

Appendix V
Drainage Impact Assessment

Drainage Impact Assessment For Section 16 Planning Application of Proposed Temporary Concrete Batching Plant for a Period of 5 Years in "Other Specified Uses" annotated "Boatyard and Marine-oriented Industrial Uses" Zone, Tsing Yi Town Lots Nos. 14 and 15 and Adjoining Government Land, Tam Kon Shan Road, Tsing Yi, New Territories



DRAINAGE IMPACT ASSESSMENT REPORT

Reference: 31048-R06-01

Date: April 2025

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1 Introduction

1.1 Background

The Applicant intends to seek Town Planning Board ("TPB") approval for a Proposed Temporary Concrete Batching Plant for a Period of 5 Years at Tsing Yi Town Lots (TYTL) 14 and 15 and Adjoining Government Land, Tam Kon Shan Road, Tsing Yi (hereafter "the proposed development").

In the Approved Tsing Yi Outline Zoning Plan No. S/TY/32 (referred to as the "OZP"), the Application Site is zoned as "Other Specified Uses" annotated "Boatyard and Marine-oriented Industrial Uses". According to the Schedule of Uses outlined in the OZP, the intended use of a Concrete Batching Plant falls under Column 2 uses. Consequently, obtaining planning permission from TPB is necessary for the proposed temporary concrete batching plant under Section 16 of the Town Planning Ordinance.

This submission intends to demonstrate the overall drainage design and provide basic information and is structured to follow the requirement of Stormwater Drainage Manual – Planning, Design and Management (2018 Edition) (SDM).

AXON Engineering & Consulting Limited (AXON) was commissioned to carry out a Drainage Impact Assessment (DIA) report for the proposed development.

1.2 Objectives

The objectives of the DIA are as follow:

- to assess the potential drainage impacts arising from the proposed development; and
- to recommend the necessary mitigation measures to alleviate the impacts, if necessary.

1.3 References

Reference is made to the following document:

1. Stormwater Drainage Manual (SDM) – 5th Edition issued by the Drainage Services Department (DSD)
2. Drainage Services Department Advice Note No. 1 – Application of the Drainage Impact Assessment Process to Private Section Project
3. Technical Note to prepare a Drainage Submission – Drainage Services Department (DSD)

2 Baseline Conditions and Review Methodology

2.1 Site Description

The Application Site is bounded by TYTL 14, TYTL 15 and Adjoining Government Land, Tam Kon Shan Road, Tsing Yi. It is bordered by Tam Kon Shan Road on the south and Tsing Yi Waterfront on the north. The site is situated to the west of Green Kwai Tsing and Tsing Yi Northeast Park. The site location is illustrated in **Figure 2.1**.

2.2 Site Conditions and Discharge Strategies

The Application Site encompasses an approximate application area of 4,335m² and a site area (paved land) of approximately 2,908m² in total. The site is surrounded by boundary walls along its eastern, western and southern site boundary, while there is no boundary wall constructed along the northern side to facilitate barge operations. Currently, the site is fully covered by the concrete surface. No site formation work will be conducted for the proposed development. Thus, there is no net difference in surface runoff due to this application.

The elevations within the paved area range from +4.05 mPD to +4.35 mPD. **Figure 2.2** shows the catchment areas and path flow of the site.

The stormwater fall on the roofs in catchments A, B and C will be collected through gutters and downpipes. In catchments D, the runoff is anticipated to primarily flow towards the northeast or the northwest, and will be collected via the proposed u-channel system.

It's important to note that many stormwater manholes from the Drainage Services Department are situated along Tam Kon Shan Road. The pipelines from both the eastbound and westbound directions divert the collected stormwater into northward through the stormwater manhole SWD4023664, which connects to the existing box culvert located beneath the site. Ultimately, the collected rainwater will be discharged into the sea.

The proposed underground pipe UP1 will establish a connection from the final catchpit, which includes a sand trap, government stormwater manhole SWD4023664, serving as the final discharge point for the planned stormwater drainage system.

2.3 Calculation Methodology for Runoff

Peak instantaneous runoff values before and after the development were calculated based on the Rational Method and with recommended physical parameters including runoff coefficient (C) and storm constants for different return periods referred to the SDM.

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

$$Q_p = 0.278 C i A$$

where	Q_p	=	Peak Runoff, m ³ /s
	C	=	Runoff Coefficient
	i	=	Rainfall Intensity, mm/hr
	A	=	Catchment Area, km ²

The paved areas of the site will account for 2,908 m². The runoff coefficient of 1.0 was assumed.

Based on the storm constants for 50-year return period recommended in the SDM, the appropriate rainfall intensities (i) were calculated as detailed in **Appendix A**.

2.4 Calculation Methodology for Channel Capacity Checking

The development site is smaller than one hectare in size. To manage stormwater runoff, it is recommended that U-channels be constructed on site. The U-channel system will collect the stormwater and divert it to the proposed u-channels and underground pipe. Eventually, the collected stormwater will be discharged to the government stormwater manhole.

A Manning's roughness coefficient value of 0.016 and 0.015 was used to calculate the capacities of concrete U-channels and concrete drainpipe respectively. This assumed the fair condition of concrete channels and concrete pipe.

Typical designs of the U-channel and Catchpit are shown in **Appendix B**.

Manning's Equation for calculating the channel and pipe capacities was 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

2.5 Summary of Assessment Assumptions

Below is a summary of the assumptions underlying the Drainage Impact Assessment:

- A 50-year return period was adopted;
- A runoff coefficient of 1.0 for the paved area was assumed; and
- Manning's roughness coefficient of 0.016 for U-channels was adopted; and
- Manning's roughness coefficient of 0.015 for underground concrete drain pipe was adopted.

3 Assessment Results

The estimated peak runoff of each catchment area is calculated based on 50 years return period and is summarised in **Table 3.1** below, runoffs and capacities of the proposed drainage system are summarised in **Table 3.2**. The proposed layout plan of the drainage system and detailed calculations are provided in **Figure 3.1** and **Appendix A**, respectively.

Table 3.1 Estimated Peak Runoffs of Each Catchment Area

Catchment ID	Catchment Area, m ²	Peak Runoff, m ³ /s
A	534	0.0393
B	166	0.0136
C	87	0.0072
D	2,121	0.1417

Table 3.2 Estimated Runoffs and Capacities of the Channels & Pipe

Type	ID	Catchment Served	Actual Runoff, m ³ /s	% of Capacity Flow	OK? (Y/N)
U-channel (375mm)	UC1	A + D (10%)	0.0532	44%	Y
U-channel (450mm)	UC2	A + D (65%)	0.1297	67%	Y
U-channel (525mm)	UC3	A + D (74%)	0.1422	48%	Y
U-channel (525mm)	UC4	A + B + D (74%)	0.1558	53%	Y
U-channel (525mm)	UC5	A + B + C + D (99%)	0.1977	67%	Y
U-channel (150mm)	UC6	D (1%)	0.0014	13%	Y
Underground Pipe (375mm)	UP1	A + D (10%)	0.0532	44%	Y

As depicted in **Table 3.2**, a drainage system, including u-channels and underground pipe, is designed to ensure that the collected stormwater runoff does not surpass 70% of its total capacity, effectively collecting the rainfall within the proposed development and discharging the runoff into government drainage system.

4 Summary and Conclusions

The Applicant intends to seek Town Planning Board ("TPB") approval for a Proposed Temporary Concrete Batching Plant for a Period of 5 Years at Tsing Yi Town Lots (TYTL) 14 and 15 and Adjoining Government Land, Tam Kon Shan Road, Tsing Yi (hereafter "the proposed development").

To prevent flooding in the Site and its surrounding areas, a drainage system is designed to ensure that the stormwater runoff does not surpass 70% of its total capacity, effectively collecting the rainfall within the proposed development and discharging the runoff into government drainage system.

The results of the assessment reveal that there would be no significant impact on the Site and the surroundings at the peak runoff under 50 years return period.



Figures





Drainage Impact
Assessment for Section
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Period of 5 Years in
"Other Specified Uses"
annotated "Boatyard
and Marine-oriented
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Land, Tam Kon Shan
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SITE LOCATION

FIGURE 2.1



Scale : 1:5000 (A3)

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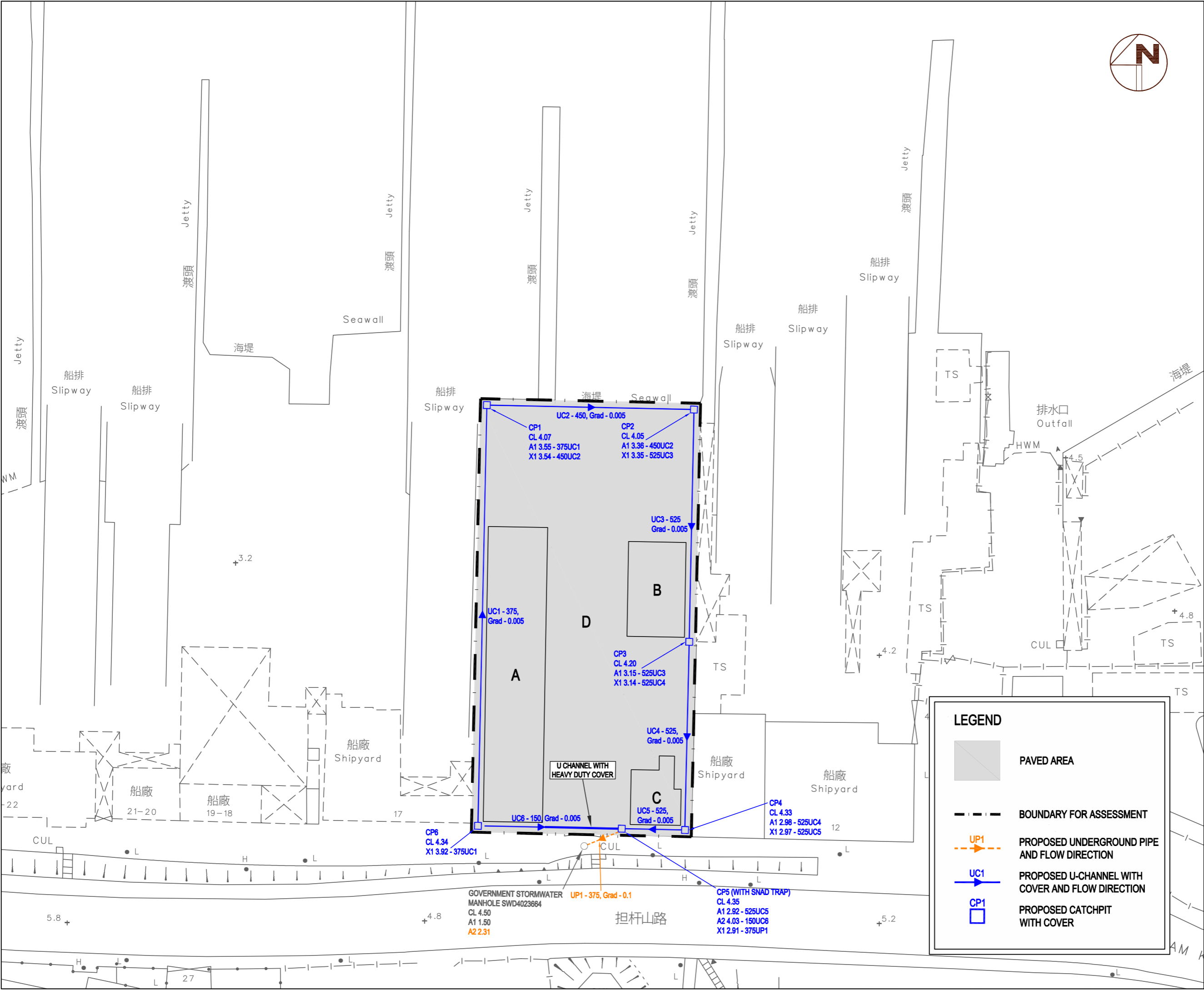
CATCHMENT AREA

FIGURE 2.2

Scale : 1:600 (A3)

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PROPOSED
DRAINAGE PLAN

FIGURE 3.1

Scale : 1:600 (A3)

Date : APR 2025

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Appendix A

Calculations of Drainage Impact



Drainage Analysis

Part A - Estimation of Peak Runoff

Return Period (No. of Years): 50

Catchment ID	Catchment Area (A), m ²	Level Difference (dh), m	Average Low Distance, (LA), m	Average Slope (H), m/100m	Flow Path Length (L), m	Inlet Time (t ₀), min.	Time of Concentration (t _c), min.	Storm Constants			Runoff Intensity (I), mm/hr	Surface	Runoff Coefficient (C)	Peak Runoff (Q _p), m ³ /s	Inside Site Boundary (Y/N)
								a	b	c					
A	534	0.10	14	0.714	14	1.16	2.4267	451.3	2.46	0.337	264.4	Roof	1.00	0.0393	Y
B	166	0.10	7	1.429	7	0.57	1.1072	451.3	2.46	0.337	294.0	Roof	1.00	0.0136	Y
C	87	0.10	7	1.429	7	0.60	1.0199	451.3	2.46	0.337	296.5	Roof	1.00	0.0072	Y
D	2121	0.30	39	0.769	39	2.76	4.3890	451.3	2.46	0.337	236.0	Paved Area	1.00	0.1391	Y

Part B - Estimated Channel Capacities

The fair condition of concrete-lined channels is considered for the value of n fir Manning equation (DSD SDM Table 13)

U-Channel ID	Nominal Diameter, mm	Nominal Depth, mm	Manning's Roughness Coefficient	Channel Gradient	Cross Section Area, m ²	Wetted Perimeter, m	Hydraulic Radius, m	Mean Velocity, m/s	Capacity, m ³ /s	Catchment Served	Actual Runoff, m ³ /s	% of Capcity Flow	Sufficient Capacity (Y/N)
UC1 (from CP6 to CP1)	375	375	0.016	0.005	0.1130	0.96	0.117	1.0584	0.1196	A + D (10%)	0.0532	44%	Y
UC2 (from CP1 to CP2)	450	450	0.016	0.005	0.1627	1.16	0.141	1.1952	0.1944	A + D (65%)	0.1297	67%	Y
UC3 (from CP2 to CP3)	525	525	0.016	0.005	0.2214	1.35	0.164	1.3245	0.2933	A + D (74%)	0.1422	48%	Y
UC4 (from CP3 to CP4)	525	525	0.016	0.005	0.2214	1.35	0.164	1.3245	0.2933	A + B + D (74%)	0.1558	53%	Y
UC5 (from CP4 to CP5)	525	525	0.016	0.005	0.2214	1.35	0.164	1.3245	0.2933	A + B + C + D (99%)	0.1977	67%	Y
UC6 (to CP5)	150	150	0.016	0.005	0.0181	0.39	0.047	0.5746	0.0104	D (1%)	0.0014	13%	Y

Part C - Manning's Equation is adopted for full-bore pipe velocity calculation


The fair conditions of concrete pipe are considered for the value of n for Manning equation (DSD SDM Table 13)

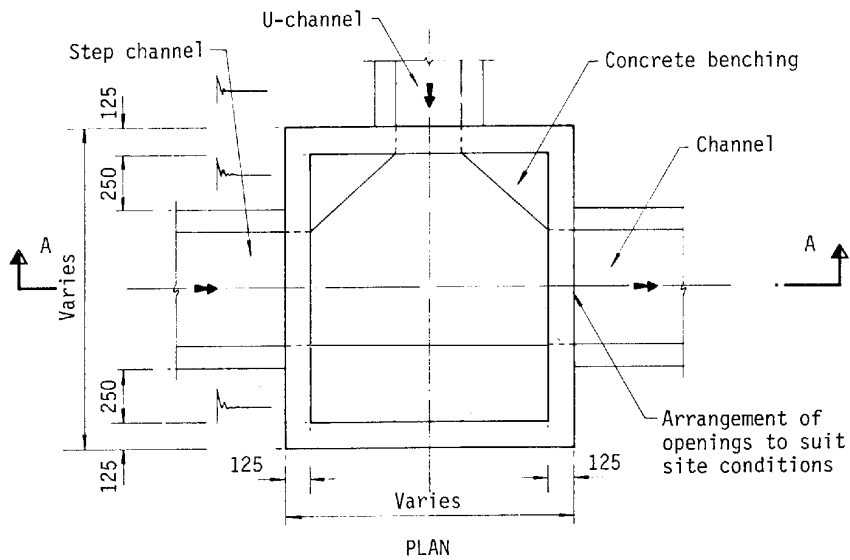
Drain Pipe ID	Nominal Diameter, mm	Gradient	Manning's Roughness Coefficient	Cross Section Area, m ²	Wetted Perimeter, m	Hydraulic Radius, m	Full Bore Velocity (Vc), m/s	Full Bore Capacity (Qc), m ³ /s	Catchment Served	Design Flow (Q), m ³ /s	% of Capcity Flow	Sufficient Capacity (Y/N)
UP1 [from CP5 to Government Manhole]	375	0.10	0.015	0.1049	1.18	0.089	4.204	0.441144989	A + B + C + D	0.1991	45%	Y



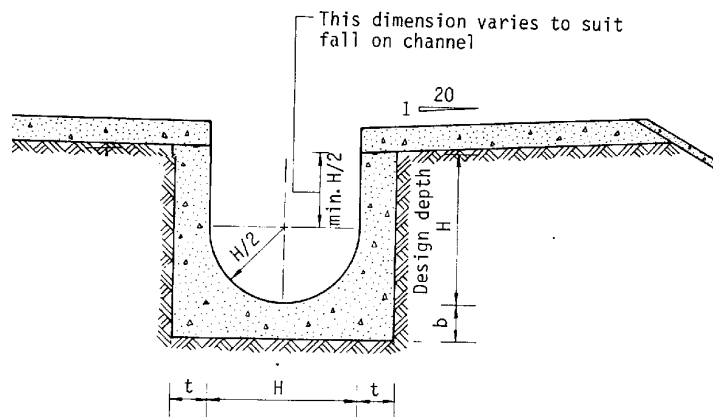
Appendix B

Typical Design of U-channel and Catchpit





TYPICAL DETAILS OF CATCHPIT



TYPICAL DETAILS OF U CHANNEL

Extracted from: *Technical Note to prepare a "Drainage Submission" (relating to applications for temporary change of land use such as temporary storage areas, car parks, workshops, small factoriesetc. under S.16 of the town Planning Ordinance published by DSD in November 2011*