

Prepared for

Glory Time Development Limited

Prepared by

Ramboll Hong Kong Limited

**APPLICATION FOR PERMISSION UNDER SECTION 16
PROPOSED RESIDENTIAL DEVELOPMENT (HOUSES) AND
MINOR RELAXATION OF BUILDING HEIGHT & PLOT RATIO
RESTRICTION IN "RESIDENTIAL (GROUP C)2" AND
"RESIDENTIAL (GROUP D)" ZONES, LOT 624(PART) & 787
IN D.D.110 AND ADJOINING GOVERNMENT LAND, KAM TIN
ROAD, SHEK KONG SAN TSUEN, YUEN LONG**

DRAINAGE AND SEWERAGE IMPACT ASSESSMENT

Date

July 2026

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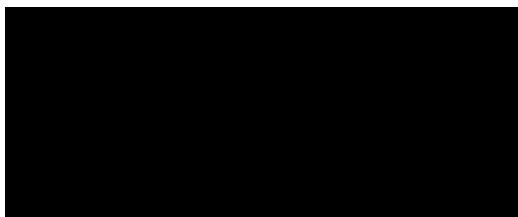
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1. INTRODUCTION

1.1 Background and Objectives

- 1.1.1 This Drainage & Sewerage Impact Assessment (DSIA) is prepared for the proposed private residential development at Lot. No. 624(Part) & 787 in D.D. 110 and Adjoining Government Land, Kam Tin Road, Shek Kong San Tsuen, Yuen Long ("Application Site"). The Application Site is located within area which is currently zoned Residential (Group C2) ("R(C)2") and Residential (Group D) (R(D)) under the Approved Kam Tin North Outline Zoning Plan (OZP) no. S/YL-KTN/11.
- 1.1.2 Ramboll Hong Kong Limited is commissioned by the Project Proponent to provide consultancy service to prepare this Drainage & Sewerage Impact Assessment based on the latest development scheme.
- 1.1.3 The design of master layout plan (MLP) and other technical information on the Proposed Development are provided by the Project Architect (CHIH Design Limited).

1.2 Application Site and its Environs

- 1.2.1 The Application Site is approximately 5,664m². It is bounded by river channel (eventually connected to Kam Tin River) to the north, Shek Kong San Tsuen to the south and Mountain View Villa to the west.
- 1.2.2 To the north on opposite side of the river channel are scattered village houses and vegetated land while to the further east separated by the river channel is also vegetated land. Both areas are zoned Residential (Group C2) under OZP. To the east, south and west are zoned Residential (Group D) under OZP.
- 1.2.3 **Figure 1.1** shows the location of the Application Site and its environs.

1.3 Proposed Development Scheme

- 1.3.1 A private residential development is proposed at the Application Site and consists of 22 residential houses, all of which are 2-storey residential buildings.
- 1.3.2 The tentative completion year of the proposed development is 2033.
- 1.3.3 Indicative layouts for the proposed private residential development are provided in **Appendix 1.1**.

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/planned drainage network serving the Application Site is sufficient to cope with the stormwater runoff from the proposed development and related surrounding catchment. Drainage Record Plans were referred to the Geoinfo Map for the purpose of this DIA.

2.2 Assessment Criteria and Methodology

- 2.2.1 The assessment standard complies with DSD Stormwater Drainage Manual (SDM) (2018 Edition) and Corrigendum No. 1/2022 where applicable. The Application Site is situated in an area served by main rural catchment drainage channels, therefore, a 1 in 50-year return storm has been adopted for the DIA.
- 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 According to surface characteristics of the catchments, the runoff coefficient for paved area is 0.95, and for unpaved area is 0.15.
- 2.2.4 The rainfall intensity parameter "i" is dependent on the return period, rainfall duration and the time of concentration of the catchment under consideration. Runoff calculations are included in **Appendix 2.1**.

2.3 Existing Drainage System

- 2.3.1 There are existing stormwater drains crossing the site from south to north located on the west side and connected to irregular river channel (SCP1013756) located on the north side of the Application Site as indicated in **Figure 2.1**.
- 2.3.2 Within the site are existing 600mm and 700mm dia. buried pipes and stream. Surface runoff from adjacent catchment to the south of the Application Site is collected by the same and then discharged to this irregular river channel (SCP1013756).

2.4 Proposed Drainage System

- 2.4.1 It is necessary to provide area reserved for future maintenance of the drainage system within site. In order to vacate adequate area for the future development including reserved area for maintenance and not seriously impact the development potential at the same time, a new drainage system and outfall is proposed along the western boundary of the Application Site as shown in **Figure 2.2**. The existing 600mm and 700mm dia. buried pipes and stream within the site will be demolished. A new 900mm dia. circular pipes (MH-D1 to MH-D4) and outfall (outfall 2) will be proposed to divert the surface runoff from the Application Site and surrounding catchment. An area of 3m width measured from outer side of the circular pipe is reserved for future maintenance purpose. No building structure will be erected within the reserved area. The drainage

facilities located within site boundary would be managed and maintained by the lot owner and its successors.

- 2.4.2 For the surface runoff collected from House 13-16 and the clubhouse on east side, another outfall on the eastern side of the Application Site (Outfall1) will be proposed. Runoff from adjacent catchment will be intercepted by proposed peripheral channel and diverted to same outfall as well.
- 2.4.3 The surface runoff from Application Site have been estimated and presented in **Appendix 2.1**.
- 2.4.4 The surface runoff of individual related catchment areas after development is summarized in **Table 2.1**.

Table 2.1 Summary of Surface Runoff under Proposed Conditions

Catchment	Area (m ²)	Runoff (m ³ /s) under 1 in 50 years scenario
S1 (Application Site)	3,611	0.189
S2 (Application Site)	2,052	0.108
A1	2,283	0.095
A2	4,233	0.197
A3	2,084	0.076
A4	4,121	0.187
A5	50,144	1.372
Total		1.926

2.5 Discussion

- 2.5.1 The total discharge volume after development is 1.926m³/s. Runoff from related catchment area is also accounted.
- 2.5.2 The existing stream and buried pipe within the site will be demolished and replaced by the proposed underground drainage pipeline of 900mm dia. It will collect the surface runoff from upstream as the existing stream does and then discharged via the new proposed outfall to the irregular river channel. Drainage capacity calculation are included in **Appendix 2.1**. The cumulative runoff is compared with the hydraulic capacity of the new drainage system within the Application Site. According to the calculation, the hydraulic capacity of the new drainage system (900mm dia. pipe with outfall2, 450mm dia pipe with outfall1) is sufficient to cater for the cumulative runoff. No adverse impact is anticipated.

Flood Level

- 2.5.3 The tidal water level at the outfall location was based on modelling result provided by DSD for the purpose to estimate the flood level that would affect the Application Site (see **Appendix 2.3**). As the subject of concern is potential flooding at the Application Site based on the proposed site formation level and drainage connection from the Application Site to Kam Tin River instead of design of any drainage trunk system, a design return period of 50 years is considered already adequate according to Table 10 of SDM2018.
- 2.5.4 The tidal water levels of 7.18mPD (return period of 50 year) based on modelling result was adopted. According to Table 11 of SDM2018, both Case I and II (i.e. 50-year rain + 10-year sea level; 10-year rain + 50-year sea level) have been considered. In addition, SDM2018 suggested the need to cater for further sea level rise due to climate

change (Table 29 of Corrigendum No.1/2022). Therefore, it is proposed to adjust the tidal water level by taking into account the sea level rise based on figures of the said tables above.

- 2.5.5 The indicative headlosses over the length of the drains under future conditions have been assessed. The assessment indicates that the upstream water levels (UWLs) would be 7.84 mPD and 7.74 mPD in 1 in 50-year return at Outfall 2 and Outfall 1 respectively, which are lower than the proposed site formation level of 10.91 mPD. Therefore, there will be no significant flooding risk due to tidal water effect.

3. SEWERAGE IMPACT ASSESSMENT

3.1 Scope of Work

- 3.1.1 The aim of this SIA is to assess whether the capacity of the existing sewerage network serving the Subject Site is sufficient to cope with the sewage flow from the Proposed Development. Information was referred to the Geoinfo Map for the purposes of this SIA.

3.2 Assessment Criteria and Methodology

- 3.2.1 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 peaking factors in this document have been adopted for this SIA.
- 3.2.2 Based on the building types in the area, the following unit flow factors are used in the SIA calculation:
- Residents: 0.37 m³/person/day (R3)
 - Clubhouse Staff: 0.28 m³/day (J11 - Community, Social & Personal Services)
- 3.2.3 Catchment Inflow Factor (P_{CIF}) of Yuen Long (1.00) has been applied in the assessment.

3.3 Existing and Future Sewerage System

- 3.3.1 There are currently no public sewer serving the Application Site and its vicinity.
- 3.3.2 A septic tank system (STS), consisting of eleven septic tanks with soakaway pits, is proposed at the Application Site. Each system will serve two houses and facilitate the sedimentation and decomposition of small solid particles, after which the wastewater will soak into the surrounding soil.
- 3.3.3 In accordance with EPD's Practice Note for Professional Persons Drainage Plans subject to Comment by the Environmental Protection Department (ProPECC PN 5/93) and EPD's Guidance Notes on Discharges from Village Houses, the septic tank should be large enough to hold at least the volume of wastewater collected in one day. The STS will be located along the driveway and the tentative location of the STS (subject to detailed design) is shown in **Appendix 3.2**.
- 3.3.4 The requirements of the STS will be designed in accordance with the Guidance Notes on Discharges from Village Houses issued by EPD. At the same time, during the design stage, Drainage Plans will be submitted to Buildings Department for approval. Upon the confirmation of the design scheme of the proposed residential development, the size of the septic tank will be provided and submitted to relevant Government Authorities for approval.
- 3.3.5 The following requirements will be considered and included in the design:
- Sufficient space for installing the system of an adequate size to handle sewage being discharged from the development;
 - Suitable ground conditions for the effluent to filter into the ground and adequate underground distance for the effluent to travel for satisfactory decomposition of the polluting materials;

- Capacity of the STS shall be able to store waste for three days (based on the rate of consumption of potable and flushing water), and to hold all the sludge likely to accumulate between desludging;
 - The septic tank shall be leak-proof and covered to prevent external deposition of solids or ingress of rain; and
 - Adequate means of access for inspection and cleaning.
- 3.3.6 To prevent flooding and overflow, inspection and desludging will be conducted regularly by a specialist contractor.
- The septic tank shall be deslugged regularly, the clogged soakaway pit shall be cleaned immediately, and any damage to the STS system shall be repaired promptly;
 - Sludge removed in the desludging process shall be handled and disposed of properly; and
 - Records of the desludging and disposal operations shall be maintained and made available for inspection by Government authorities.
- 3.3.7 The proposed sewage treatment will be fully enclosed and equipped with silencers, if necessary, to reduce noise generated from its ventilation system. Detailed design of the treatment plant will be provided in later stage. No adverse sewerage impact is anticipated.

3.4 Wastewater Generated by the Proposed Development

- 3.4.1 Wastewater arising from the Proposed Development will be primarily contributed by residents and clubhouse staff. Sewage from the Proposed Development will be discharged to the on-site septic tank system. Detailed calculation for the Proposed Development is given in **Table 3.1** below and **Appendix 3.1**.

Table 3.1 Estimated Peak Flow

Development Parameters	Proposed Development	
	Residential	Clubhouse
Total number of units	22	-
Assumed Area (m ²)	-	136
Number of Population	154 ⁽¹⁾	5
Design Flow (m ³ /person/day)	0.37 ⁽²⁾	0.28 ⁽³⁾
Flow Rate (m³/day)	57.0	1.3
Total Flow Rate with P_{CF} (m³/day)	58.2	
Peak Flow (L/s)	5.4	

(1) Assume 7 persons per household.

(2) Refer to Table T-1 of GESF – Private R3

(3) Refer to Table T-2 of GESF – J11 Community, Social & Personal Services

3.5 Discussion

- 3.5.1 Wastewater from Proposed Development will be discharged to the on-site septic tank system.

- 3.5.2 The potential sewerage impact due to the Proposed Development has been quantitatively addressed. Sewage generation rate from the Subject Site is estimated to be: 58.2m³/day and peak flow of 5.4 litre/sec.
- 3.5.3 The on-site sewage system will be able to cater for the sewage generated from the Proposed Development.

4. OVERALL CONCLUSION

4.1 Conclusion

- 4.1.1 A private residential development is proposed for the Application Site at Lot No. 624 & 787 in D.D. 110 and adjoining government land, Kam Tin Road, Yuen Long. The potential drainage and sewerage impact has been quantitatively addressed.
- 4.1.2 The existing buried pipes and stream within the site will be demolished and the new 900mm dia. drainage pipes (MH-D1 to MH-D4) and new outfall (outfall 2) are proposed to divert the runoff from the Proposed Development and surrounding catchment via the new outfall to the irregular river channel to the north.
- 4.1.3 Another new outfall (outfall 1) will be proposed on the eastern side of the Application Site to receive runoff from House 13 to 16 and the clubhouse on east side of the proposed development. Runoff from adjacent catchment will be intercepted by proposed peripheral channel and diverted to same outfall as well.
- 4.1.4 Based on the drainage impact assessment results, the proposed drainage system will have adequate capacity to cater for stormwater generated from the proposed development and related existing catchment area. Moreover, based on the proposed site formation level, there will be no significant flooding risk.
- 4.1.5 As there are currently no public sewer serving the Application Site and its vicinity, an STS is proposed for the Application Site.
- 4.1.6 The design parameters of the STS will be submitted to relevant Government authorities for approval at later detailed design stage. During operation phase, regular maintenance and inspection will be conducted to avoid any adverse impacts on the surrounding.
- 4.1.7 This DSIA confirms the feasibility of the proposed development in terms of impacts to the public drainage and sewerage system.

Figures

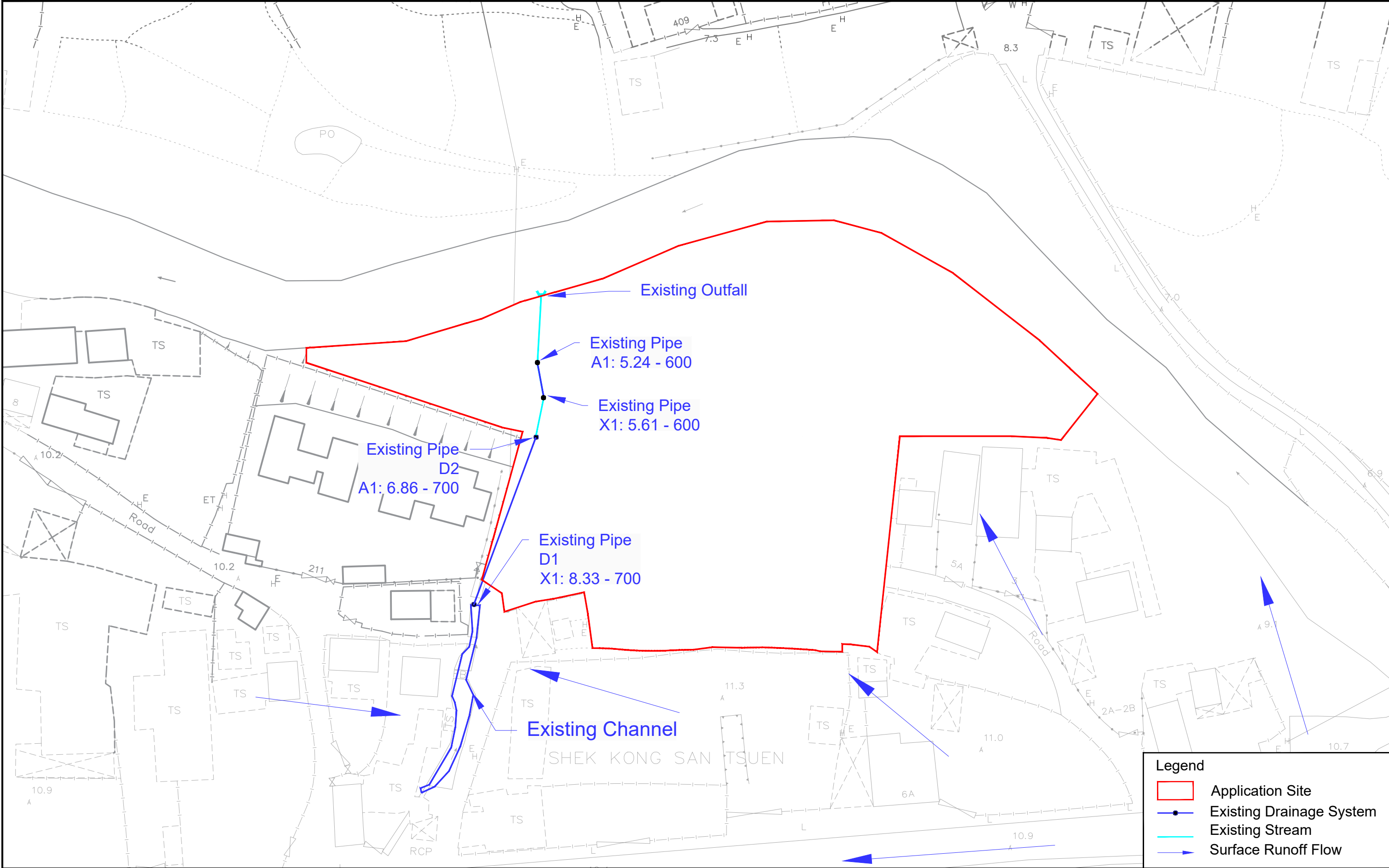


Figure: 2.1	RAMBOLL	
Title: Existing Drainage System in the Vicinity of the Application Site	Drawn by:	MW
	Checked by:	ZC
Project: Application for Permission Under Section 16 Proposed Residential Development (Houses) and Minor Relaxation of Building Height & Plot Ratio Restriction in "Residential (Group C)2" and "Residential (Group D)" Zones, Lot 624 (part) & 787 in D.D. 110 and Adjoining Government Land, Kam Tin Road, Shek Kong San Tsuen, Yuen Long	Rev.:	1.0
	Date:	Jul 2026

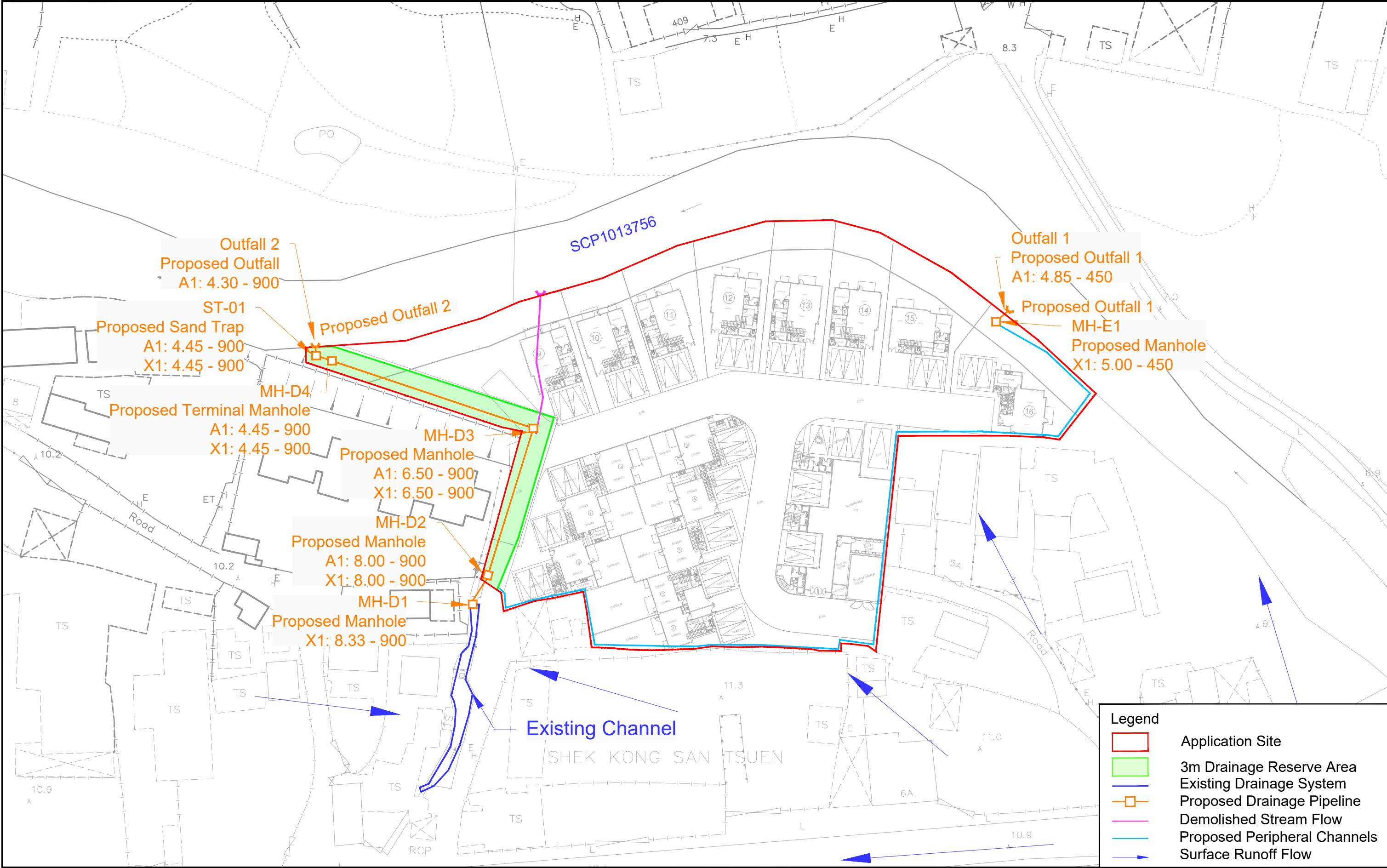


Figure: 2.2	RAMBOLL
Title: Existing Drainage System in the Vicinity of the Application Site and Proposed Drainage Pipeline	Drawn by: MW
Project: Application for Permission Under Section 16 Proposed Residential Development (Houses) and Minor Relaxation of Building Height & Plot Ratio Restriction in "Residential (Group C)2" and "Residential (Group D)" Zones, Lot 624 (part) & 787 in D.D. 110 and Adjoining Government Land, Kam Tin Road, Shek Kong San Tsuen, Yuen Long	Checked by: ZC
	Rev.: 1.0
	Date: Jul 2026

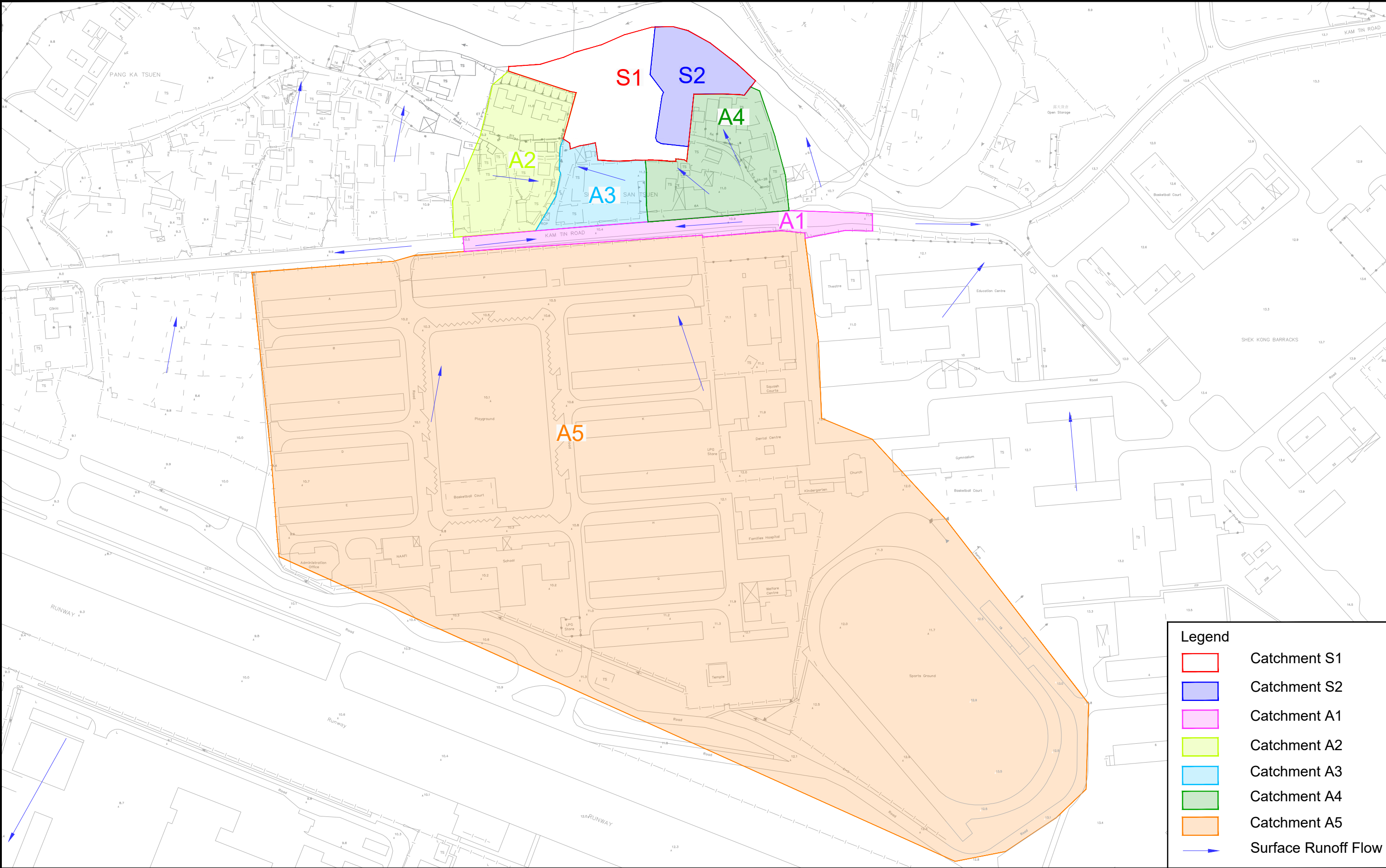
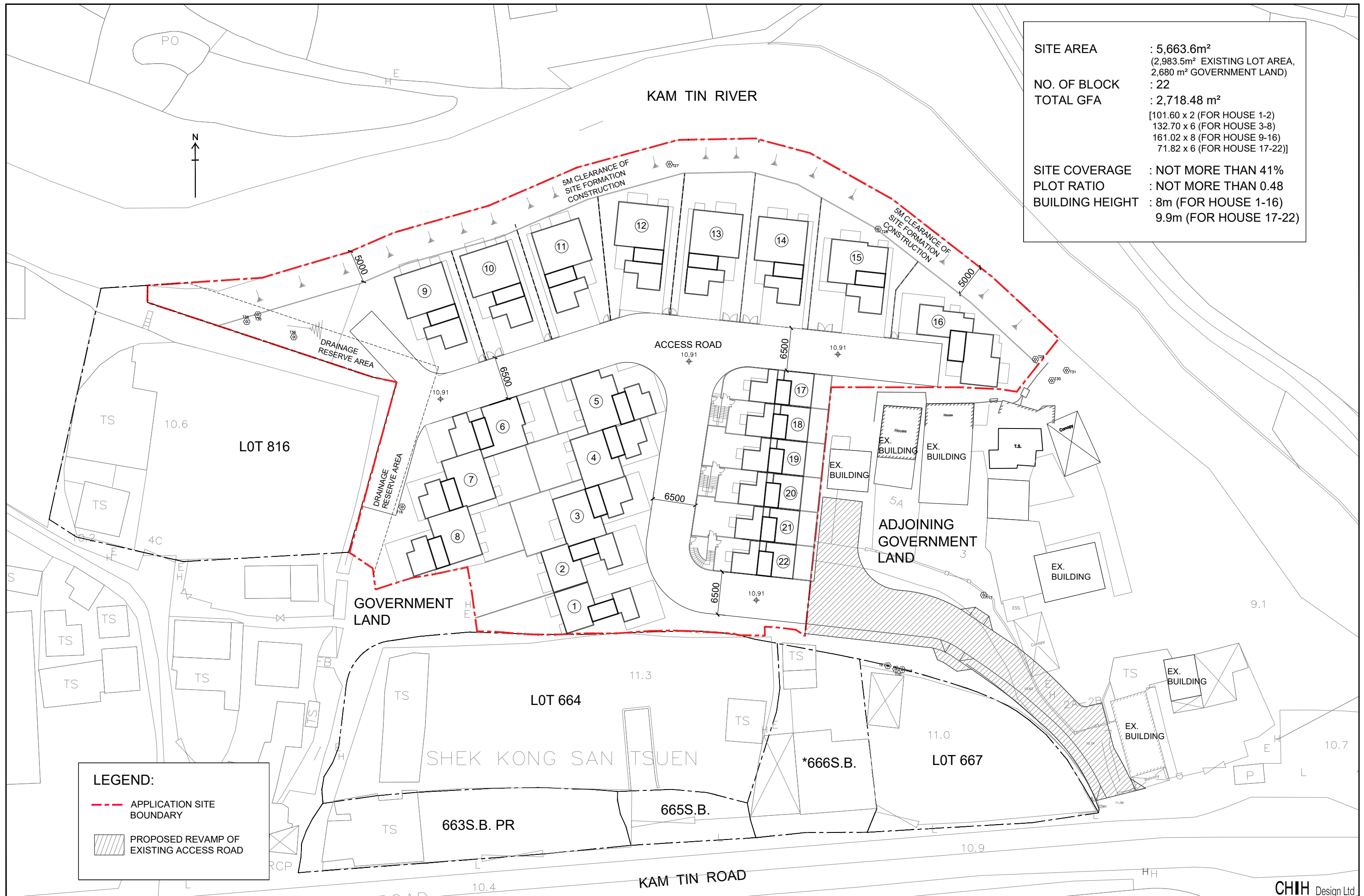


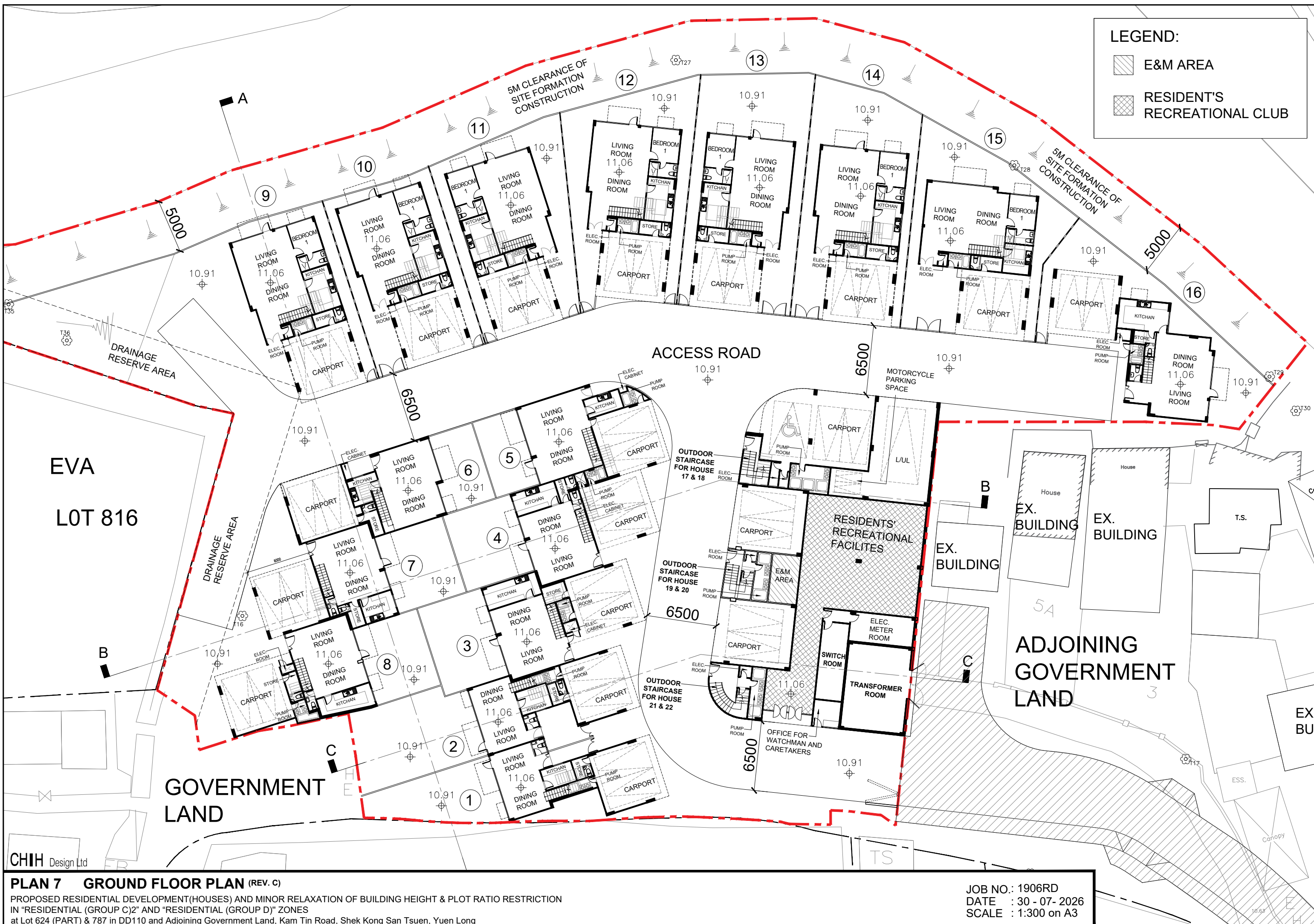
Figure: 2.3	Title: Drainage System and Catchment Area in the Vicinity of the Application Site	Project: Application for Permission Under Section 16 Proposed Residential Development (Houses) and Minor Relaxation of Building Height & Plot Ratio Restriction in "Residential (Group C)2" and "Residential (Group D)" Zones, Lot 624 (part) & 787 in D.D. 110 and Adjoining Government Land, Kam Tin Road, Shek Kong San Tsuen, Yuen Long	RAMBOLL
			Drawn by: MW
			Checked by: ZC
			Rev.: 1.0
			Date: Jul 2026

Appendix 1.1 Master Layout Plan



LEGEND:

-  E&M AREA
-  RESIDENT'S RECREATIONAL CLUB







Appendix 2.1 Detailed Drainage Impact Assessment Calculations

Lots 624 (Part) and 787 in DD110, Shek Kong
Table 1 - Proposed Catchment Areas and Run-off (1 in 50 year)

Notes:
Site Area 5664 m²

Catchments are small, so Rational Method is appropriate

1 in 50-year (according to Table 3 of DSD Manual)
a= 505.5
b= 3.29
c= 0.355

$Q_p = 0.278 \ C \ i \ A$

where Q_p = peak runoff in m³/s
C = runoff coefficient (dimensionless)
i = rainfall intensity in mm/hr
A = catchment area in km²

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

	Catchment	Discharge Manhole	Paved	Unpaved	Run-off at	Area	Levels (mPD)		Fall	Overland, L	Fall, H	Overland t _c	t ₀	Total t _r 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)	
Future	Appliation Site																		
	S1	MH-D2	80%	20%	MH-D2	3,611							5.0	0.00	5.00	239	0.79	0.189	
					MH-D3									0.30	5.30	236	0.79	0.187	
					MH-D4									0.45	5.74	231	0.79	0.184	
					ST-01									0.07	5.81	231	0.79	0.183	
					Outfall2									0.02	5.83	231	0.79	0.183	
	S2	MH-E1	80%	20%	MH-E1	2,052						5.0	0.00	5.00	239	0.79	0.108		
					Outfall1	0.03							5.03	238	0.79	0.107			
Overall						5,664												0.297	
Future	Surrounding Catchments																		
	A1	MH-D1	100%	0%	MH-D1	2,283	11.4	10.4	1.0	235.0	0.4	18.6	18.6	5.00	23.61	157	0.95	0.095	
					MH-D2									0.09	23.71	157	0.95	0.095	
					MH-D3									0.30	24.00	156	0.95	0.094	
					MH-D4									0.45	24.45	155	0.95	0.094	
					ST-01									0.07	24.52	155	0.95	0.094	
					Outfall2									0.02	24.54	155	0.95	0.094	
	A2	MH-D1	80%	20%	MH-D1	4,233	11.0	10.6	0.4	50.9	0.8	3.4	3.4	5.00	8.37	211	0.79	0.197	
					MH-D2									0.09	8.46	211	0.79	0.196	
					MH-D3									0.30	8.76	209	0.79	0.194	
					MH-D4									0.45	9.20	206	0.79	0.192	
					ST-01									0.07	9.27	206	0.79	0.191	
					Outfall2									0.02	9.29	206	0.79	0.191	
	A3	MH-D1	80%	20%	MH-D1	2,084	10.7	10.6	0.1	133.0	0.1	15.0	15.0	5.00	20.03	165	0.79	0.076	
					MH-D2									0.09	20.13	165	0.79	0.076	
					MH-D3									0.30	20.42	164	0.79	0.075	
					MH-D4									0.45	20.87	163	0.79	0.075	
ST-01					0.07									20.94	163	0.79	0.075		
Outfall2					0.02									20.96	163	0.79	0.075		
A4	MH-E1	80%	20%	MH-E1	4,121	10.7	7.5	3.3	84.7	3.8	4.1	4.1	5.00	9.07	207	0.79	0.187		
				Outfall1									0.03	9.10	207	0.79	0.187		
A5	MH-D1	70%	30%	MH-D1	50,144	13.7	10.5	3.2	549.4	0.6	30.0	30.0	5.00	35.00	139	0.71	1.372		
				MH-D2									0.09	35.09	138	0.71	1.371		
				MH-D3									0.30	35.39	138	0.71	1.367		
				MH-D4									0.45	35.84	138	0.71	1.361		
				ST-01									0.07	35.91	137	0.71	1.360		
				Outfall2									0.02	35.92	137	0.71	1.360		
Overall						62,865												1.926	

Remarks:
1. Assumed Time of Concentration through stream flow
2. Assumed Time of Concentration

Lots 624 (Part) and 787 in DD110, Shek Kong
Hydraulic Calculations of Existing and Proposed Drainage System

Table 2a - 1 in 50 year Runoff of Future Catchments (m³/s)

Runoff at	Catchment							
	A1	A2	A3	A4	A5	S1	S2	Total
MH-D1	0.095	0.197	0.076		1.372			1.74
MH-D2	0.095	0.196	0.076		1.371	0.189		1.93
MH-D3	0.094	0.194	0.075		1.367	0.187		1.92
MH-D4	0.094	0.192	0.075		1.361	0.184		1.90
ST-01	0.094	0.191	0.075		1.360	0.183		1.90
Outfall2	0.094	0.191	0.075		1.360	0.183		1.90
MH-E1				0.187			0.108	0.29
Outfall1				0.187			0.107	0.29

Table 3a - Hydraulic Capacities for Proposed 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
MH-D1 - MH-D2	-	-	Circular	900	8.3	8.33	8.00	9.81	0.0030	0.040	25	0.000001	5.09	0.64	3.24	2.91
MH-D2 - MH-D3	-	-	Circular	900	26.7	7.80	6.50	9.81	0.0030	0.049	21	0.000001	5.64	0.64	3.59	3.41
MH-D3 - MH-D4	-	-	Circular	900	40.3	6.50	4.56	9.81	0.0030	0.048	21	0.000001	5.62	0.64	3.57	3.39
MH-D4 - ST-01	-	-	Circular	900	6.2	4.56	4.35	9.81	0.0030	0.034	30	0.000001	4.71	0.64	2.99	2.70
ST-01 - Outfall2	-	-	Circular	900	1.5	4.35	4.30	9.81	0.0030	0.033	30	0.000001	4.67	0.64	2.97	2.67
MH-E1 - Outfall1	-	-	Circular	450	2.8	4.90	4.85	9.81	0.0003	0.018	56	0.000001	2.94	0.16	0.47	0.42

Table 4a - Comparison of Runoff from Proposed Catchments and Hydraulic Capacities of Proposed 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?	Runoff [4]	Occupancy	Sufficient Capacity?
			mm	m ³ /s		m ³ /s			m ³ /s			m ³ /s			m ³ /s		
MH-D1 - MH-D2	-	-	900	2.91	A1, A2, A3, A5	1.74	59.6%	YES	1.93	66.3%	YES	2.02	69.2%	YES	2.23	76.4%	YES
MH-D2 - MH-D3	-	-	900	3.41	A1, A2, A3, A5, S1	1.93	56.5%	YES	2.14	62.8%	YES	2.23	65.5%	YES	2.47	72.4%	YES
MH-D3 - MH-D4	-	-	900	3.39	A1, A2, A3, A5, S1	1.92	56.5%	YES	2.13	62.8%	YES	2.22	65.5%	YES	2.46	72.4%	YES
MH-D4 - ST-01	-	-	900	2.70	A1, A2, A3, A5, S1	1.90	70.7%	YES	2.12	78.5%	YES	2.21	82.0%	YES	2.44	90.5%	YES
ST-01 - Outfall2	-	-	900	2.67	A1, A2, A3, A5, S1	1.90	71.2%	YES	2.11	79.1%	YES	2.21	82.6%	YES	2.44	91.2%	YES
MH-E1 - Outfall1	-	-	450	0.42	S2, A4	0.29	70.1%	YES	0.33	77.9%	YES	0.34	81.4%	YES	0.38	89.9%	YES

Remarks:

1. Q_{silt}: 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: $D^2 \times \pi / 4$
3. Perimeter of Circular Pipe: $(D \times 2 \times \pi) / 2$
4. Runoff [2] represents the situation in Mid 21st Century (11.1%)
5. Runoff [3] represents the situation in Late 21st Century (16%)
6. Runoff [4] includes rainfall increase due to Climate Change 16% + Design Allowance 12.1% in the end of 21 st Century

Lots 624 (Part) and 787 in DD110, Shek Kong

Table 5a: Hydraulic Capacities for Future Drainage System under free flow condition

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k _s	s	v	V	Area	Q
			mm	m	mPD	mPD	m/s ²	m		m ² /s	m/s	m ²	m ³ /s
Outfall 2	-	-	900	1.5	4.35	4.30	9.81	0.00300	0.033	0.000001	4.67	0.64	2.97
Outfall 1	-	-	375	5.3	5.00	4.85	9.81	0.00030	0.029	0.000001	3.33	0.11	0.37

Lots 624 (Part) and 787 in DD110, Shek Kong

Table 6a: Upstream Water Level of Existing Drainage System under surcharge condition (1 in 50 year)

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	g	k _s	s ²	v	V	Area	Q ¹	Headloss over Length ³	Downstream Water Level	Upstream Water Level
			mm	m	m/s ²	m		m ² /s	m/s	m ²	m ³ /s	m	mPD	mPD
Outfall 2	-	-	900	1.5	9.81	0.00300	0.0137	0.000001	2.99	0.64	1.903	0.456	7.38	7.84
Outfall 1	-	-	375	5.3	9.81	0.00060	0.0216	0.000001	2.67	0.11	0.295	0.363	7.38	7.74

Remarks:

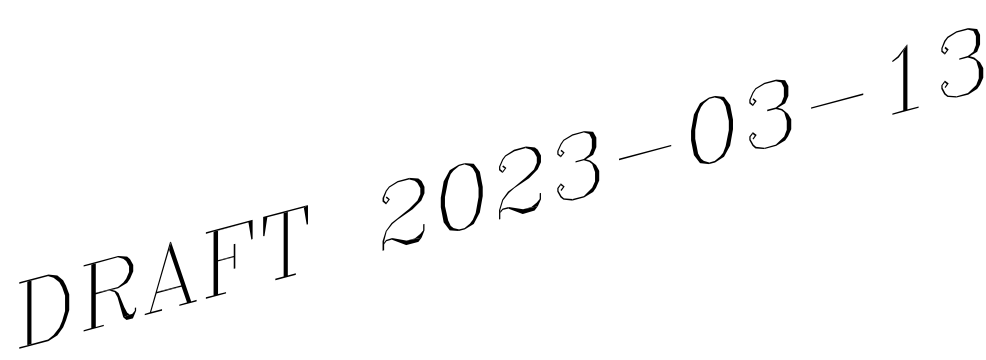
1. Discharge Calculated in Table 1 and Table 2
2. Required Hydraulic Gradient to pass flow, back calculated from discharge calculated in Table 5.
3. Head losses Coefficient, K, is assumed as 1.0 as a conservative approach.
4. Downstream Water Level is adjusted based on increase in sea level by mid 21st century (Table 29)
5. The Upstream Water Level (UWL) is lower than the lowest site formation level 10.91mPD, therefore no adverse drainage impact is anticipated due to tidal effect.

$$H = K \frac{V^2}{2g}$$

Where:

- H = Headloss (m)
 K = Head Loss Coefficient
 V = velocity of flow (m/s)
 g = gravitational acceleration (m/s²)

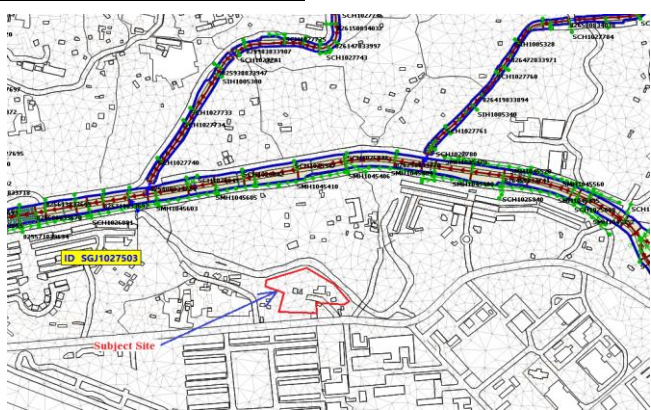
Appendix 2.2 Topographical Survey



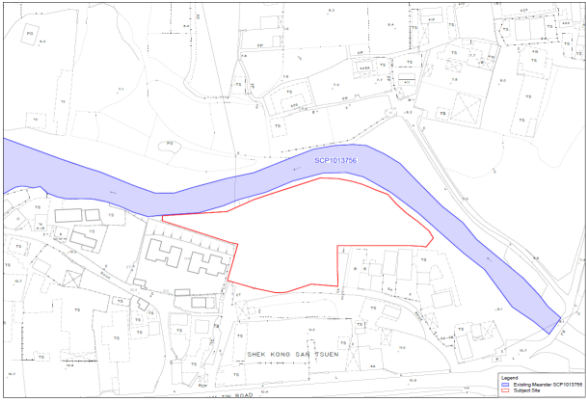
Appendix 2.3 Information Obtained from DSD

Node ID : **SGJ1027503**

Return Period	50A	50B	200A	200B
Max Water Level	7.188	6.761	7.432	6.839



Location Plan



Appendix 3.1 Detailed Sewerage Impact Assessment Calculations

Table 1 Estimated Sewage Flow for Proposed Residential Development

1. Residential

Total number of units	=	22	Units
Assumed number of residents	=	154	people (assume 7 persons per household)
Unit Flow Factor (UFF)	=	0.37	m ³ /person/day -- (refer to Table T-1 of GESF - R3)
Design Average Dry Weather Flow (ADWF)	=	57.0	m ³ /day

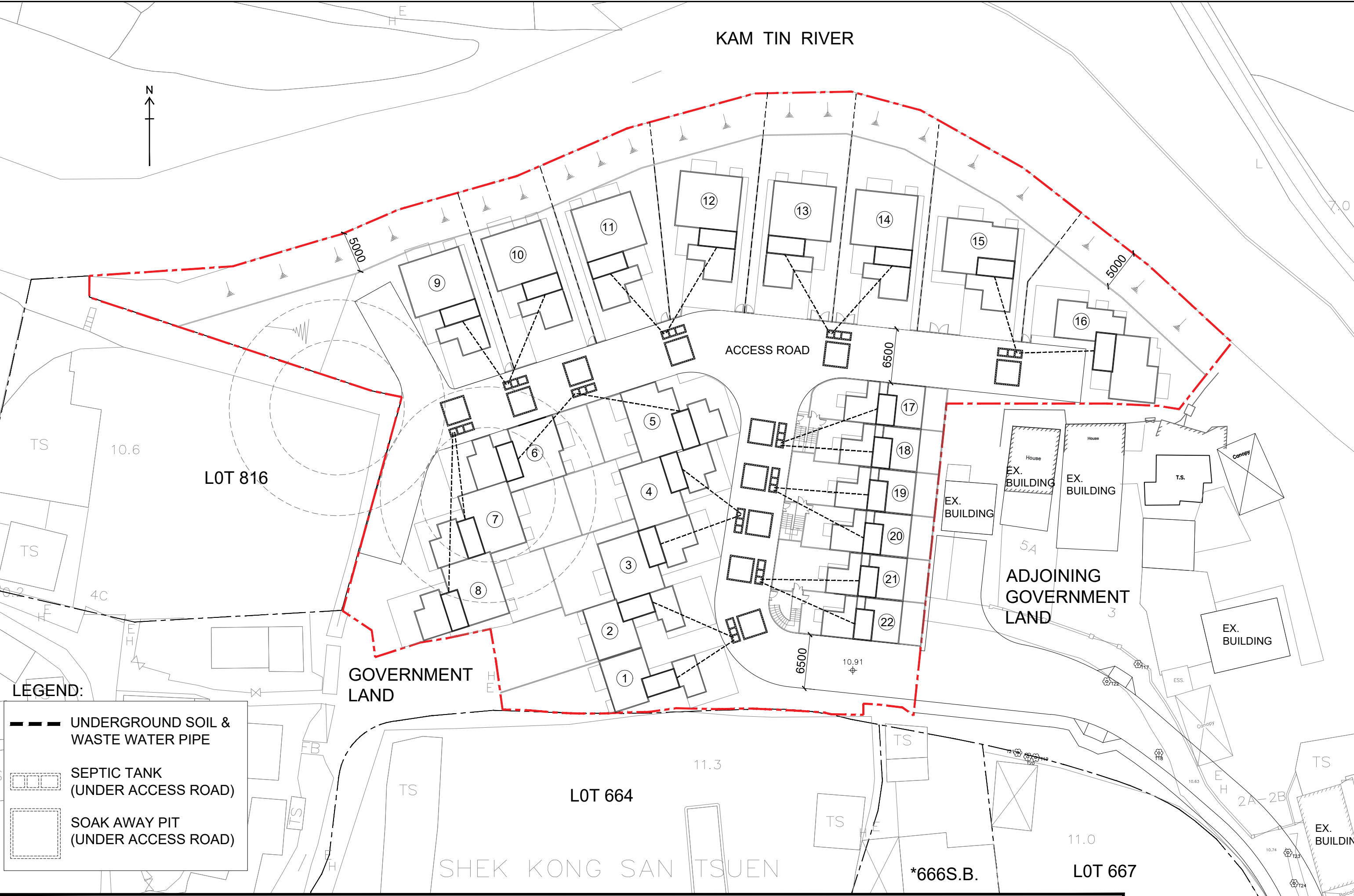
2. Clubhouse Area

Area	=	136.0	m ²
Assumed number of employees	=	5	people (CIFSUS Community, Social & Personal Services 3.3 per 100m ²)
Unit Flow Factor (UFF)	=	0.28	m ³ /person/day -- (refer to Table T-2 of GESF - J11)
Design Average Dry Weather Flow (ADWF)	=	1.3	m ³ /day

Sub-Total Flow at Manhole FTMH-01

Flow Rate (without Catchment Inflow Factor)	=	58.2	m ³ /day
Catchment Inflow Factor P _{CIF}	=	1.0	Catchment Inflow Factor for Yuen Long in Table T-4 of GESF
Flow Rate (with Catchment Inflow Factor)	=	58.2	m ³ /day
Contributing Population	=	216	people
Peaking factor	=	8	Refer to Table T-5 of GESF incl. stormwater allowance
Peak Flow	=	5.4	L/s

Appendix 3.2 Location of Treatment Plants



LEGEND:

- UNDERGROUND SOIL & WASTE WATER PIPE
- [Symbol] SEPTIC TANK (UNDER ACCESS ROAD)
- [Symbol] SOAK AWAY PIT (UNDER ACCESS ROAD)