA Report

	Approved QRA Report			Current Proposal		
Population in:	Residential	Commercial	Total	Residential	Commercial+GIC	Total
Day Time	1,413	458	1,871	1,280	991	2,271
Night Time 1	5,653	46	5,699	5,120	99	5,219
Night Time 2	5,653	3	5,656	5,120	5	5,125
Maximum population			**5,699**			**5,219**

2.3.8 According to the comparison, daytime population is increased by 400 numbers; night time 1 population is decreased by 480 numbers; night time 2 population is decreased by 531 numbers. As discussed before, maximum population within consultation zone should occur during night time considering the nature of landuse. The proposed development is mainly residential in nature, maximum population will also occur during night time when most residents stay at home. The increase in daytime population compared with the Approved QRA is mainly due to the proposed commercial and GIC uses. These uses will be located away from the Ma Tau Kok Gas Works as far as practicable, subject to detailed design. In addition, the increase of population during day time would not affect the maximum population. The maximum population based on current proposal would be reduced by 480 numbers so that the maximum fatality would likely be reduced.

2.3.9 Given that the effective population in the Schemes will be reduced in future when compared to the Approved QRA report, no increase in potential risk due to operation of existing MTK Plant is anticipated.

2.3.10 It is considered that the societal risk level based on the latest development proposal would still fall within ALARP region so that practicable mitigation measures should be considered and adopted to reduce the risks. In the Approved QRA report, the recommended measures applicable to the Schemes at KC-018 & KC-019 including (1) to provide at-grade passageway on southern side of both KC-018 and KC-019 sites, and (2) to minimise bench/ sitting-out area at grade facing MTK Plant.

2.3.11 The same mitigation measures will be incorporated into the latest development proposal so as to reduce the risk impact. While vulnerable population arising from GIC use is not anticipated at this stage, it is noted that (3) in case uses such as elderly day care centre which would attract vulnerable population is planned in future, the GIC use will be located away from the risk source as practicably possible.

3. CONCLUSION

3.1.1 The development potential of KC-018 site and KC-019 site within previously referred "5 Streets" area is proposed to be increased with revised P.R. of 6.5 (domestic) + 1.0 (non-domestic)

3.1.2 Based on the evaluation in this context, the current proposal for KC-018 site and KC-019 site would result in reduced number of maximum population when compared to the assumption in previously Approved QRA report.

3.1.3 Therefore, no further increase in societal risk impact encroaching into UNACCEPTABLE region due to the operation of existing Ma Tau Kok Gas Work North Plant is anticipated.

3.1.4 Since the societal risk impact would fall within ALARP region with respect to the latest development proposal, same mitigation measures recommended in the Approved QRA report will be adopted to reduce the risk impact. In addition, due to incorporation on GIC use, further mitigation measures will be recommended. The risk mitigation measures are summarised below:

(1) to provide at-grade passageway on southern side of both KC-018 and KC-019 sites;

(2) to minimise bench/ sitting-out area at grade facing MTK Plant;

(3) to locate the GIC use away from the risk source as practicably possible in case uses such as elderly day care centre which would attract vulnerable population is planned in future

3.1.5 Upon DSP approval by the CE in C, the URA will liaise with relevant government departments and CCPHI on the available mitigation measures, and follow as far as practicable, subject to detailed design.

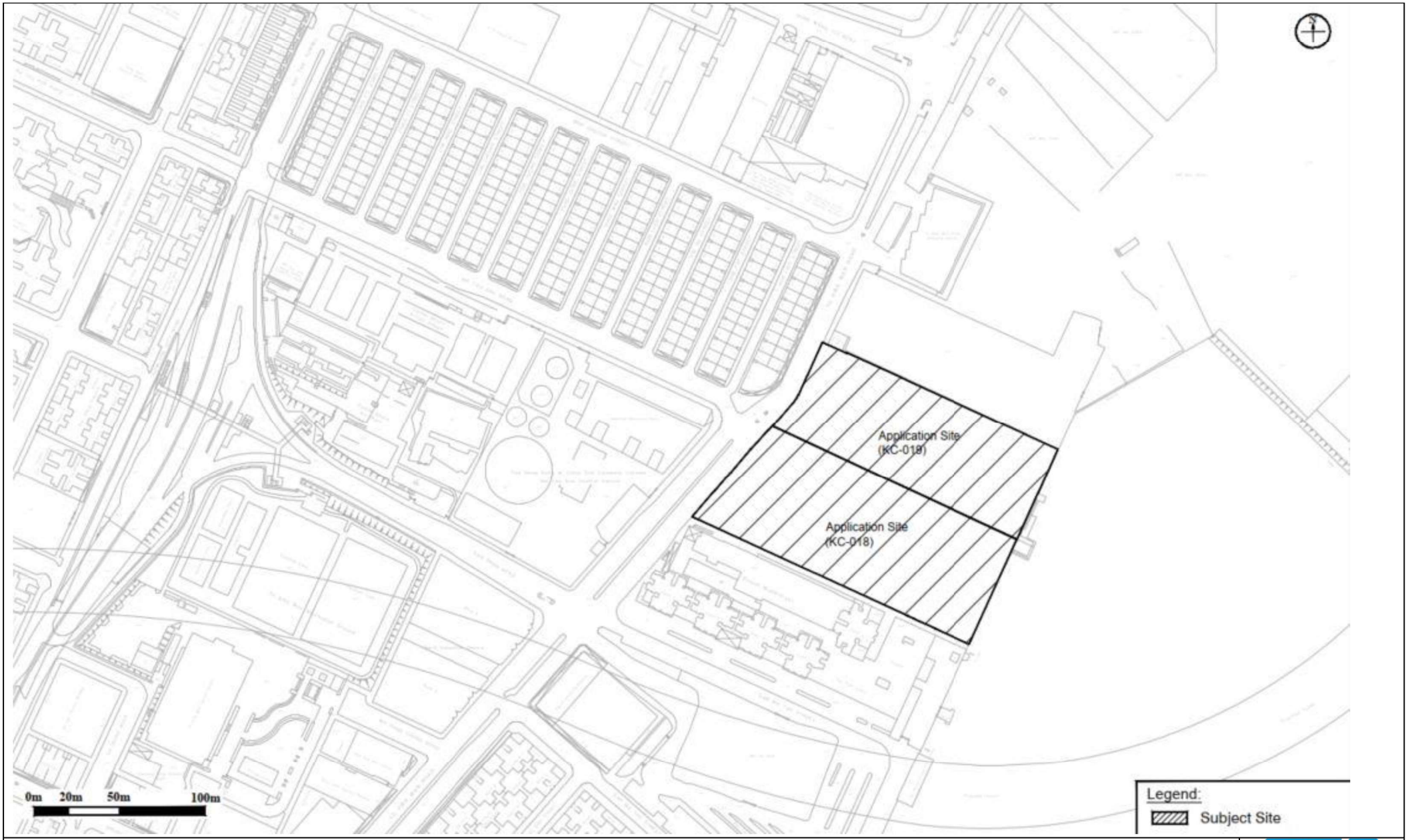

Figure: 1.1	RAMBOLL
Title: Application Site and its Environs	Drawn by: SL
	Checked by: CC
Project: Two Development Schemes - Ming Lun Street/ Ma Tau Kok Road (KC-018) and To Kwa Wan Road/ Ma Tau Kok Road (KC-019)	Rev.: 1.1
	Date: Jul 2022

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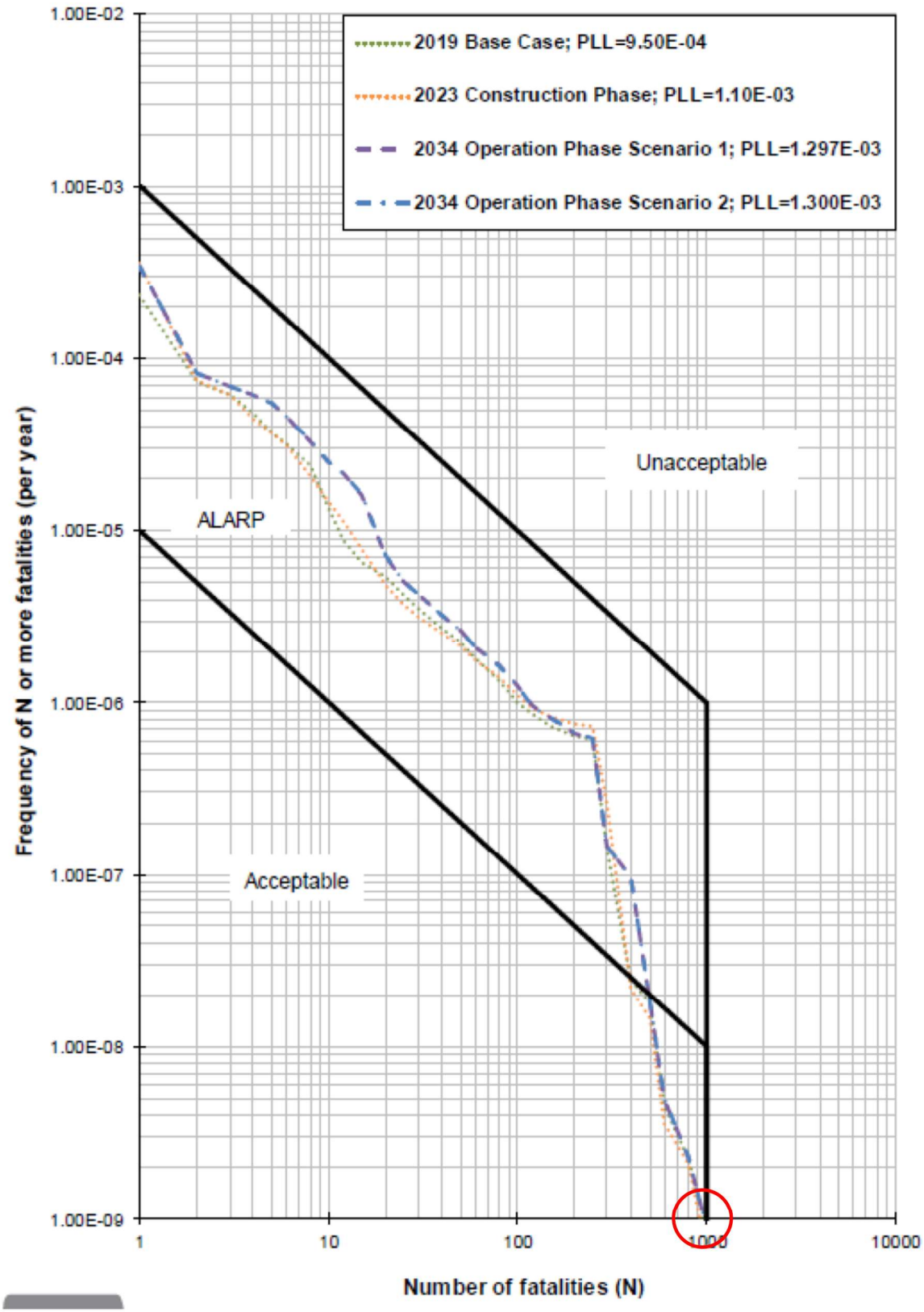
Appendix 2.1 Extracts of Results from Approved QRA Report

Observation: FN curve falls within ACCEPTABLE and ALARP regions. The FN curve is nearest to UNACCEPTABLE region at N=1000



Appendix 10

Tentative Implementation Programme

KC-018 & KC-019 URA Ming Lun Street / Ma Tau Kok Road & To Kwa Wan Road / Ma Tau Kok Road Development Schemes

Tentative Implementation Programme