

TEMPORARY DRAINAGE PROPOSAL



TEMPORARY DRAINAGE PROPOSAL FOR THE PROPOSED TEMPORARY PLACE OF RECREATION, SPORT OR CULTURE (PADEL TENNIS) WITH ANCILLARY EATING PLACE AND SHOP AND SERVICES FOR A PERIOD OF 3 YEARS AT LOT 1560 (PART) IN D.D.107 AND ADJOINING GOVERNMENT LAND, KAM TIN, YUEN LONG, NEW TERRITORIES

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1. Introduction

This report presents the temporary drainage proposal for proposed temporary place of recreation, sport or culture (padel tennis) with ancillary eating place and shop and services for a period of 3 years at Lot 1560 (Part) in D.D.107 and adjoining government land, Kam Tin, Yuen Long, New Territories. The site location is shown in **Appendix A**.

1.1. Objectives of the Report

This report shall be prepared to include the following:

- Identify the potential drainage impact assessment from the proposed Application Site
- Recommend and implement all necessary measures to mitigate adverse drainage impacts arising from the application site

1.2. Report Structure

The report contains the following sections:

- Section 1 on Introduction;
- Section 2 on Development Proposal;
- Section 3 on Assessment Methodology;
- Section 4 on Potential Drainage Impact; and /
- Section 5 on Conclusion

1.3. References

This report has been prepared with reference to the following documents:

- Stormwater Drainage Manual: Planning, Design and Management (Fifth Edition, January 2018)
- Technical Note No.1 Technical Note to Prepare a Drainage Submission (December 2024)
- Stormwater Drainage Manual – Corrigendum No. 1/2022
- Stormwater Drainage Manual – Corrigendum No. 1/2024

2. Development Proposal

2.1. Existing Site Conditions

The application site is located in Kam Tin in Yuen Long, New Territories. The total area is approximately 8200 m^2 . The site layout plan is provided in **Appendix B**.

The applied development is a temporary place of recreation, sport or culture (padel tennis) with ancillary eating place and shop and services for a period of 3 years. The zonings are under "Comprehensive Development Area (1)" and "Comprehensive Development Area". The application site is Lot 1560 (Part) in D.D.107 and adjoining government land, Kam Tin, Yuen Long, New Territories.

Localised site formation is planned for the proposed tennis court area. The existing ground level is approximately +4.50 to 5.20 mPD, while the proposed is ground level is approximately +4.89 to +4.92 mPD.

The application site is less than 1 ha in size and neither fall within flood prone areas such as lowlying areas and flooding blackspots nor involve pond filling and substantial earth filling, so it is regarded as simple site.

There is an existing public open channel (SCP1013160) with width of 12m on the north side of the application site and the other existing public open channel (SCP1009605) with width of 6.5m on the south side of the application site that proposed be the ultimate discharge point. There are also existing village surface channels with 750mm width and catchpits in vicinity of the application site. The location and picture of the existing village surface channel and open channel are shown **Figure 1** and appended in **Appendix C**.

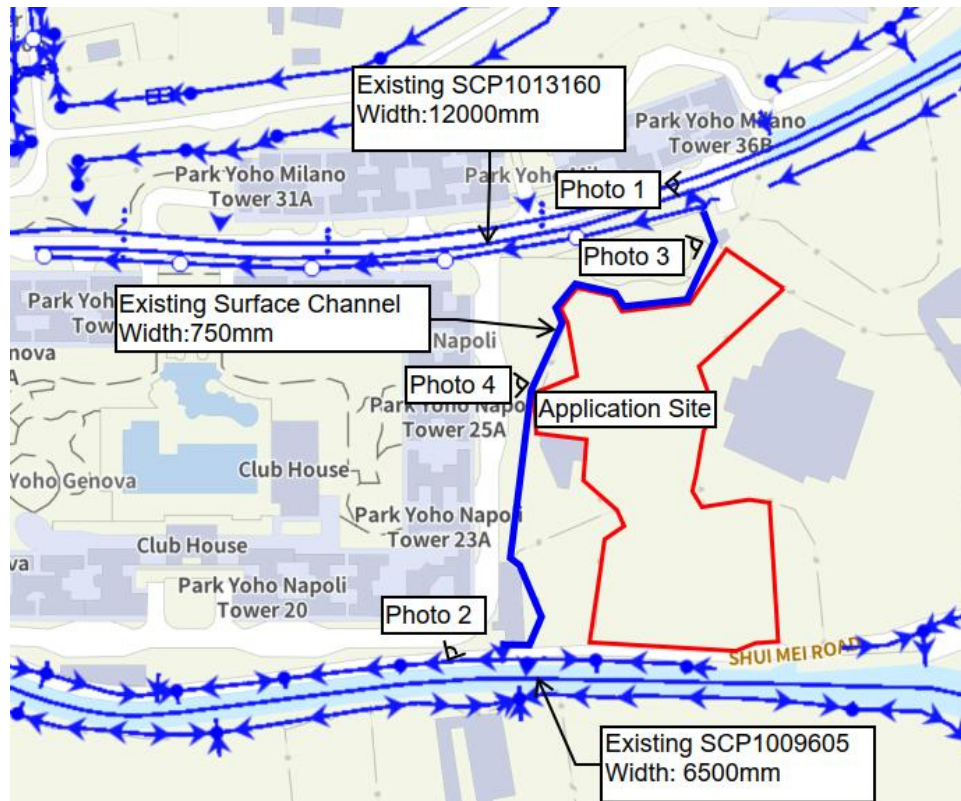


Figure 1. Location Plan of Existing Drainage Facilities

3. Assessment Methodology

3.1. Calculation Methodology for Runoff

According to Section 6.6.2 of *the Storm Drainage Manual (SDM)*, an "Urban Drainage Branch System" refers to a network of interconnected drains that collect rainwater runoff from an urban area and transport it to a trunk drain, river, or sea. In simpler terms, the largest pipe size or the equivalent diameter in case of a box culvert in a branch system will normally be less than 1.8m.

Referring to *SDM*, since the proposed U-channels have dimensions smaller than 1.8m, the drainage system would be classified as an urban drainage branch. In consideration of the effect of recent climate change in the drainage design, the return period is 50 years with the storm constraints specified in *Stormwater Drainage Manual – Corrigendum No. 1/2024*.

To calculate the peak instantaneous runoff values before and after the development, the Rational Method with recommended physical parameters including runoff coefficient (C) and storm constants for different return periods are adopted referred to the *SDM*.

The Rational Method is adopted for hydraulic analysis and the peak runoff is calculated based on the following equation:

$$Q_p = 0.278 Ci A$$

where Q_p = Peak Runoff, m^3/s

C = Runoff Coefficient

i = Rainfall Intensity, mm/hr

A = Catchment Area, km^2

A runoff coefficient of 0.85 was adopted for paved surfaces with brick paving. In accordance with the *SDM – Corrigendum No. 1/2024*, a 16% increase in rainfall intensity due to projected climate change impacts by the end of the 21st century was incorporated into the analysis. Based on the storm constants recommended in the *SDM* for the 50-year return period, the corresponding rainfall intensities (*i*) were calculated as presented in **Appendix E1** and **Appendix E2**.

3.2. Calculation Methodology for Capacity Checking

Based on the runoff results, a drainage layout was developed to intercept and convey stormwater efficiently. Surface U-channels were proposed along the site perimeter and internal flow paths to collect runoff directly from paved and filled areas. These channels guide surface water toward catchpits, which act as collection points and allow debris to settle before water enters underground pipes.

Underground drainage pipes were designed to carry collected runoff from the catchpits to a suitable discharge point.

Peripheral surface U-channels are proposed to collect stormwater runoff within the site. Surface U-channels with nominal widths of 450 mm and 525 mm are proposed along the site periphery to convey the collected runoff. The stormwater will be discharged to the 750mm surface U-channel, existing 12 m wide open channel and the existing 6.5 m wide open channel located in the vicinity of the site respectively.

Fair condition of concrete U channel is assumed for the Manning's roughness coefficient i.e coefficient value is 0.015 for calculating capacities of concrete U-channel using Manning's Equation. The recommended roughness values k_s for precast concrete is 0.6 mm under poor condition.

Manning's Equation for calculating the channel and pipe capacities is adopted for this analysis:

$$V = \frac{R^{2/3} S^{1/2}}{n}$$

where V = mean velocity, m/s

S = slope of the total energy line

n = Manning's roughness coefficient

R = hydraulic radius, m

Deposition of sediment in stormwater drainage system is considered in the hydraulic calculation as required by the SDM. 10% reduction in flow area is adapted to consider the effects to flow capacity due to materials deposited on the bed.

3.3. Summary of Assessment Assumptions

The assumptions of the Drainage Proposal are summarized below for ease of reference:

- Runoff coefficient of 0.85 for the paved area is assumed;
- Storm constants for 50 years return periods of HKO Headquarters
- Manning's roughness coefficient of 0.015 for the proposed concrete U-channels and concrete pipe are adopted; and
- Roughness values k_s of 0.6 mm for prestressed concrete channels is adopted.

4. Potential Drainage Impact

4.1. Change in Drainage Characteristics

There is no existing drainage provision inside the current site, the stormwater was discharged as surface runoff and infiltration leading to the natural stream or river.

The total application area is approximately 8,200 m², they are divided into four catchment areas, namely CA1 (2,300 m²), CA2 (2,700 m²), CA3 (1,200 m²) and CA4 (2,000 m²).

The adjacent sites have no record of flooding. Peripheral surface channels are proposed to collect the surface runoff accrued on the site. After site formation, the proposed ground level is slightly higher than the adjacent lands, only insignificant overland flow from adjacent lands will pass through the application site. For conservative approach, external catchment areas are also considered in the hydraulic calculation, which is shown in **Table 1** and **Appendix E2**. Hoardings are erected with adequate opening to allow existing overland flow passing through the site.

Catchment Area	Application Site (m ²)	Application Site +External Area (m ²)
CA1	2300	2800
CA2	2700	3400
CA3	1200	2900
CA4	2000	2400

Table 1: Catchment Area for Site Only and External Area

To manage the stormwater flows after developing the site, this drainage proposal detailed the proposed drainage system consisting of a set of U-channels for diverting stormwater flows to avoid causing flooding to the site.

4.2. Proposed Drainage Works

The runoff from the application site is proposed to be collected by U-channels along the site boundary and discharged to the four terminate catchpits with sand trap and eventually lead to the existing open channels in vicinity of the site. Cover levels and invert levels of both the proposed and existing drainage facilities were shown on the drainage plan. The invert levels of the upstream drainage facilities were higher than those at the downstream to ensure proper flow direction. In addition, the gradients and sizes of the proposed and existing drainage facilities were also indicated on the drainage plan. The detail of the proposed drainage works in drainage plan are illustrated in **Appendix D1**.

Cross sections showing the proposed drainage facilities and the existing and proposed ground levels of the captioned site with respect to the adjacent areas were provided in **Appendix D2**.

Hydraulic calculations were carried out to demonstrate that the proposed drainage facilities were adequate to collect, convey, and discharge the surface runoff generated from the application site. The hydraulic calculations for the proposed U-channel and drainage pipes are presented in **Appendix E1**, the hydraulic calculations with external catchment area are presented in **Appendix E2**.

Moreover, separate hydraulic calculation has been checked for the existing facilities to be discharged to have sufficient capacity to cater for application site, it is appended in **Appendix F**.

The construction details of the proposed drainage facilities and typical details for the U-channels and catchpits in CEDD's standard drawings are provided in **Appendix G** as a reference.

4.3. Design Calculation and Result

Hydraulic calculation demonstrated 450mm width surface U-channels are adequate to collect the surface runoff accrued on CA1 and CA4 while 525mm width are adequate for the surface runoff accrued on CA2 and CA3. The design calculations for U-channel with the application site are summarized in **Table 2**, appended in **Appendix E1** and **Appendix E2**.

Catchment Area (m ²)	Surface Channel	From	To	Cover Level	Inlet Level	Width (mm)	Length (m)	Grad	Vel. Full Bore (m/s)	Runoff / Cap. (Q/Qo) Site Only	Runoff / Cap. (Q/Qo) Site and External Catchment	Check
CA1: Site :2300 m ² (With External 2800m ²)	UC1	CP1	CP2	4.92	4.35	450	12.3	100	1.80	65.1%	79.4%	OK
	UC2	CP2	CP3	4.92	4.13	450	21.6	100	1.80	64.0%	78.1%	OK
	UC3	CP3	CP4	4.91	3.85	450	27.8	100	1.80	62.8%	76.5%	OK
	UC4	CP4	TCP5	4.89	3.66	450	19.2	100	1.80	62.0%	75.5%	OK
	UC5a	CP18	CP8	4.93	3.85	450	38.4	100	1.80	56.7%	69.3%	OK
	UC6	CP8	CP7	4.92	3.68	450	17.4	100	1.80	56.2%	68.7%	OK
	UC7	CP7	CP6	4.90	3.56	450	18.1	150	1.47	68.1%	83.2%	OK
	UC8	CP6	TCP5	4.89	3.46	450	15.1	150	1.47	67.5%	82.4%	OK
CA2: Site 2700 m ²	UC9	CP16	CP17	4.92	4.32	525	11.8	150	1.63	62.3%	78.6%	OK
	UC10	CP17	CP18	4.93	4.24	525	12.1	150	1.63	61.7%	77.8%	OK
	UC11	CP8	CP9	4.91	3.74	525	16.9	150	1.63	60.4%	74.7%	OK

Catchment Area (m ²)	Surface Channel	From	To	Cover Level	Inlet Level	Width (mm)	Length (m)	Grad	Vel. Full Bore (m/s)	Runoff f / Cap. (Q/Qo) Site Only	Runoff / Cap. (Q/Qo) Site and External Catchment	Check
With External 3400 m ²	UC12	CP9	CP10	4.91	3.68	525	8.8	150	1.63	60.0%	74.2%	OK
	UC13	CP10	TCP11	4.90	3.44	525	35.4	150	1.63	58.4%	72.3%	OK
	UC14	CP16	CP12	4.92	4.03	525	54.1	150	1.63	51.0%	64.5%	OK
	UC15	CP12	TCP11	4.10	3.70	525	49.7	150	1.63	49.8%	62.9%	OK
CA3: Site 1200 m ² (With External 2900 m ²)	UC16	CP12	TCP13	4.92	4.26	525	35.4	200	1.41	25.5%	61.6%	OK
	UC17	CP15	CP14	4.92	4.18	525	26.7	200	1.41	29.1%	71.1%	OK
	UC18	CP14	TCP13	4.90	4.01	525	56.2	200	1.41	25.4%	62.5%	OK
CA4: Site 2000 m ² (With External 2400 m ²)	UC5	CP17	CP18	4.93	4.18	450	8.9	150	1.47	61.1%	73.4%	OK
	UC5B	CP18	CP1	4.92	3.74	450	65.1	150	1.47	66.7%	80.1%	OK
	UC20	CP17	CP19	4.93	4.14	450	9.5	150	1.80	57.6%	69.2%	OK
	UC21	CP19	CP20	4.92	3.88	450	38.9	150	1.47	68.0%	81.7%	OK
	UC22	CP20	CP21	4.92	3.63	450	38.4	150	1.47	65.8%	79.0%	OK
	UC23	CP21	CP22	4.92	3.45	450	26.1	200	1.47	64.5%	77.4%	OK
	UC24	CP22	TCP23	4.92	3.31	450	21.1	200	1.47	63.4%	76.2%	OK
	UC25	CP1	TCP23	4.92	4.33	450	14.3	100	1.80	55.8%	67.1%	OK

Table 2: Drainage Schedule of Proposed U-channel

Drainage pipes are proposed to connect from the terminal catchpits to the existing village surface channel and open channel. The sizes of the drainage pipes are 450mm and 525mm respectively, they are detailed as in **Table 3** and appended in **Appendix E1** and **Appendix E2**.

From	To	U/S I.L. (mPD)	D/S I.L. (mPD)	Width (mm)	Length (m)	Grad.	Vel. V (m/s)	Runoff Q (m ³ /s)	Runoff / Cap. (Q/Qo) Site Only	Runoff / Cap. (Q/Qo) Site and External Catchment	Check
TCP5	DP1	3.46	3.30	450	7.9	49	2.211	0.274	64%	78%	OK
TCP11	DP2	3.44	2.98	525	31.9	69	2.068	0.325	58%	73%	OK
TCP13	DP3	3.86	3.61	525	18.1	72	2.024	0.274	26%	63%	OK
TCP23	DP4	3.31	3.10	450	9.8	47	2.274	0.226	52%	62%	OK

Table 3: Drainage Schedule of Proposed Drainage Pipe

To confirm that the receiving drainage facilities have sufficient capacity to accommodate the discharge from the application site, additional hydraulic calculations were carried out on existing 750 mm U-channel and 6500mm open channel in the vicinity of the application site. The results are summarized in **Table 3** and appended in **Appendix F**. This demonstrates that the proposed development will not adversely affect the existing drainage system.

Existing Drainage Facility	Catchment Area m ² (Original)	Catchment Area m ² (Application Site)	Total Catchment Area m ²	Nominal Width (mm)	Length (m)	Vel. Full Bore (m/s)	Original Capacity	With Application Site capacity	Check
Existing UC	2800	4300	7100	750	110	1.82	20.9%	53.0%	OK
Existing UC	3000	2700	5700	750	50	1.64	29.1%	55.2%	OK
Existing UC	2800	4300	7100	900	90	2.05	13.5%	34.3%	OK
SCP1009605	57000	9000	66000	6500	600	2.76	2.5%	2.9%	OK
SCP1013160	52000	9000	61000	12000	400	2.90	0.7%	0.8%	OK

Table 4: Design Checking for Existing Drainage Facilities

5. Conclusion

A temporary drainage proposal has been designed for proposed temporary place of recreation, sport or culture (padel tennis) with ancillary eating place and shop and services for a period of 3 years at Lot 1560 (Part) in D.D.107 and adjoining government land, Kam Tin, Yuen Long, New Territories.

Based on the hydraulic calculations, a set of peripheral U-channel with width of 450mm and 525mm have been deemed sufficient to convey peak runoff under a 50-year return period from the application site. The stormwater collected from the site will be discharged into the village surface channels with 750mm width and catchpits in vicinity of the application site. The ultimate discharge points will be existing public open channel (SCP1013160) with width of 12m on the north side of the application site and the other existing public open channel (SCP1009605) with width of 6.5m on the south side of the application site.

Coordination will be undertaken with relevant stakeholders, agreement will be sought from the owner prior to commencement of the proposed work, and feedback will be sought from appropriate government departments regarding temporary drainage arrangements to ensure the system operates effectively.