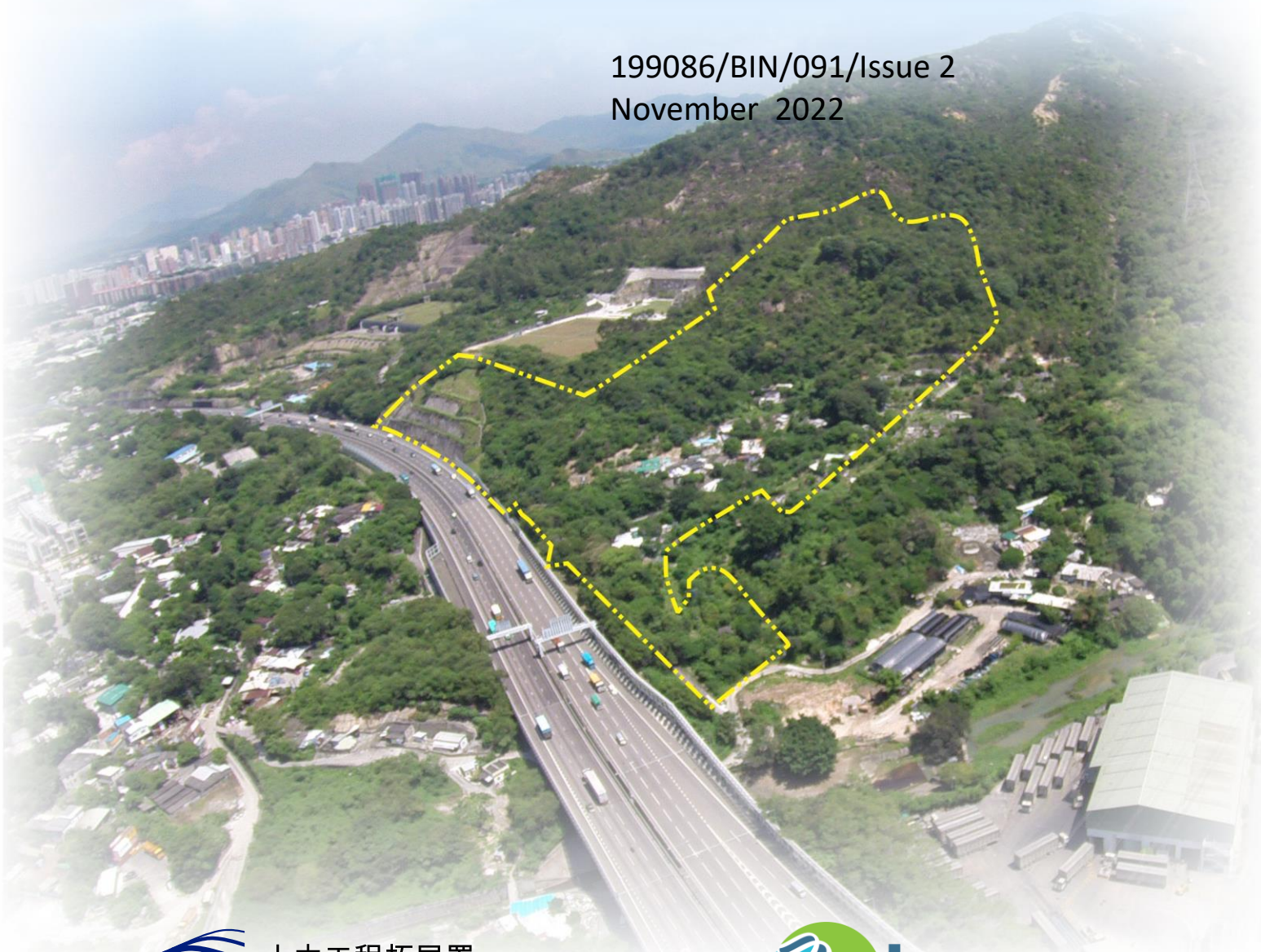
APPENDIX D
AIR VENTILATION ASSESSMENT REPORT

Agreement No. CE 92/2017 (CE)

Site Formation and Infrastructure Works for Public Housing Development near Tan Kwai Tsuen, Yuen Long – Investigation, Design and Construction

DRAFT AIR VENTILATION ASSESSMENT REPORT - EXPERT EVALUATION

199086/BIN/091/Issue 2
November 2022



CEDD 土木工程拓展署
Civil Engineering and Development Department

binnies

Agreement No. CE 92/2017 (CE)

Site Formation and Infrastructure Works for Public Housing Developments near Tan Kwai Tsuen, Yuen Long – Investigation, Design and Construction

Draft Air Ventilation Assessment Report - Expert Evaluation

199086/BIN/091/Issue 2

Nov 2022

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1 INTRODUCTION

1.1 Project Background

1.1.1 As a prevailing policy to increase land supply to meet the housing demand in the short, medium and long terms, the Government has identified sites in various districts with the potential to be developed for residential use. Amongst others, a site near Tan Kwai Tsuen (the Application Site), Yuen Long has been identified for public housing development. The location of the Application Site is indicated in **Figure 1.1**.

1.1.2 Binnies Hong Kong Limited was commissioned by the Civil Engineering and Development Department (CEDD) under Agreement No. CE 92/2017 (CE) Site Formation and Infrastructural Works for the Development near Tan Kwai Tsuen, Yuen Long – Investigation, Design and Construction for site formation and provision of essential infrastructures to support the housing development at the Application Site.

1.1.3 In accordance with the "Tong Yan San Tsuen Outline Zoning Plan No. S/YL-TYST/14", the current land use zoning of the Application Site is "Residential (Group A)2" ("R(A)2"). Under the 'Remarks' column in the Notes for R(A) use, for R(A)2, no new development, or addition, alteration and/or modification to or redevelopment of an existing building shall result in a total development and/or redevelopment in excess of a maximum plot ratio of 6.5, and maximum building height of 205mPD, or the plot ratio and height of the existing building, whichever is the greater.

1.1.4 In view of the acute shortage of housing, the domestic PR of the Application Site is proposed to be intensified to 6.5 with an aim to increase flat production. The Application Site will provide a total of 7,420 public housing units with planned population intake from 2030 by phases. An "Application for Permission under Section 16 of the Town Planning Ordinance" is being prepared for the Proposed Development in order to obtain planning permission from the Town Planning Board for minor relaxation of the following restrictions:

- Maximum plot ratio:
  - Phase 1: from 6.5 to 7.0 (i.e. domestic PR of 6.5 and non-domestic PR of 0.5)
  - Phase 2: from 6.5 to 7.2 (i.e. domestic PR of 6.5 and non-domestic PR of 0.7)
  - Phase 3: from 6.5 to 7.3 (i.e. domestic PR of 6.5 and non-domestic PR of 0.8)

- Maximum building height:
  - Phase 1: from 205 mPD to 240 mPD
  - Phases 2 and 3: from 205 mPD to 235 mPD

1.2 Objective of the Air Ventilation Assessment (Expert Evaluation)

1.2.1 The purpose of the AVA-EE is to qualitative assessment the air ventilation performance to the surrounding pedestrian wind environment due to the proposed increase in maximum plot ratio and building height of the proposed housing development (the Proposed Development).

1.3 Application Site and its Environs

1.3.1 ***Figure 1.1*** shows the location of the Application Site and their environs.

1.3.2 The Application Site consists of public housing development with an area of around 48,765 m^2 which is located near Tan Kwai Tsuen of the Yuen Long District. It is located within "Residential (Group A)" ("R(A)2") in the approved Outline Zoning Plan (OZP) No. S/YL-TYST/14 near Tan Kwai Tsuen, Yuen Long.

1.3.3 The Application Site in irregular shape is currently within rural areas with village houses and overlooked by natural hillside. To the west and northwest of the Application Site is Yuen Long Highway, village houses and some low-rise residential and industrial developments. To the north is the existing Tan Kwai Tsuen South Fresh Water Service Reservoir and the existing Tan Kwai Tsuen Salt Water Service Reservoir. The hilly terrains are on the east and southeast side of the Application Site and located over 500 m away from its boundary. As part of the infrastructure works proposed for the housing development, water supply facilities (proposed flushing water storage reservoir and proposed fresh water storage reservoir with formation level (roof level) at around +110 mPD (+115 mPD) and +115 mPD (+125 mPD) respectively) are planned to be built to the north of the Application Site and the associated access roads for supporting the proposed public housing development are proposed to cut through the Site in a "S" shaped alignment. Further to the south and southeast are Lam Tei Quarry and Tai Lam Country Park respectively.

1.4 Baseline Scheme

1.4.1 The Baseline Scheme is taken from the Air Ventilation Assessment – Expert Evaluation (AVA-EE) Report prepared under Agreement No. CE 31/2015 (CE)[1] to support the previous rezoning of the Application Site for housing development. The master layout plan of the Baseline Scheme is shown in ***Figure 1.2***.

1.4.2 The Baseline Scheme consists of seven residential blocks with stepped platforms. Blocks 1 to 3 are situated on the lower platform at around +52 mPD; Blocks 4 and 5 are situated on the middle platform at level from +71 to +75 mPD and Blocks 6 and 7 are situated on the upper platform at around +84 mPD. The building height of the above residential blocks are at around +168 mPD for Blocks 1, 2 and 3; +191 mPD for Blocks 4 and 5; and +200 mPD for Blocks 6 and 7.

1.4.3 Two non-domestic blocks and a PTI with building height at around +67 mPD and +52 mPD respectively are proposed on the north-western part of the site in the Baseline Scheme.

1.5 Proposed Scheme

1.5.1 ***Figure 1.2*** illustrates the building layout of the Proposed Scheme and ***Appendix 1*** provides the cross sections of the Proposed Development.

1.5.2 The Proposed Scheme consists of seven residential blocks with an area of around 48,765 m^2 along with its necessary facilities. Around 7,420 public housing flats are planned to be built on stepped platforms at the Application Site. Blocks 1 to 3 in Phase 3 with 60 storeys including 7-storey podium for each block are situated on the lower platform at around +80 mPD at the north-western portion of the Application Site; Blocks 4 and 5 with 51 storeys including 5-storey podium for each block are situated on the middle platform at around +100 mPD to the middle portion of the Application Site; Blocks A and B with 50 storeys including 5-storey podium for each block are situated on the upper platform at around +110 mPD at the south-eastern portion of the Application Site. The building height of the above residential blocks are at around +235 mPD for Blocks 1 to 5; and +240 mPD for Blocks A and B. The podiums of Blocks 1 to 5 and A to B consist of welfare facilities and carparks. A 1- storey PTI at around +42 mPD is proposed underneath the podium of Phase 3; retails stores are provided in the

[1] Black & Veatch (2017) Final Preliminary Air Ventilation Assessment Report in the Form of Expert Evaluation (TR13) under Agreement No. CE 31/2015 (CE) Site Formation and Infrastructural Works for the Development near Tan Kwai Tsuen, Yuen Long – Feasibility Study

podiums of Phase 2 and 3; and kindergartens are proposed in the podiums of Phase 1 and 2.

2 SITE WIND AVAILABILITY

2.1 Site Wind Availability Data

2.1.1 Considering this expert evaluation is not a detailed study for air ventilation performance, it is therefore considered acceptable to use the Regional Atmospheric Modelling System (RAMS) data for Site Wind Availability initially as a starting point. According to the location of the Application Site, the RAMS data of the grid (044,066) extracted from the Site Wind Availability Data of Planning Department's web site are used for the study.

2.1.2 ***Figure 2.1*** shows the relevant windrose diagrams representing the frequency and wind speed distribution at 200 m height of the district concerned during the annual condition and summer condition (Jun – Aug). Based on the wind rose with different heights (200 m, 300 m or 500 m) available, the 200 m site wind availability data represents wind data that takes into account the topographical effect around the Application Site. Therefore, a lower level of windrose 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.

2.1.3 According to the wind rose at 200 m altitude, the annual prevailing wind directions for the Application Site are NNE, NE and E; whereas the summer prevailing wind directions are SSE, S and SSW. The wind frequency data under the annual and summer conditions at 200 m altitude is shown in ***Table 2.1*** below.

Table 2.1 Summary of RAMS Data under Annual and Summer Conditions

Wind Direction	Probability for Annual Condition	Probability for Summer Condition
0° (N)	2.9%	0.9%
22.5° (NNE)	**10.9%**	1.2%
45° (NE)	**11.6%**	1.5%
67.5° (ENE)	8.8%	3.0%
90° (E)	**12.1%**	7.1%
112.5° (ESE)	9.7%	7.3%
135° (SE)	8.6%	9.8%
157.5° (SSE)	7.6%	**13.7%**
180° (S)	6.9%	**14.8%**
202.5° (SSW)	6.9%	**15.0%**
225° (SW)	5.1%	12.5%
247.5° (WSW)	2.2%	4.7%
270° (W)	2.3%	4.1%
292.5° (WNW)	1.5%	2.3%
315° (NW)	1.4%	1.2%
337.5° (NNW)	1.5%	0.9%

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

2.2 Topography and Building Morphology

Topography

2.2.1 There is an existing hilly terrain at around 500 m to the east and southeast side of the Application Site; whilst the existing topography of Tan Kwai Tsuen to the west of the Application Site is generally flat. On the east side of the Application Site, there are slopes with their heights increasing from west to east. Further south to southeast is the hilly terrain of Lam Tei Quarry and Tai Lam Country Park, where the hilltop (around +328 mPD) may create

a shelter, weakening the general southeast quadrant winds towards the Application Site.

2.2.2 On examining the annual and summer wind roses at 200 m, the existing hilly terrain on the east side of the Application Site, Lam Tei Quarry and Tai Lam Country Park would block the E, SSE, S and SSW prevailing winds reaching to the Application Site. However, as shown in ***Figure 1.1***, given the large distance (around 750 m) between the Application Site and the hilly terrains, the sheltering effect on the easterly and southerly winds by the hills would not be significant. Therefore, the wind flow pattern at the Application Site would only be slightly influenced by the surrounding topography.

2.2.3 For annual NNE and NE wind directions, the wind availability would not be influenced by hilly terrains. For the annual winds under E direction, the wind availability towards the Application Site has been partially obstructed by the hilly terrain on the east side of the Application Site.

2.2.4 In the summertime, SSW, S, SSE prevailing winds towards the Application Site and its downstream areas are partially obstructed by the hilly terrain of Lam Tei Quarry and Tai Lam Country Park. Therefore, the wind flow pattern at the site would be slightly influenced by the surrounding topography.

Building Morphology

2.2.5 ***Figure 1.1*** indicates the locations of the Application Site and the surrounding proposed and existing developments.

2.2.6 Regarding the existing building morphology, there are low-rise residential and industrial developments including Tan Kwai Tsuen, Casa Regalia, Domus, Meadowlands and Wo Ping San Tsuen, etc, identified on the west to northwest side of the Application Site, in which potential building blockages are considered low. Also, the existing North West N.T. Refuse Transfer Station located to the southwest of the Application Site is low-rise in nature while the existing Tan Kwai Tsuen North Fresh Water Service Reservoir, the existing Tan Kwai Tsuen South Fresh Water Service Reservoir and the existing Tan Kwai Tsuen Salt Water Service Reservoir are low-rise in nature which also provide a large area of open space near the north side of the Application Site. It is expected that the effect of blocking incoming wind to the Application Site is very limited.

2.2.7 The proposed water supply facilities (including the proposed flushing water and fresh water storage tanks) are on the immediate northeast side of the Application Site whilst the proposed primary school site is situated to the east of the Application Site. The proposed access road will cut through the middle of the Site in a "S" shaped alignment.

2.2.8 As most of the existing developments near the Application Site are low-rise developments, it is expected that they will not impose significant ventilation impact on the Application Site under the NE, NNE, E, SSE, S and SSW prevailing wind conditions. It is observed that there are several noise barriers (the tallest of these noise barriers is a cantilever noise barrier of 5.5 m high with a 2.5 m extension) constructed along Yuen Long Highway. It would slightly obstruct the incoming wind and could possibly induce small wind shadow regions at nearby residential development.

2.2.9 The building height of the existing developments and their locations from the Application Site are tabulated in the following ***Table 2.2*** and illustrated in ***Figure 1.1***.

Table 2.2 Building Height of Existing and Neighbouring Development

Name of Development	Building Height	Location from Application Site
The Woodsville	~+26.5 to +33.2 mPD	N

Name of Development	Building Height	Location from Application Site
Treasure Court, Lai Hung Garden and Symphony Garden	~+30.8 to +48.6 mPD	N
Meadowlands	~+30 to ~+36 mPD	NW
Domus	~+40 mPD	NW
Casa. Regalia	~+40 mPD	NW
Osmanthus Garden	~+26 to ~+36 mPD	NW
Wo Ping San Tsuen	~+15 to +16 mPD	NW
The VERDANCY	~+19.9 to +23.7 mPD	NW
Jubilee Gardens and Trafalgar Gardens	~+29.4 to +33.8 mPD	NW
Bauhinia Garden	~+28.1 to +36.7 mPD	NW
Arnold Garden	~+29.3 to +31.3 mPD	NW
Chung Uk Tsuen	~+14 to +24 mPD	NW
Tan Kwai Tsuen	~+22 to ~+32 mPD	NW
Wo Ping San Tsuen	~+22 to ~+32 mPD	NW
Tan Kwai Tsuen North Fresh Water Service Reservoir	~+68 mPD	NE
Tan Kwai Tsuen South Fresh Water Service Reservoir	~+68 mPD	NE
Tan Kwai Tsuen Salt Water Service Reservoir	~+68 mPD	NE
North West N.T. Refuse Transfer Station	~+30 mPD	SW

2.3 Summary of Site Wind Availability under Existing Site Condition

2.3.1 RAMS wind data is recommended to be used for directional analysis.

Annual Condition

2.3.2 According to the RAMS wind availability data, the annual wind directions of the area are mainly NNE, NE and E. From ***Table 2.1*** above, the wind probability from the E direction is 12.1%, which is considered to be the dominant wind direction for the Application Site. NNE (10.9%) and NE (11.6%) wind are also dominant prevailing wind directions apart from the E wind.

2.3.3 Under the NNE wind condition, given that Yuen Long Highway is generally aligned in parallel to the NE - SW prevailing wind directions, it is expected that there is high wind availability of prevailing winds flowing along Yung Long Highway. Besides, the existing low-rise Tan Kwai Tsuen North Fresh Water Service Reservoir, the existing Tan Kwai Tsuen South Fresh Water Service Reservoir and the existing Tan Kwai Tsuen South Salt Water Service Reservoir renders large open space to the north side of the Application Site. It is expected that the NNE prevailing wind can flow atop the above existing water service reservoirs into the Application Site and further reach to its downstream areas.

2.3.4 Under the NE wind condition, the NE prevailing wind would also flow atop the existing three Water Service Reservoirs and further reach the Application Site and its surrounding (i.e. Tan Kwai Tsuen) and downstream areas (i.e. Wo Ping San Tsuen and the existing North West N.T. Refuse Transfer Station). Therefore, the wind environment at the Application Site under NNE and NE directions is expected to be satisfactory.

2.3.5 Due to the high hilly terrain to the east of the Application Site, it is expected that the annual

prevailing wind under E wind condition would be partially obstructed by the topography, such that the E prevailing wind is expected to be weakened before reaching the Application Site. As a result, the wind performance of the Application Site would be slightly reduced under the annual E wind condition.

Summer Condition

2.3.6 Under summer conditions, the prevailing winds are mainly coming from SSE (13.7%), S (14.8%) and SSW (15%) directions.

2.3.7 Under the SSE wind condition, the prevailing winds are still able to penetrate the Application Site and reach the downstream areas. Given that the natural topographic regions (Tai Lam Country Park) to the south to southeast is further away from the Application Site, it is expected that they will not impose significant air ventilation impact in summer SSE wind direction. The incoming SSE wind is expected to penetrate towards to the Tan Kwai Tsuen, Casa Regalia, Domus, Tan Kwai Garden, Meadowlands and Wo Ping San Tsuen etc. at downstream areas. The open space near the Application Site above the existing Tan Kwai Tsuen South Fresh Water Service Reservoir and the existing Tan Kwai Tsuen Salt Water Service Reservoir could possibly act as wind entrances for facilitating SSE wind flowing towards the downstream areas. Therefore, the existing wind environment at the Application Site under SSE direction is expected to be satisfactory.

2.3.8 Under the S and SSW wind directions, Yuen Long Highway could potentially act as a summer air path. A portion of incoming wind coming from the existing North West N.T. Refuse Transfer Station and the lower part of Kung Um Shan would flow relatively unobstructed to the Application Site and its downstream areas.

2.3.9 Considering the above, potential building blockage effect from the Application Site is considered low. Wind availability at pedestrian level under prevailing situation is considered good.

3 EXPERT EVALUATION OF AIR VENTILATION PERFORMANCE OF THE PROPOSED DEVELOPMENT

3.1 Assessment Methodology

3.1.1 ***Section 2*** above describes the wind availability at the Application Site, and the dominant wind flow during annual and summer conditions. It is identified that the annual prevailing winds for the area are from NNE, NE and E directions whereas the summer prevailing winds are from SSE, S and SSW directions. The Proposed Development layout at the Application Site will be evaluated against the dominant wind directions identified, i.e. NNE and NE portions, E portion, SSE portion, S portion and SSW portion.

3.2 Annual Prevailing Wind Flow from NNE, NE and E Directions

NNE and NE Winds

3.2.1 ***Figure 3.1*** illustrates the prevailing winds from NNE and NE wind directions under the Baseline Scheme and the Proposed Scheme.

3.2.2 Given that the existing Tan Kwai Tsuen South Fresh Water Service Reservoir and the existing Tan Kwai Tsuen South Salt Water Service Reservoir located to the northeast side of the Application Site are low-rise structures which form a large open area in the upwind area, the NNE and NE prevailing winds would flow atop these reservoirs towards the Application Site and its surrounding areas under both Baseline and Proposed Schemes.

3.2.3 Under the NNE and NE wind conditions, the proposed high-rise buildings at the Application Sites under both the Baseline Scheme and the Proposed Scheme would obstruct a portion of the NNE and NE winds from penetrating into its downstream areas such as the existing North West N.T. Refuse Transfer Station and create a wind shadow in the immediate leeward regions, thus, reducing the wind availability. Compared to the Baseline Scheme, although the effects of the building blockage are amplified by the increased building height in the Proposed Scheme, its effect would not be significant because wind blockage at pedestrian level caused by the rise in building height becomes less significant beyond a certain height threshold. Moreover, since the area to the south of the Application Site have limited number of receivers, the impacts in terms of air ventilation performance under the NNE and NE winds to the existing users around the Application Site is minimal.

3.2.4 Under both schemes, various building separations, aligning in the NE–SW direction, are proposed between the building blocks at the Application Site to facilitate the NNE and NE winds to penetrate through the Application Site to the downstream areas such as the existing North West N.T. Refuse Transfer Station. Building separation of 15m in NE-SW direction has been allowed in the lower platform as well as between the middle and the upper platforms in both schemes. The proposed access road between the lower platform and middle platform provides a larger building separation for NE and NNE winds to penetrate through the Site in both schemes. Such building gap is enlarged from >30m in the Baseline Scheme to >40m in the Proposed Scheme, which would enhance NE and NNE winds penetration through the Site.

3.2.5 At the western portion of the Application Site, minor blockage to incoming NNE and NE winds at pedestrian level is expected due to the proposed low-rise structures at the Application Site under the Baseline Scheme, such as community hall/primary school/PTI/non-domestic blocks. While in the Proposed Scheme, since there is only a low-rise proposed primary school site to the north-west side of the Application Site, the NNE and NE winds can flow freely over open spaces along the western boundary of the Application Site and skim over the proposed school site towards its downstream areas including the existing Northwest N.T. Refuse

Transfer Station, Wo Po San Tsuen and its surroundings. Hence, compared to the Baseline Scheme, the Proposed Scheme has improved air ventilation performance due to the provision of more open space along the western boundary of the Application Site. Also, as shown in ***Figure 3.1***, under the Baseline Scheme, there are building setbacks of about 21 m to 53 m between Yuen Long Highway and the proposed building blocks along the western boundary of the Application Site, whilst under the Proposed Scheme, such building setback increases to about 84 m from Yuen Long Highway. The incoming NNE and NE winds would flow along Yuen Long Highway (a large wind corridor) and penetrate across the above setback areas and reach the downstream areas such as Wo Ping San Tsuen. Therefore, the impact to the surrounding environment by the Proposed Development under NNE and NE prevailing winds is reduced.

3.2.6 Overall, it is anticipated that the Proposed Scheme would enhance NNE and NE wind penetration as compared to the Baseline Scheme.

E wind

3.2.7 ***Figure 3.2*** illustrates the prevailing wind flow from the E wind condition under the Baseline Scheme and the Proposed Scheme.

3.2.8 Due to the high hilly terrain to the east of the Application Site, a portion of E wind would be shielded from the topography, such that the E prevailing wind is expected to be weakened before reaching the Application Site. However, since there is a large distance of about 750 m between the hilly mountain and the Application Site, the sheltering effect on E winds by the hills would not be significant.

3.2.9 As shown in ***Figure 3.2***, the proposed high-rise residential building blocks at the Application Site would likely block the incoming E wind from flowing to the downstream areas such as Wo Ping San Tsuen and it surroundings under both schemes. The Proposed Development would shelter the incoming wind and induce localised air ventilation impact. Compared to the Baseline Scheme, although the effects of the building blockage are amplified by the increased building height in the Proposed Scheme, its effect would not be significant because wind blockage at pedestrian level caused by the rise in building height becomes less significant beyond a certain height threshold. Moreover, the downstream area is separated by Yuen Long Highway, which act as a major breezway, E wind is able to be diverted around the edge of the Site, replenish along Yuen Long Highway and settle further downstream at Tan Kwai Tsuen and Wo Ping San Tsuen.

3.2.10 Compared to the Baseline Scheme, a building setback of 15m from the southern boundary at the upper platform, which is not in presence in the Baseline Scheme, would facilitate E wind penetration along the southern boundary of the Site. While at the northern part of the Site, the non-domestic buildings in the Baseline Scheme have been removed under the Proposed Scheme, thus providing more at-grade space for E wind to penetrate through the Site. The wind availability at downstream areas and the areas on the west side of the Application Site is expected to be slightly lower and comparable under both schemes.

3.2.11 Overall, it is anticipated that the Proposed Scheme would enhance E wind penetration as compared to the Baseline Scheme.

3.3 Summer Prevailing Wind Flow from SSE, S and SSW Directions

S and SSE winds

3.3.1 ***Figure 3.3*** illustrates the wind flow from S and SSE directions under the Baseline Scheme and the Proposed Scheme.

3.3.2 The green belt, Lam Tei Quarry and Tai Lam Country Park are located at the upwind area of the Application Site under SSE prevailing wind. The Proposed Development at the Application Site would not have any adverse implications to the surrounding pedestrian areas at the windward side.

3.3.3 Referring to ***Figure 3.3***, under the SSE wind condition, the proposed high-rise residential development is expected to impose wind blockage impacts on its downstream areas such as Domus, Casa Regalia, Meadowlands and Tan Kwai Tsuen. When the prevailing wind comes from the SSE wind direction, the proposed residential development would have some localised effects on air ventilation performance. Therefore, it is expected that wind availability of the above downstream areas would be reduced. Similar to E wind flow, although the effects of the building blockage are amplified by the increased building height in the Proposed Scheme, its effect would not be significant because wind blockage at pedestrian level caused by the rise in building height becomes less significant beyond a certain height threshold. Moreover, the downstream area is separated by Yuen Long Highway, which act as a major breezeway, S and SSE winds would be diverted around the edge of the Site near the proposed school site and along the eastern site boundary, replenish along Yuen Long Highway and settle further downstream at Tan Kwai Tsuen and Wo Ping San Tsuen.

3.3.4 Therefore, the Proposed Scheme performs similarly to the Baseline Scheme under S and SSE wind condition.

SSW Wind

3.3.5 ***Figure 3.4*** illustrates the wind flow from SSW direction under the Baseline Scheme and the Proposed Scheme.

3.3.6 As shown in ***Figure 3.4***, considering that the residential building clusters such as Wo Ping San Tsuen, Tan Kwai Tsuen located to the west side of the Application Site are of low-rise buildings, the SSW prevailing wind would readily penetrate these building clusters and reach their surrounding areas. Also, Yuen Long Highway, which is located to the northwest of the Application Site aligned in the NE-SW direction, would act as a wind corridor to allow effective wind penetration under the summer SSW wind condition.

3.3.7 On the other hand, the proposed residential development at the Application Site would block some SSW prevailing winds towards the north side of the Application Site and the downstream areas of Tan Kwai Tsuen and Casa Regailia under both the Baseline Scheme and the Proposed Scheme. Compared to the Baseline Scheme, although the effects of the building blockage are amplified by the increased building height in the Proposed Scheme, its effect would not be significant because wind blockage at pedestrian level caused by the rise in building height becomes less significant beyond a certain height threshold. Moreover, since the area to the immediate north and northeast of the Application Site have limited number of receivers, the impacts in terms of air ventilation performance under the SSW wind to the existing users around the Application Site is minimal.

3.3.8 Under both schemes, various building separations, aligning in the NE–SW direction, are proposed between the building blocks at the Application Site to facilitate the SSW wind to penetrate through the Application Site to the downstream areas. Building separation of 15m in NE-SW direction has been allowed in the lower platform as well as between the middle and upper platform in both schemes. The proposed access road between the lower platform and middle platform provides a larger building separation for SSW wind to penetrate through the Site in both schemes. Such building gap is enlarged from >30m in the Baseline Scheme to >40m in the Proposed Scheme, which would enhance SSW wind penetration through the Site.

3.3.9 At the western portion of the Application Site, various building setbacks are proposed

between Yuen Long Highway and the Application Site. Under the Baseline Scheme, around 21 m to 53 m building setback distances are proposed between Yuen Long Highway and the proposed building blocks along the western boundary, whereas under the Proposed Scheme, such building setback increases to about 84 m from Yuen Long Highway, thus providing open spaces for free wind flow along the western portion of the Application Site. It is expected that SSW prevailing wind would penetrate through Yuen Long Highway and the building setback and reach the downstream areas further improving the wind availability there under the SSW wind condition.

3.3.10 Overall, it is anticipated that the Proposed Scheme would enhance SSW wind penetration as compared to the Baseline Scheme.

3.4 Summary of Air Ventilation Performance

3.4.1 It is believed that the proposed high-rise development may obstruct some wind flow to downwind areas under the annual and summer prevailing wind directions. Compared to the Baseline Scheme, although the effects of the building blockage are amplified by the increased building height in the Proposed Scheme, its effect would not be significant because wind blockage at pedestrian level caused by the rise in building height becomes less significant beyond a certain height threshold.

3.4.2 Under annual conditions, penetration of NNE, NE and E prevailing winds would be enhanced under the Proposed Scheme due to the removal of non-domestic buildings at the northern portion of the Site, enlarged building setback along Yuen Long Highway and along the southern boundary of the upper platform, thus providing more open space for winds to penetrate through the western and southern boundary of the Site. Moreover, the building separation between the lower platform and the middle platform has been enlarged from >30m in the Baseline Scheme to >40m in the Proposed Scheme, enhancing NNE and NE winds penetration through the Site.

3.4.3 Under summer conditions, S and SSE wind penetration would be comparable between the Baseline Scheme and the Proposed Scheme. It is expected that S and SSE winds would be diverted around the edge of the Site near the proposed school site and along the eastern site boundary, replenish along Yuen Long Highway and settle further downstream at Tan Kwai Tsuen and Wo Ping San Tsuen under both schemes. Similar to NNE and NE winds, SSW wind penetration is expected to enhance in the Proposed Scheme due to the larger open space provided along the western boundary and the enlarged building separation between the lower and middle platforms.

3.4.4 Mitigation measures such as the NE-SW aligned building separations at the lower platform, as well as between the middle and upper platforms proposed in the Baseline Scheme are maintained in the Proposed Scheme to allow wind penetration. In addition, building setbacks along the western boundary at the lower platform, southern boundary of the upper platform and between the lower and middle platform are proposed in the Proposed Scheme which would enhance wind penetration further.

3.4.5 Overall, it can be concluded that the Proposed Scheme at the Application Site performs better than the Baseline Scheme under the prevailing wind conditions after incorporating the above proposed mitigation measures.

3.5 Building Design Features

3.5.1 The details of the proposed mitigation measures to be adopted in the Proposed Scheme for enhancing the air ventilation at the Application Site and the surrounding areas are summarised below and illustrated in ***Figure 3.5***:

A. Building separation of at least 15 m in width, aligning in approximately NE to SW directions, is proposed to be incorporated between Block 1 and Block 2 in the Application Site for facilitating wind penetration mainly from SW and NE quadrants to benefit its downstream areas.

B. Building separation of at least 15 m in width, aligning in approximately NE to SW directions, is proposed to be incorporated between Block 5 and Block A in the Application Site for facilitating wind penetration mainly from SW and NE quadrants to benefit its downstream areas.

C. Building setback of around 84m in width from the edge of Yuen Long Highway, aligning in approximately NE to SW directions, would facilitate wind penetration mainly from SW and NE quadrants to benefit its downstream areas.

D. Building setback of 15m in width from the edge of the southern boundary at the upper platform, aligning in approximately E to W direction, would facilitate wind penetration mainly from E quadrant to benefit its downstream areas.

E. Building separation of at least 15m for all building blocks to increase permeability of the Site.

4 CONCLUSIONS

4.1.1 A qualitative assessment of the wind performance of the proposed public housing development near Tai Kwai Tsuen has been carried out.

4.1.2 According to the findings of this AVA-EE, the annual prevailing wind comes from NNE, NE and E directions while the summer prevailing wind comes from SSE, S and SSW directions. After comparing the Baseline Scheme and the Proposed Scheme, it is concluded that the Proposed Scheme would overall perform better than the Baseline Scheme from the air ventilation perspective with design measures that can enhance wind penetration incorporated. It is considered that the Proposed Development would not have significant adverse impact to surrounding environment.

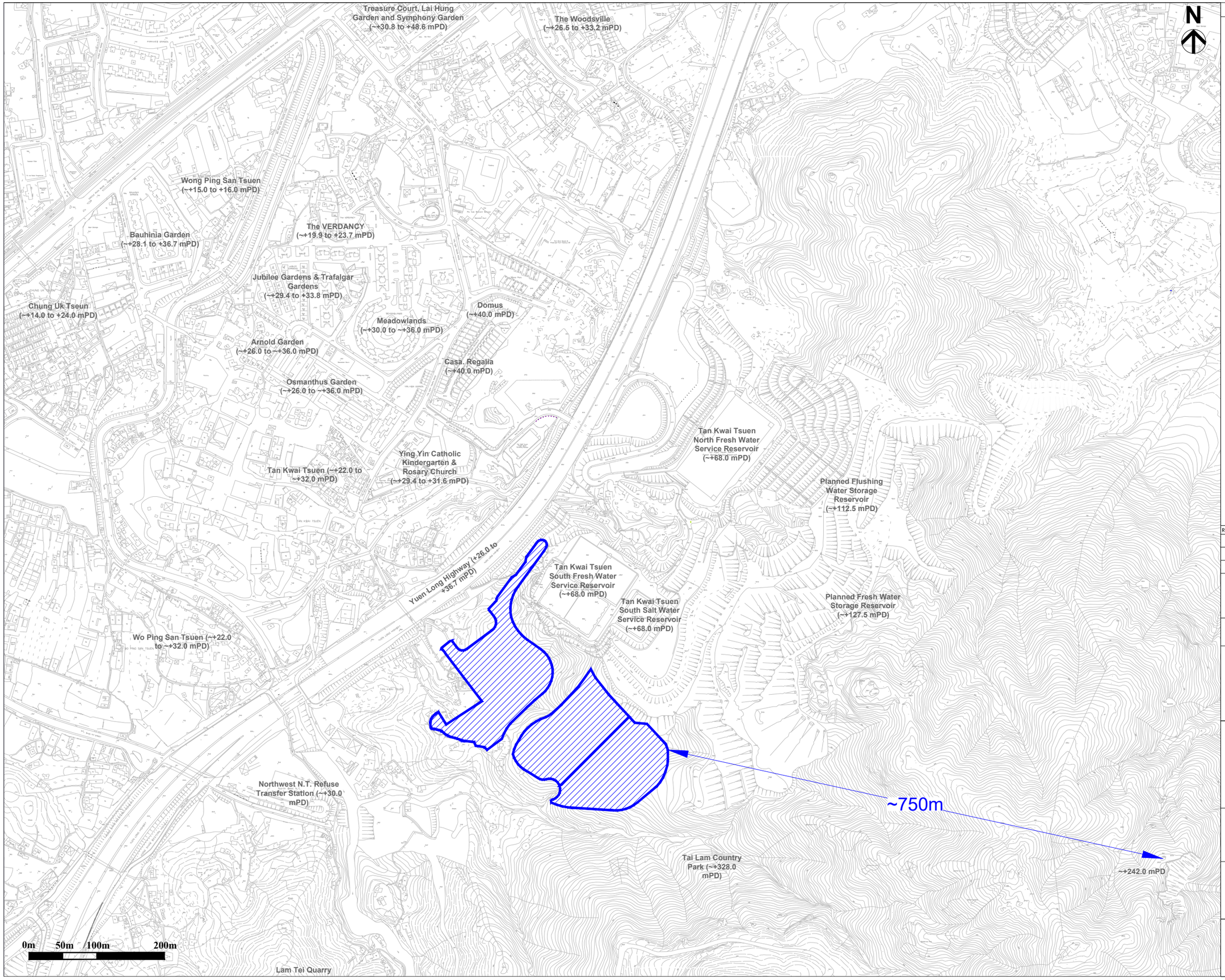
4.1.3 The Development shall not be limited to the proposed design and shall include other features as far as possible at the detailed design stage, including effective building separations and setbacks in alignment with the prevailing winds, to facilitate the penetration of wind across the Application Site. The followings are further recommendation design principles for further consideration at the detailed design stage to facilitate wind penetration:

- Building Permeability equivalent to 20% to 33.3% of total frontal area with reference to PNAP APP-152;
- Minimisation of podium bulk with ground coverage of no more than 65%;
- Building setback with reference to PNAP APP-152;
- Greenery (preferably tree planting) of target 30% for sites larger than 2 ha, and 20% for sites below 2 ha at lower levels, preferably at grade ;
- Avoidance of long continuous façades; and
- Reference could also be made to recommendations of design measures in the Hong Kong Planning Standards and Guidelines.

4.1.4 It is recommended that a quantitative AVA shall be carried out for the Proposed Development at the detailed design stage to review the building design, quantify the potential air ventilation impact and assess the effectiveness of the proposed mitigation measures to optimise the building arrangement.

END OF TEXT

FIGURES



LEGEND:

APPLICATION SITE

Revision	Date	Description			Initial
	Designed	Checked	Drawn		Checked
Initial			VS		KY
Date			11/22		11/22

Approved

Agreement no.

CE 92/2017 (CE)

Agreement title

SITE FORMATION AND INFRASTRUCTURE WORKS FOR PUBLIC HOUSING DEVELOPMENTS NEAR TAN KWAI TSUEN, YUEN LONG – INVESTIGATION, DESIGN AND CONSTRUCTION

Drawing title

LOCATION OF THE APPLICATION SITE AND ITS ENVIRONS

Drawing No.	Scale
Figure 1.1	

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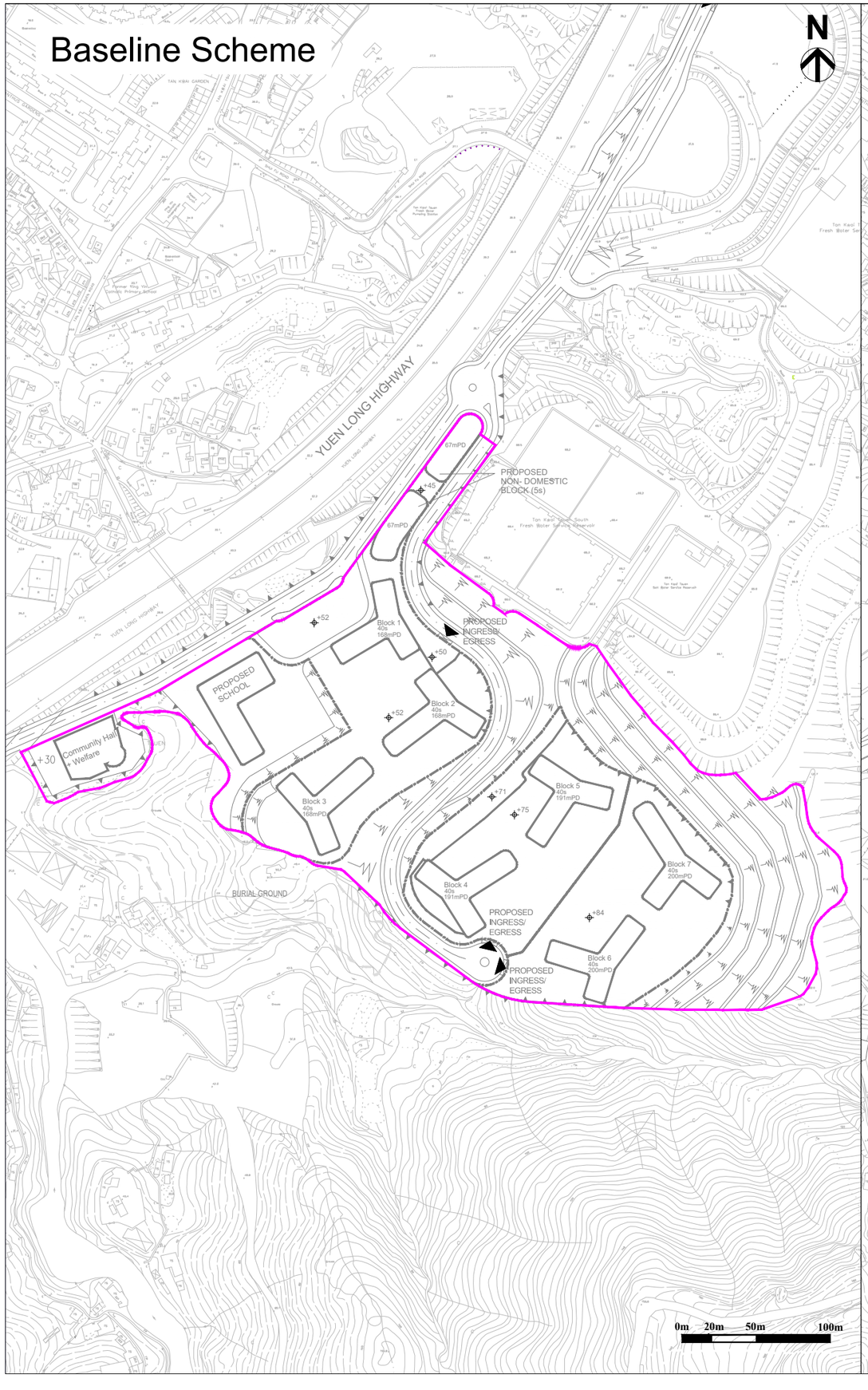

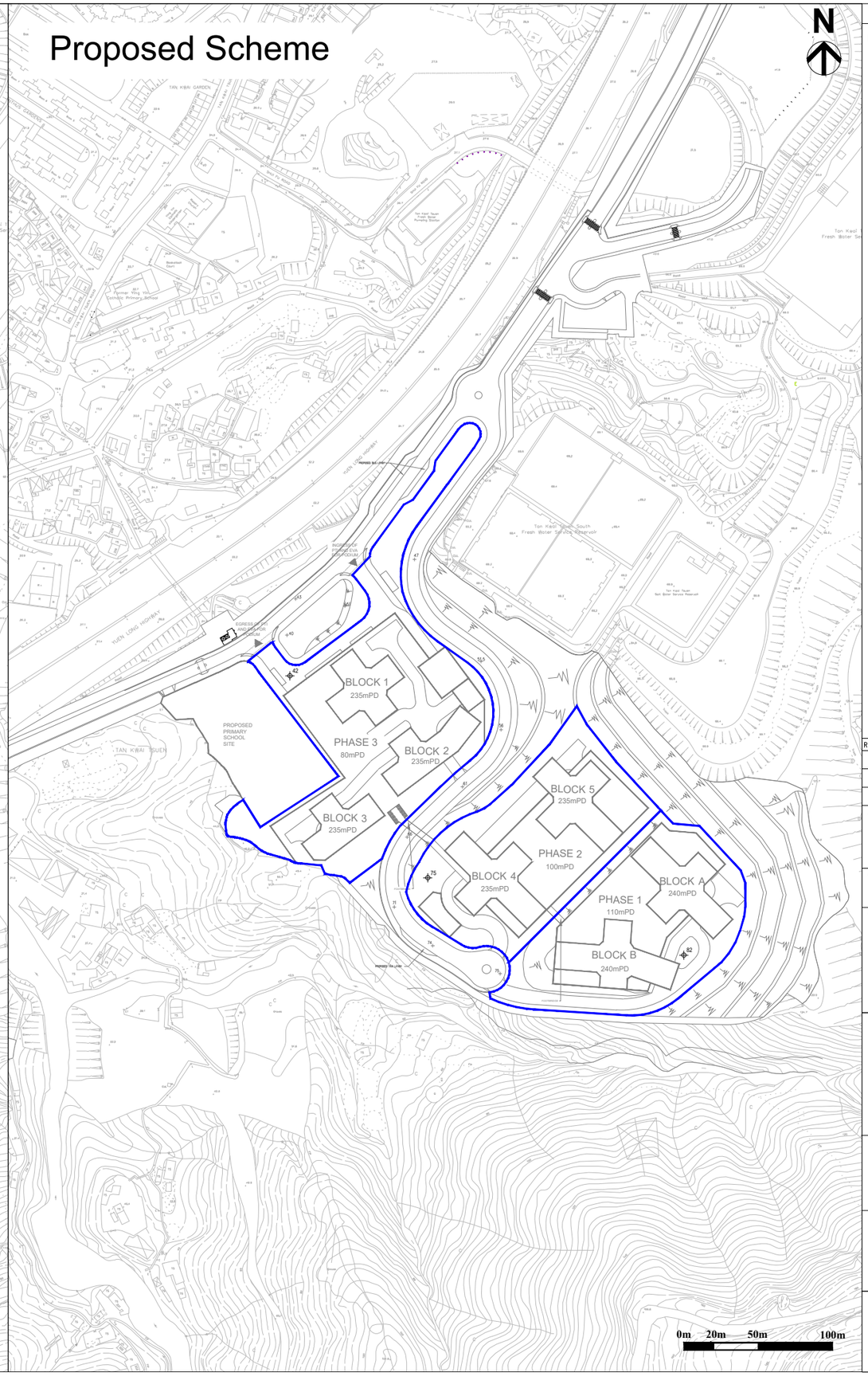

LEGEND:

- SITE BOUNDARY OF BASELINE SCHEME
- SITE BOUNDARY OF PROPOSED SCHEME

Revision	Date	Description		Initial
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Initial			VS	KY
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SITE FORMATION AND INFRASTRUCTURE WORKS FOR PUBLIC HOUSING DEVELOPMENTS NEAR TAN KWAI TSUEN, YUEN LONG – INVESTIGATION, DESIGN AND CONSTRUCTION

Drawing title

MASTER LAYOUT PLANS OF BASELINE SCHEME AND PROPOSED SCHEME

Drawing No.

Figure 1.2

Scale

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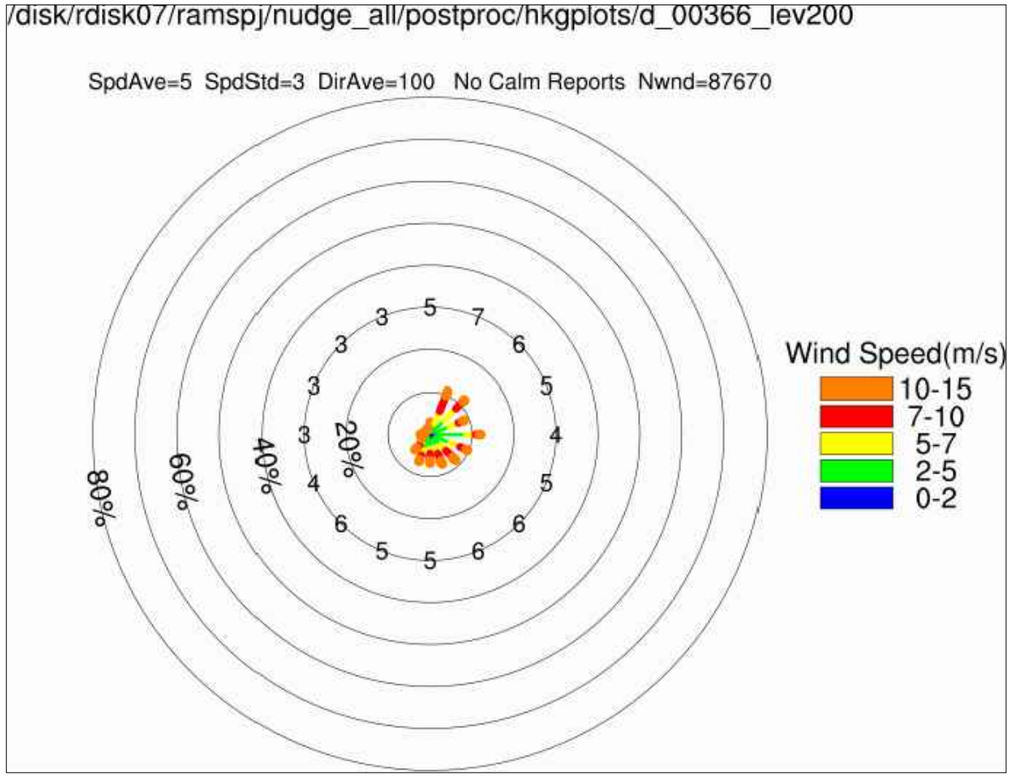
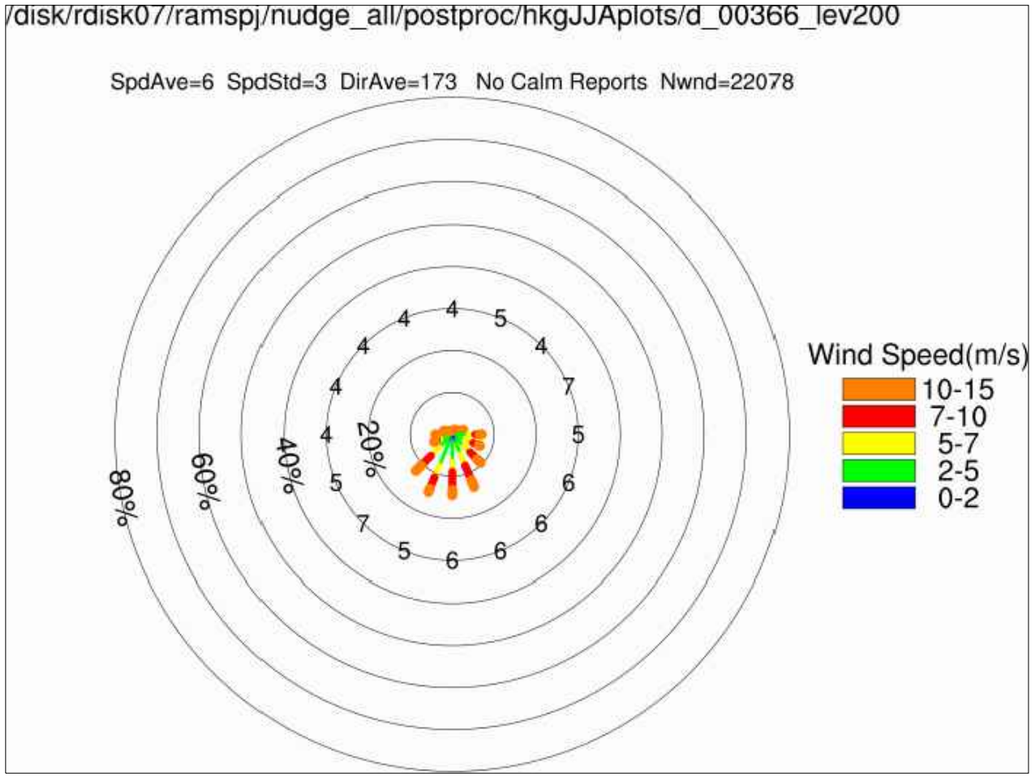


Windrose for Annual (200m)



Windrose for Summer (200m)

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SITE FORMATION AND INFRASTRUCTURE WORKS FOR PUBLIC HOUSING DEVELOPMENTS NEAR TAN KWAI TSUEN, YUEN LONG – INVESTIGATION, DESIGN AND CONSTRUCTION

Drawing title
ANNUAL AND SUMMER WIND ROSES ON RAMS (044,066) AT 200m

Drawing No.
Figure 2.1

Scale

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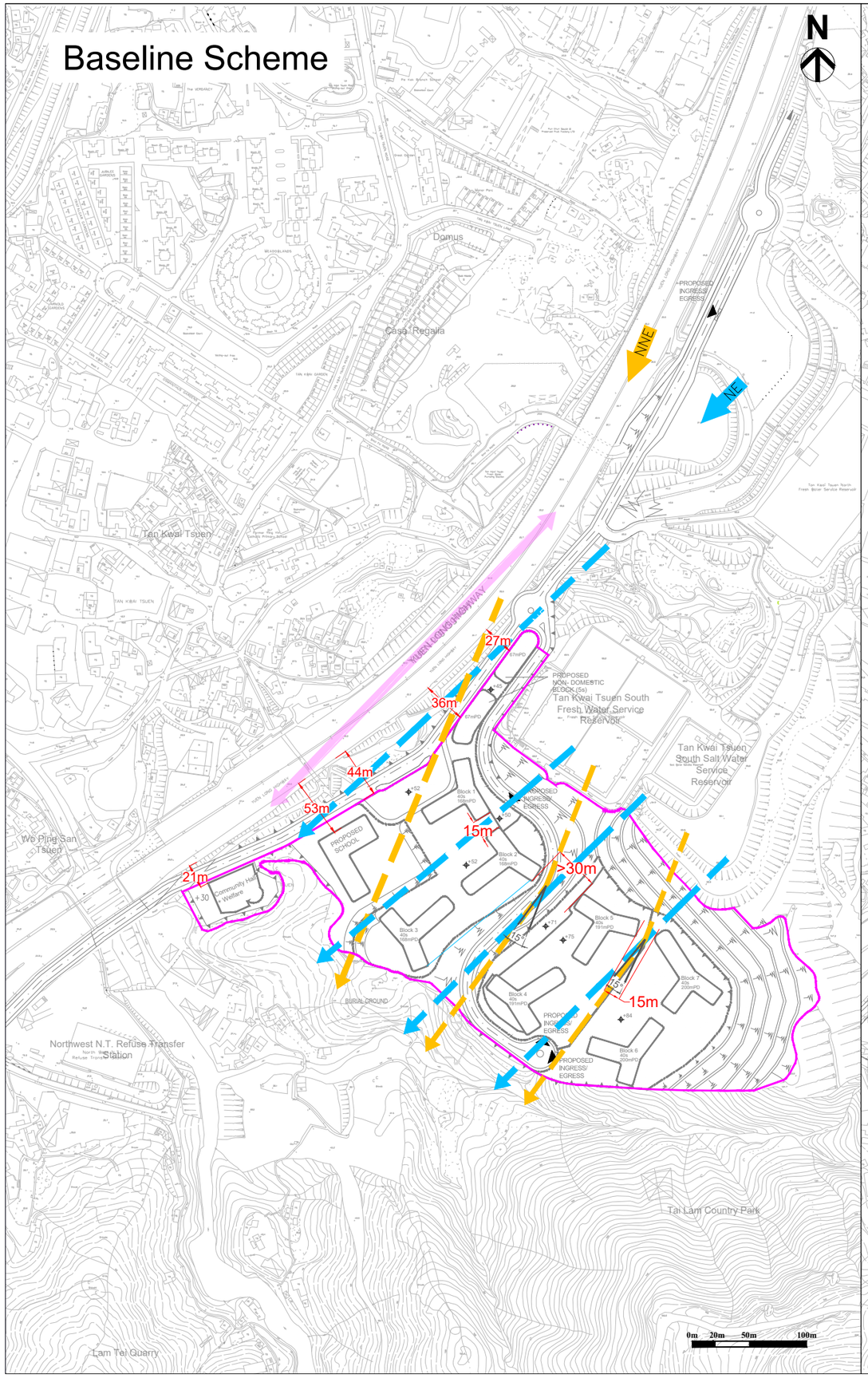

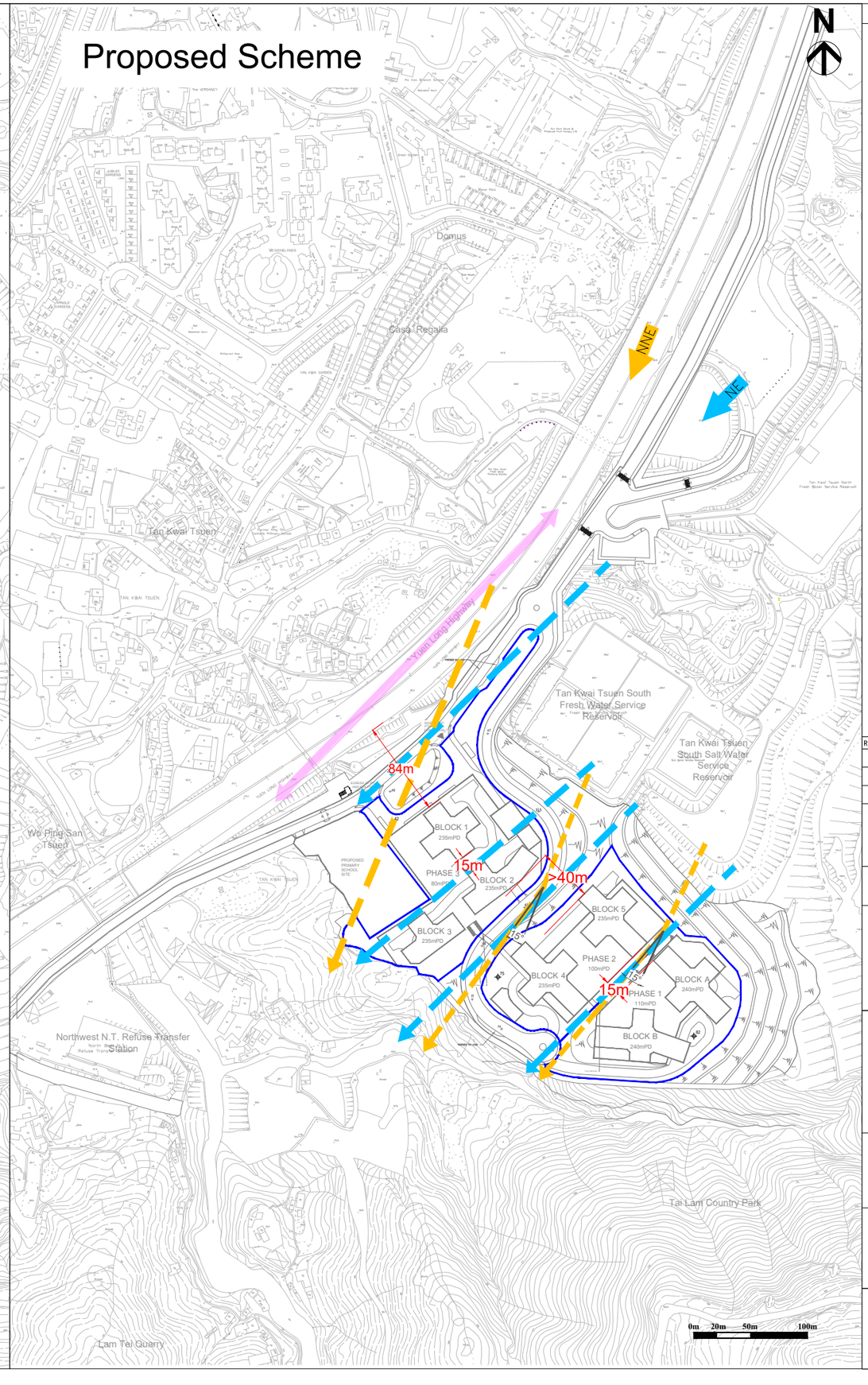

LEGEND:

- SITE BOUNDARY OF BASELINE SCHEME
- SITE BOUNDARY OF PROPOSED SCHEME
- EXPECTED NE WIND FLOW
- EXPECTED NNE WIND FLOW
- EXISTING BREEZEWAY
- BUILDING SEPARATIONS/ SETBACKS

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SITE FORMATION AND INFRASTRUCTURE WORKS FOR PUBLIC HOUSING DEVELOPMENTS NEAR TAN KWAI TSUEN, YUEN LONG – INVESTIGATION, DESIGN AND CONSTRUCTION

Drawing title

ILLUSTRATION OF WIND FLOW FROM NORTH NORTHEAST AND NORTHEAST WIND DIRECTIONS

Drawing No.

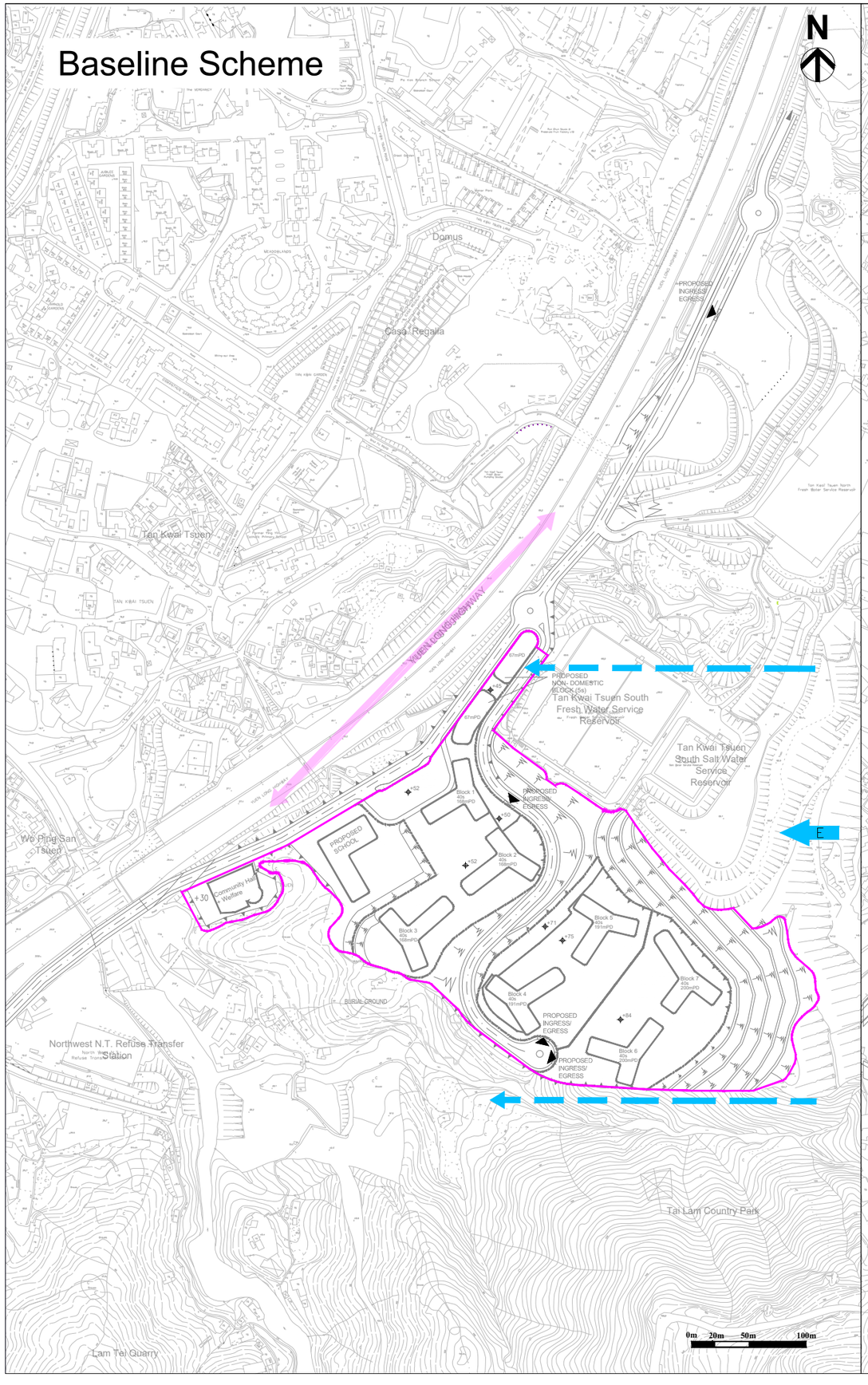
Figure 3.1

Scale

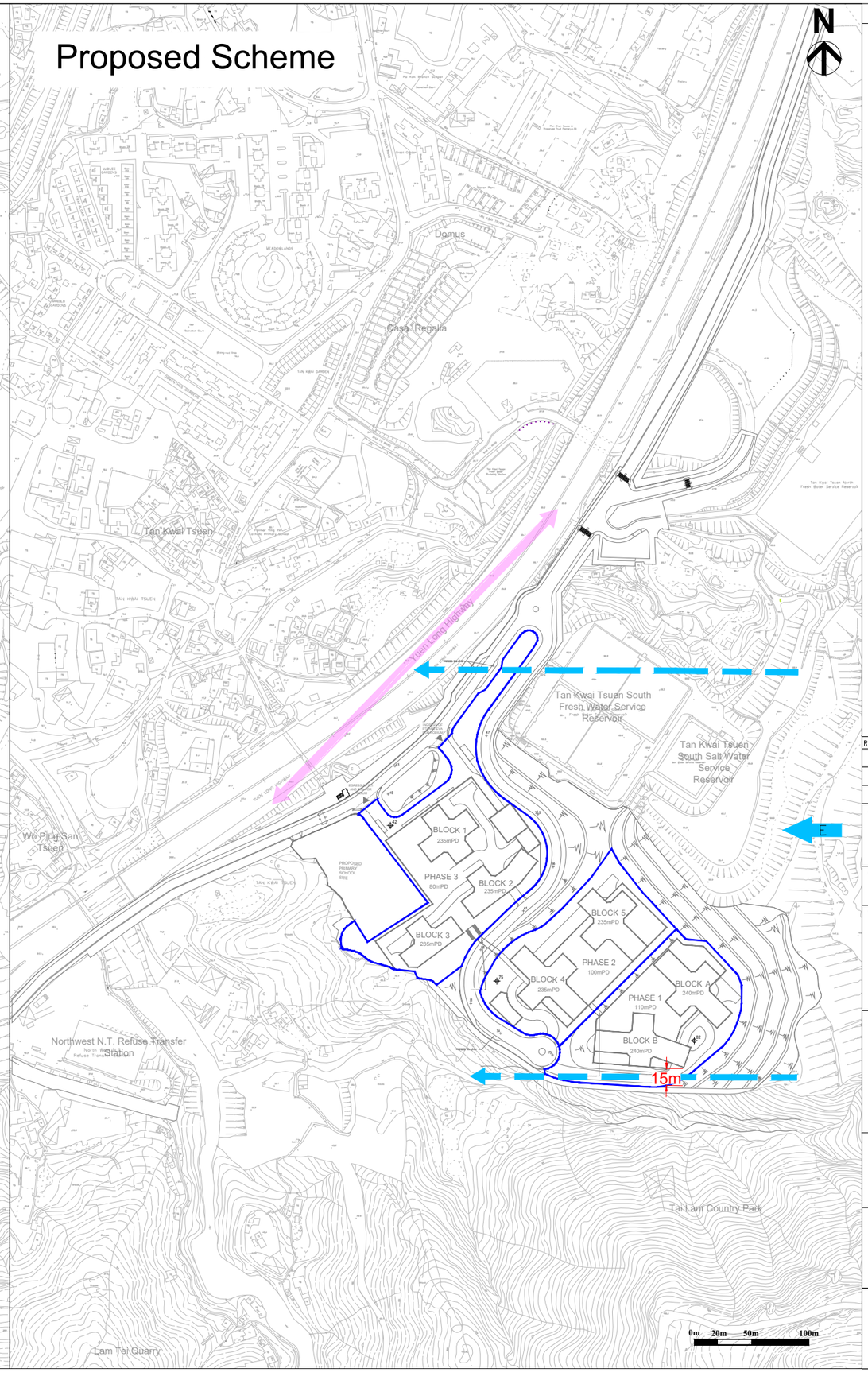
土木工程拓展署
CEDD Civil Engineering and Development Department

BINNIES HONG KONG LIMITED
賓尼斯工程顧問有限公司

Baseline Scheme



Proposed Scheme



LEGEND:

- SITE BOUNDARY OF BASELINE SCHEME
- SITE BOUNDARY OF PROPOSED SCHEME
- EXPECTED E WIND FLOW
- EXISTING BREEZEWAY
- BUILDING SEPARATIONS/ SETBACKS

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SITE FORMATION AND INFRASTRUCTURE WORKS FOR PUBLIC HOUSING DEVELOPMENTS NEAR TAN KWAI TSUEN, YUEN LONG – INVESTIGATION, DESIGN AND CONSTRUCTION

Drawing title
ILLUSTRATION OF WIND FLOW FROM EAST WIND DIRECTION

Drawing No.
Figure 3.2

Scale

土木工程拓展署
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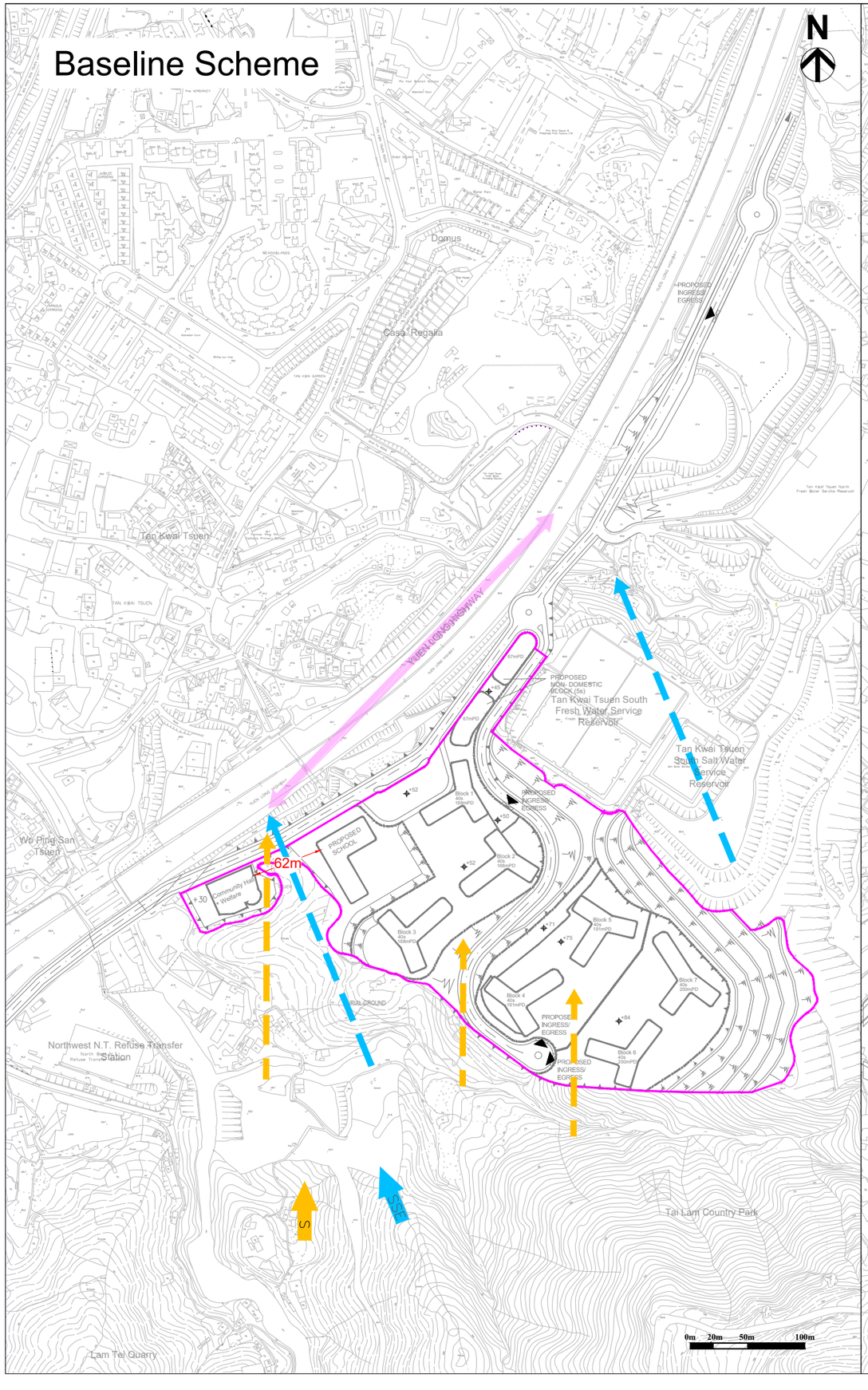
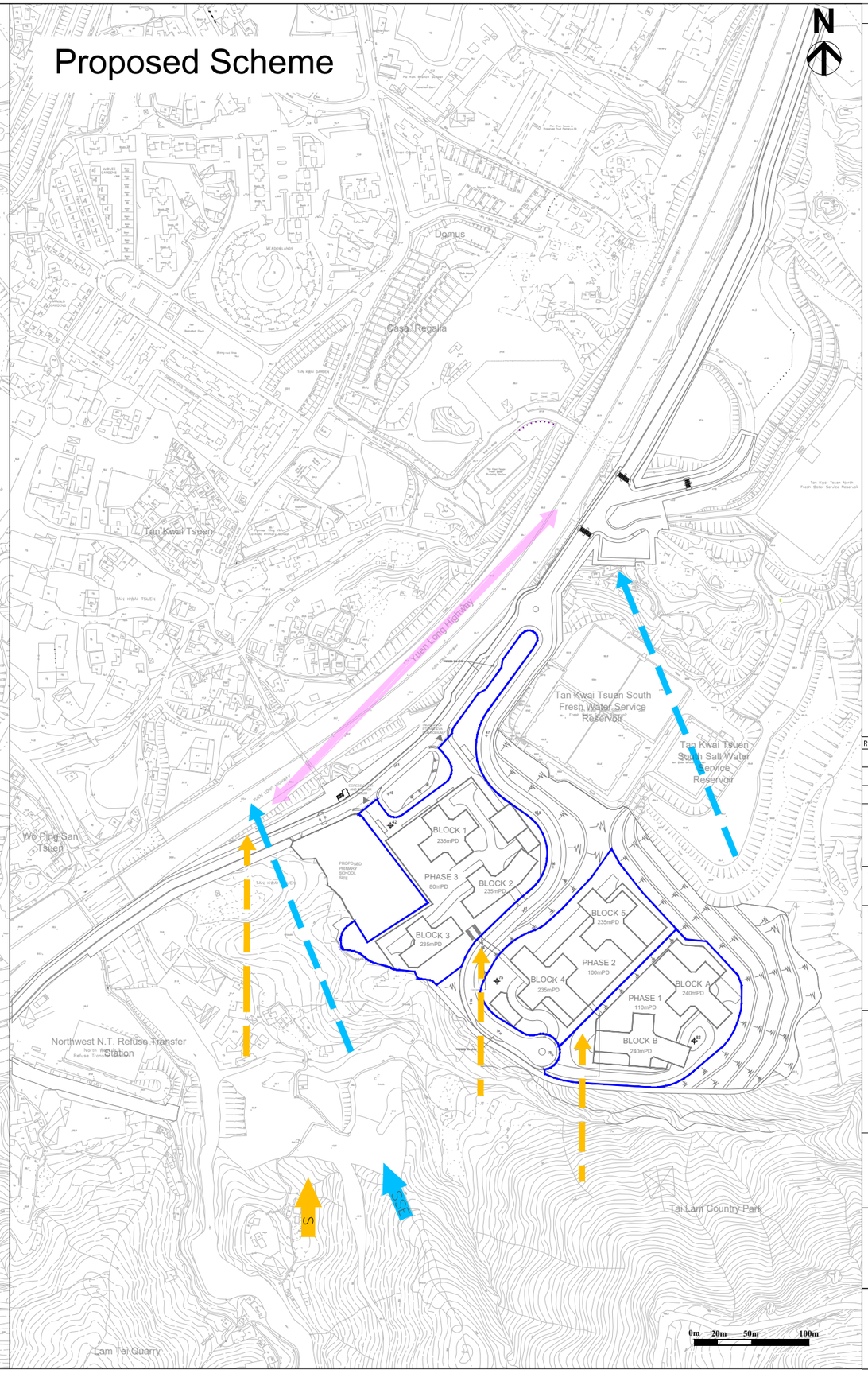
BINNIES HONG KONG LIMITED
賓尼斯工程顧問有限公司





LEGEND:

- SITE BOUNDARY OF BASELINE SCHEME
- SITE BOUNDARY OF PROPOSED SCHEME
- EXPECTED SSE WIND FLOW
- EXPECTED S WIND FLOW
- EXISTING BREEZEWAY
- BUILDING SEPARATIONS/ SETBACKS

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SITE FORMATION AND INFRASTRUCTURE WORKS FOR PUBLIC HOUSING DEVELOPMENTS NEAR TAN KWAI TSUEN, YUEN LONG – INVESTIGATION, DESIGN AND CONSTRUCTION

Drawing title

ILLUSTRATION OF WIND FLOW FROM SOUTH SOUTHEAST AND SOUTH WIND DIRECTIONS

Drawing No.

Figure 3.3

Scale

土木工程拓展署
CEDD Civil Engineering and Development Department

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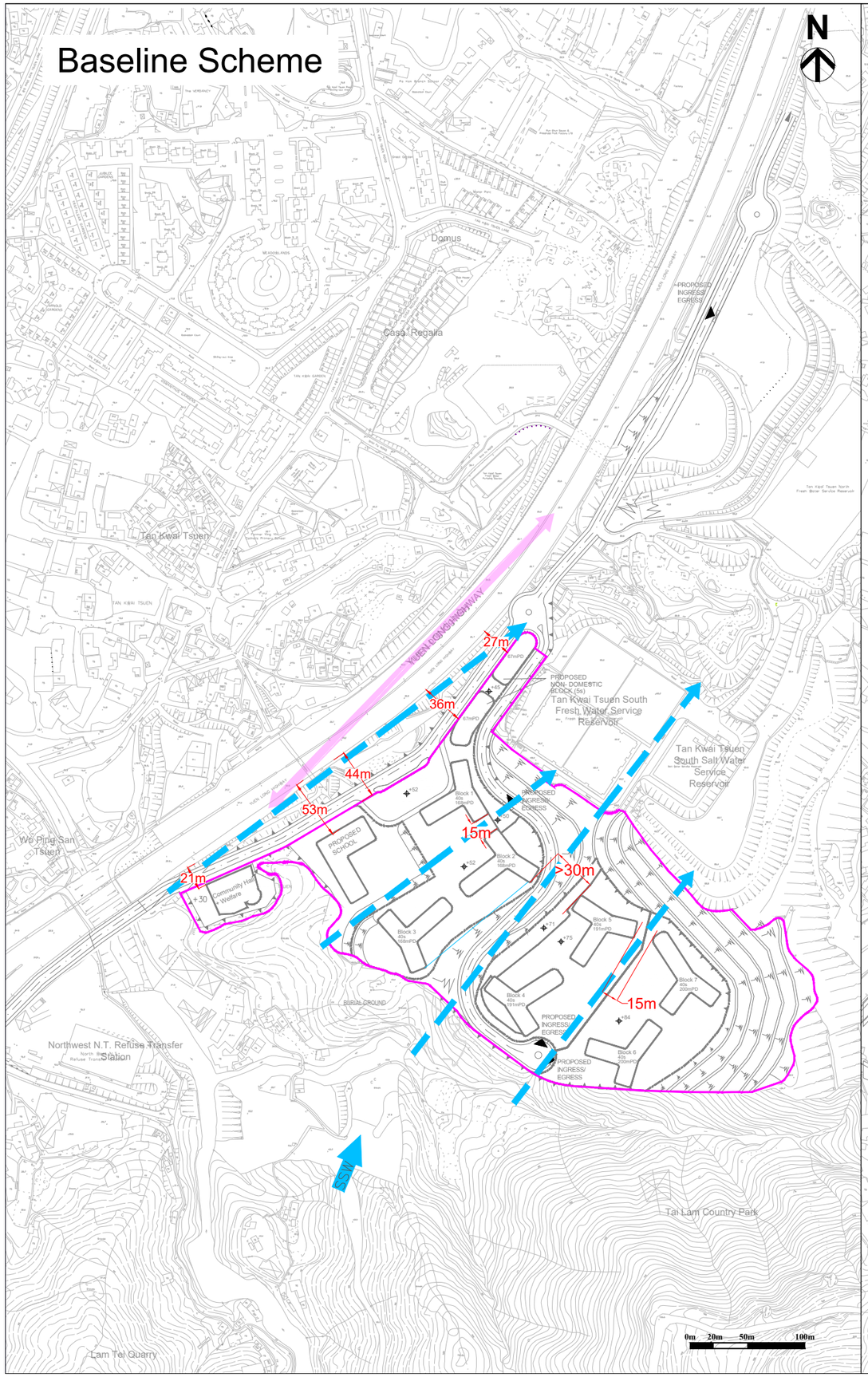
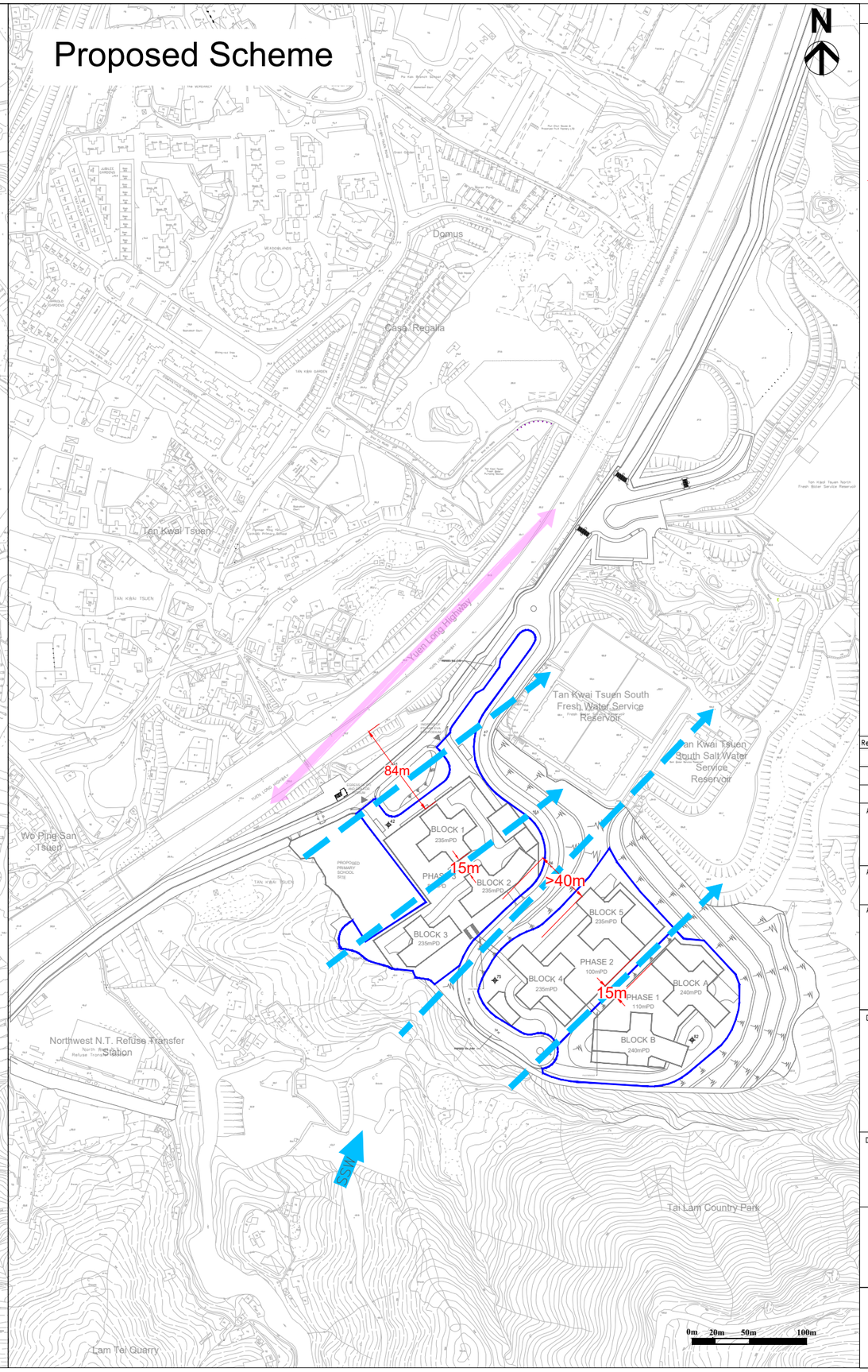
賓尼斯工程顧問有限公司

Baseline Scheme



Proposed Scheme



LEGEND:

- SITE BOUNDARY OF BASELINE SCHEME
- SITE BOUNDARY OF PROPOSED SCHEME
- EXPECTED SSW WIND FLOW
- EXISTING BREEZEWAY
- BUILDING SEPARATIONS/ SETBACKS

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Agreement title

SITE FORMATION AND INFRASTRUCTURE WORKS FOR PUBLIC HOUSING DEVELOPMENTS NEAR TAN KWAI TSUEN, YUEN LONG – INVESTIGATION, DESIGN AND CONSTRUCTION

Drawing title

ILLUSTRATION OF WIND FLOW FROM SOUTH SOUTHWEST WIND DIRECTION

Drawing No.

Figure 3.4

Scale

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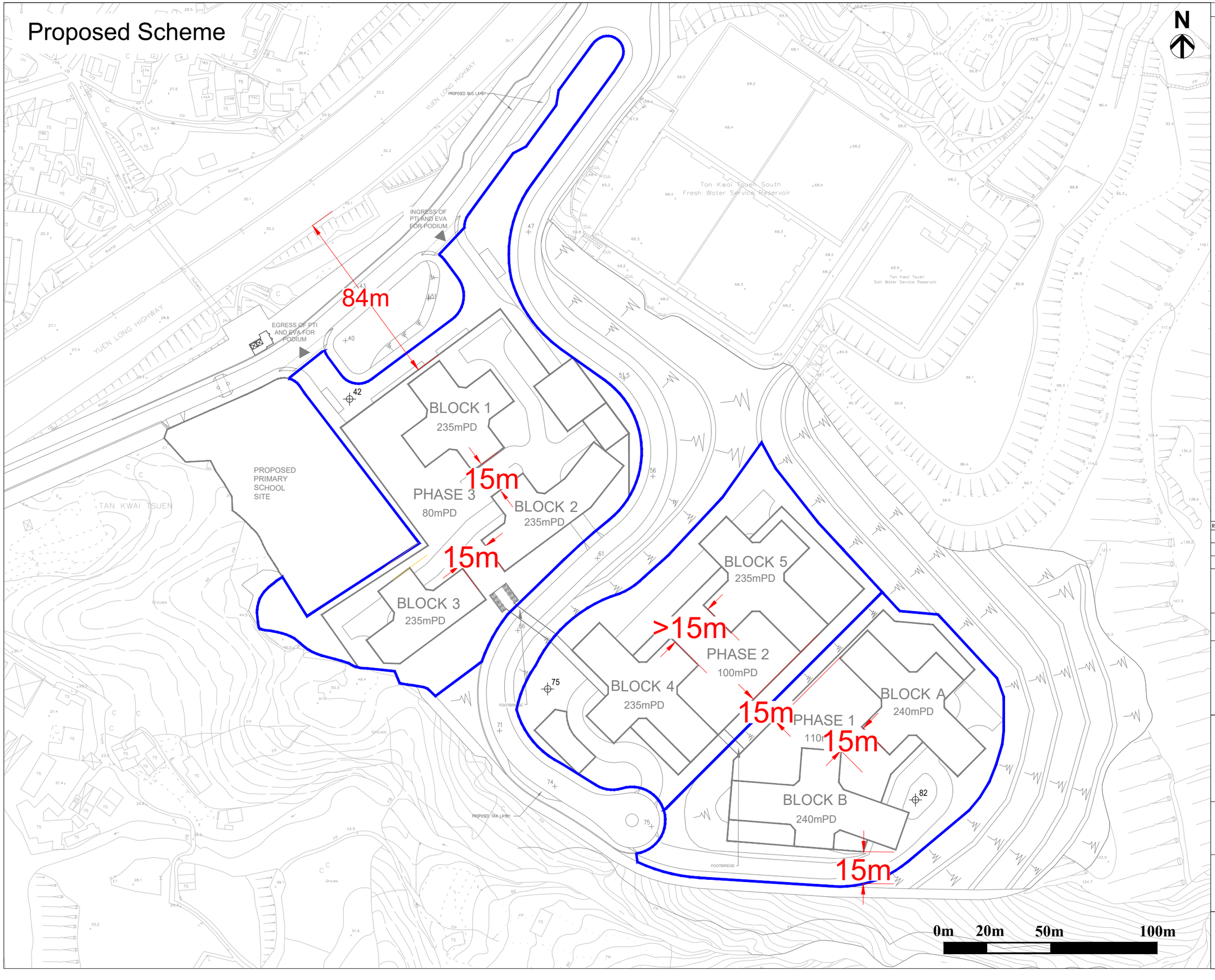
CEDD Civil Engineering and Development Department

BINNIES HONG KONG LIMITED
賓尼斯工程顧問有限公司

Proposed Scheme



LEGEND:

- SITE BOUNDARY OF PROPOSED SCHEME
- BUILDING SEPARATIONS/ SETBACKS

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SITE FORMATION AND INFRASTRUCTURE WORKS FOR PUBLIC HOUSING DEVELOPMENTS NEAR TAN KWAI TSUEN, YUEN LONG – INVESTIGATION, DESIGN AND CONSTRUCTION

Drawing title
PROPOSED MITIGATION MEASURES OF PROPOSED SCHEME

Drawing No.
Figure 3.5

Scale

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CEDD Civil Engineering and Development Department

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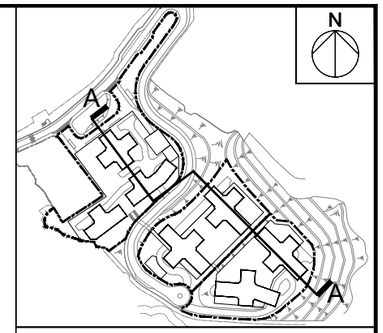
APPENDIX 1
CROSS SECTIONS OF PROPOSED SCHEME

LEGEND

- SITE BOUNDARY
- DOMESTIC BLOCK
- COMMERCIAL / RETAIL / CARPARK / SOCIAL WELFARE FACILITIES
- PUBLIC TRANSPORT INTERCHANGE
- FOOTBRIDGE



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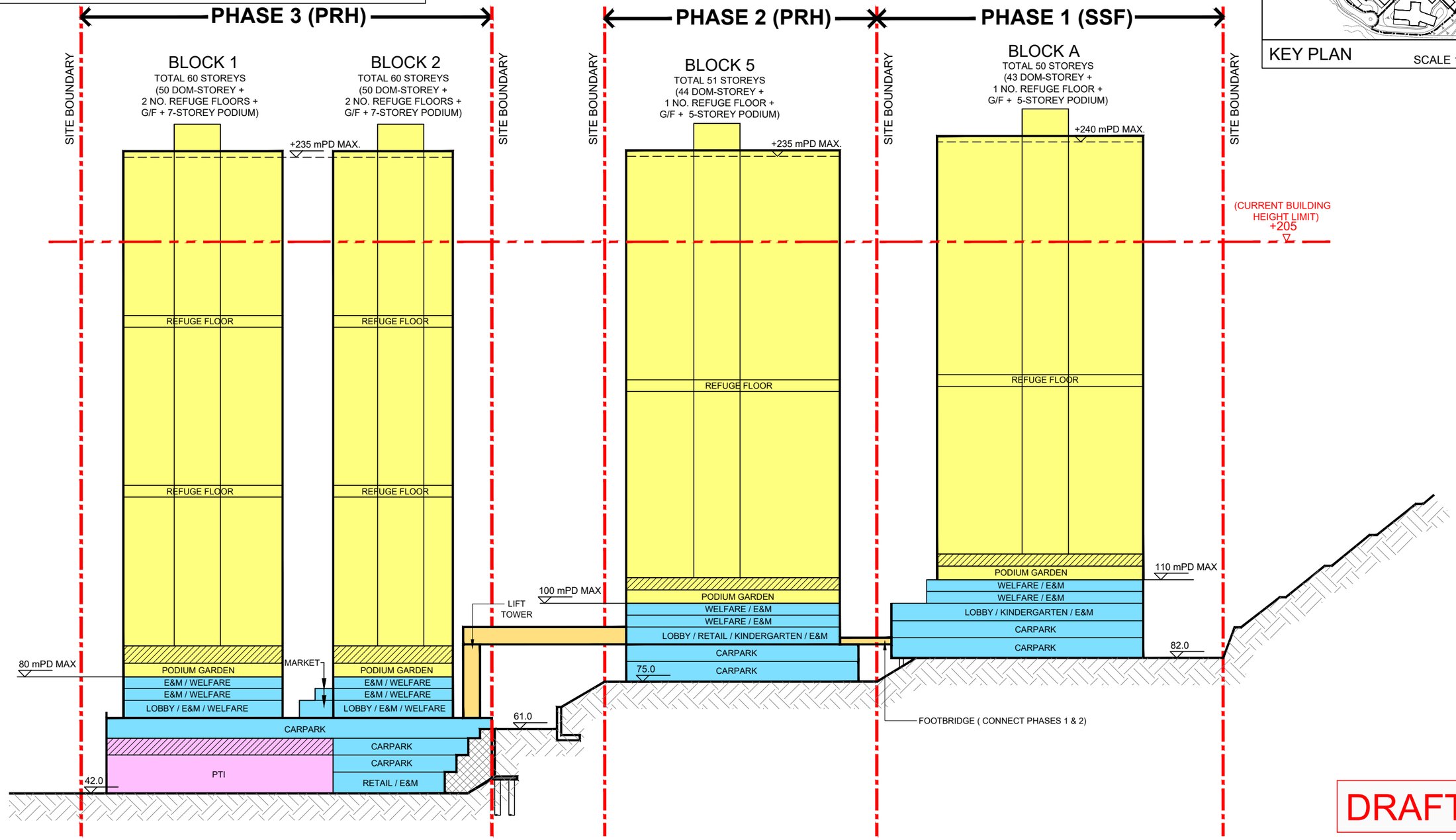


DRAFT

PROJECT TITLE

PUBLIC HOUSING DEVELOPMENT AT NEAR TAN KWAI TSUEN PHASES 1, 2 & 3

DRAWING TITLE

SITE SECTION A - A

SCALE 1:600 (A1) , 1:1200 (A3)

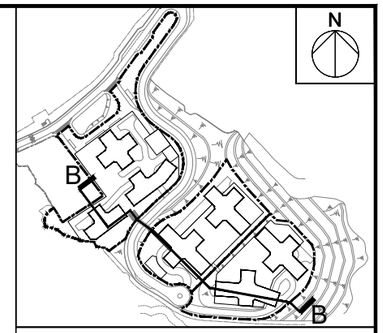
房 屋 署
HOUSING DEPARTMENT

DRAWING NO. YL52/S16/A/LO-02

DATE: 13/6/2022

LEGEND

- SITE BOUNDARY
- DOMESTIC BLOCK
- COMMERCIAL / RETAIL / CARPARK / SOCIAL WELFARE FACILITIES
- FOOTBRIDGE



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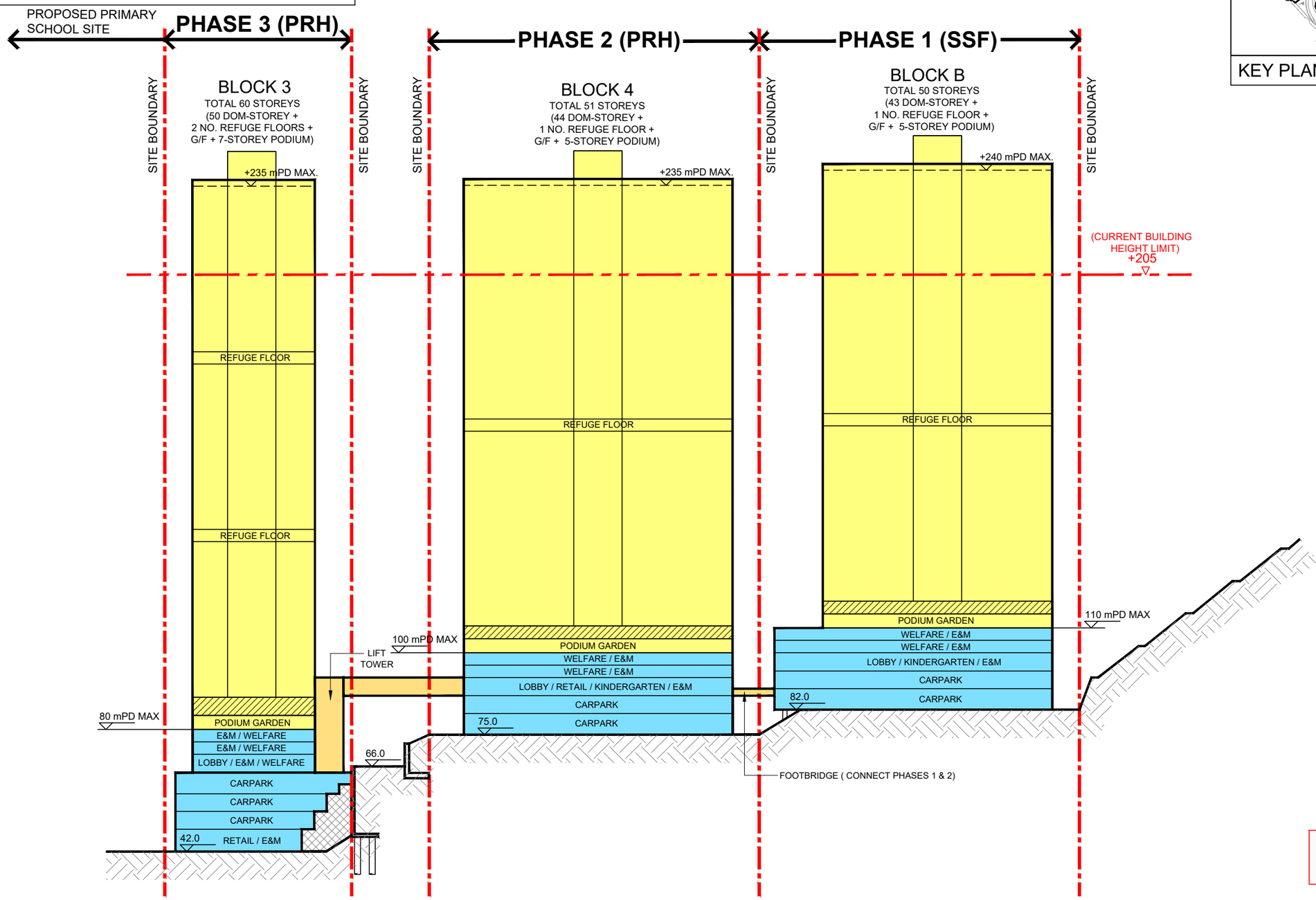

DRAFT

PROJECT TITLE

PUBLIC HOUSING DEVELOPMENT AT NEAR TAN KWAI TSUEN PHASES 1, 2 & 3

DRAWING TITLE

SITE SECTION B - B

SCALE 1:600 (A1) , 1:1200 (A3)

房 屋 署
HOUSING DEPARTMENT

DRAWING NO. YL52/S16/A/LO-03

DATE: 13/6/2022