



Storm Drainage Design

for

Various Lots in DD104

Under Planning Application No. A/YL-MP/172

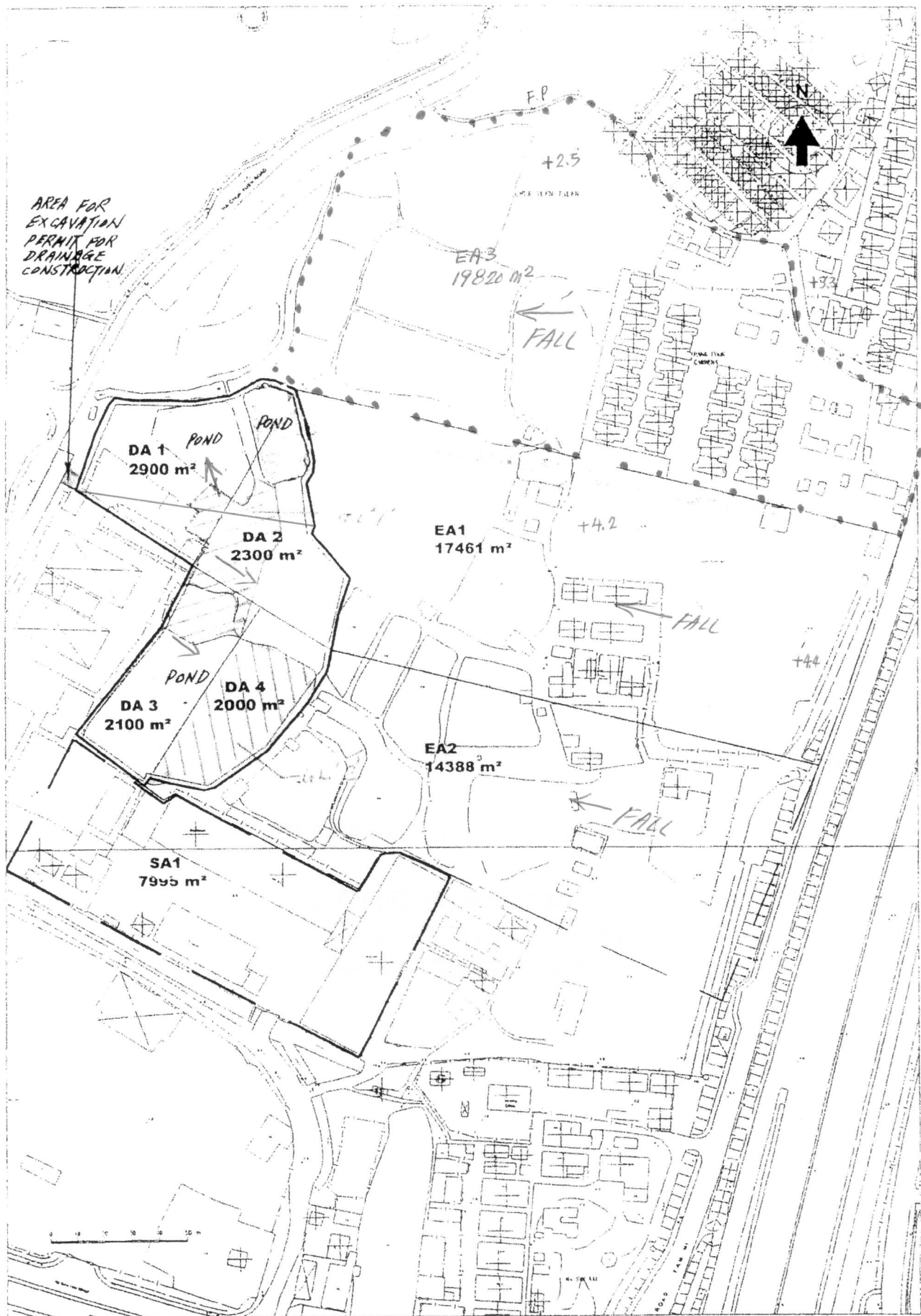
San Tin, Yuen Long, N.T.

July 2009

Troika Engineering Limited, Consulting Engineers

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Design Calculation



Title: Catchment Area

CH2M HILL Hong Kong Limited

Project: Proposed Land and Pond Filling for Permitted New Territories Exempted House Development in "Village Type Development" zone, Various Lots No. in DD 104, and Adjoining Government Land, San Tin, Yuen Long (Planning Application No. A/YL-MP/154)

Scale: NTS

Figure: P1

Job No.	Sheet No.	Rev.
J0770A	1	
Member / Location		
Job Title	Drg. Ref.	
LANDFILL APPLICATION No A/YL-MPI72		
DESIGN OF U-CHANNEL	Made by	Date Chd.

(i) DRAIN AREA TOWARD EAST, DA2, DA3 and DA4 = 6400 m²

$$L \approx 180 \text{ m}$$

$$H = 1 \text{ m/100 m}$$

$$t_d = \frac{0.14465 L}{H^{0.2} A^{0.1}} = \frac{0.14465 \times 180}{10.2 \times 6400^{0.1}} = 10.8 \text{ min}$$

Let $a = 687$, $b = 4.2$, $c = 0.42$ $K = 1.0$ Frequency = 1:50 yr

$$i = \frac{687}{(10.8 + 4.2)^{0.42}} = 220 \text{ mm/hr}$$

$$Q = kiA = 1 \times 0.22 \times 6400 \div 3600 = 0.39 \text{ m}^3/\text{sec.}$$

$$= 23400 \text{ l/min}$$

From design chart

provide 450 U with gradient 1:50 FALL

(ii) DRAIN AREA TOWARD WEST, DA1 = 2900 m²

$$L \approx 100 \text{ m}$$

$$H = 1 \text{ m/100 m}$$

$$t_d = \frac{0.14465 \times 100}{10.2 \times 2900^{0.1}} = 6.5 \text{ min}$$

$$i = \frac{687}{(6.5 + 4.2)^{0.42}} = 254 \text{ mm/hr}$$

$$Q = kiA = 1 \times 0.254 \times 2900 \div 3600 = 0.2 \text{ m}^3/\text{sec}$$

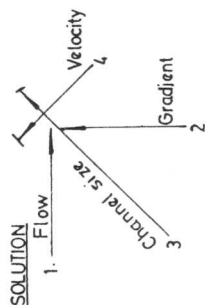
$$= 12000 \text{ l/min}$$

From design chart

provide 375 U with gradient 1:100 fall

DESIGN METHOD USING CHART

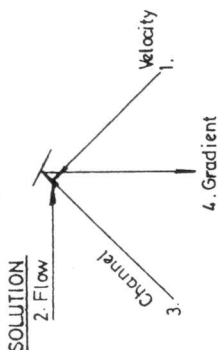
(a) NORMAL CHANNEL



Example

1. Enter Run-off = 4 000 L/min
2. Enter Gradient = 1m in 40m
3. Read Channel required = 225U or 300 H.R.
4. Read Velocity = 2.2 m/sec $\therefore$ OK

(b) STEPPED CHANNEL



Example

1. Enter Velocity = 5m/sec
2. Enter flow = 20,000 L/min
3. Read req'd Channel size = 300U
4. Read req'd. gradient = 1 in 14

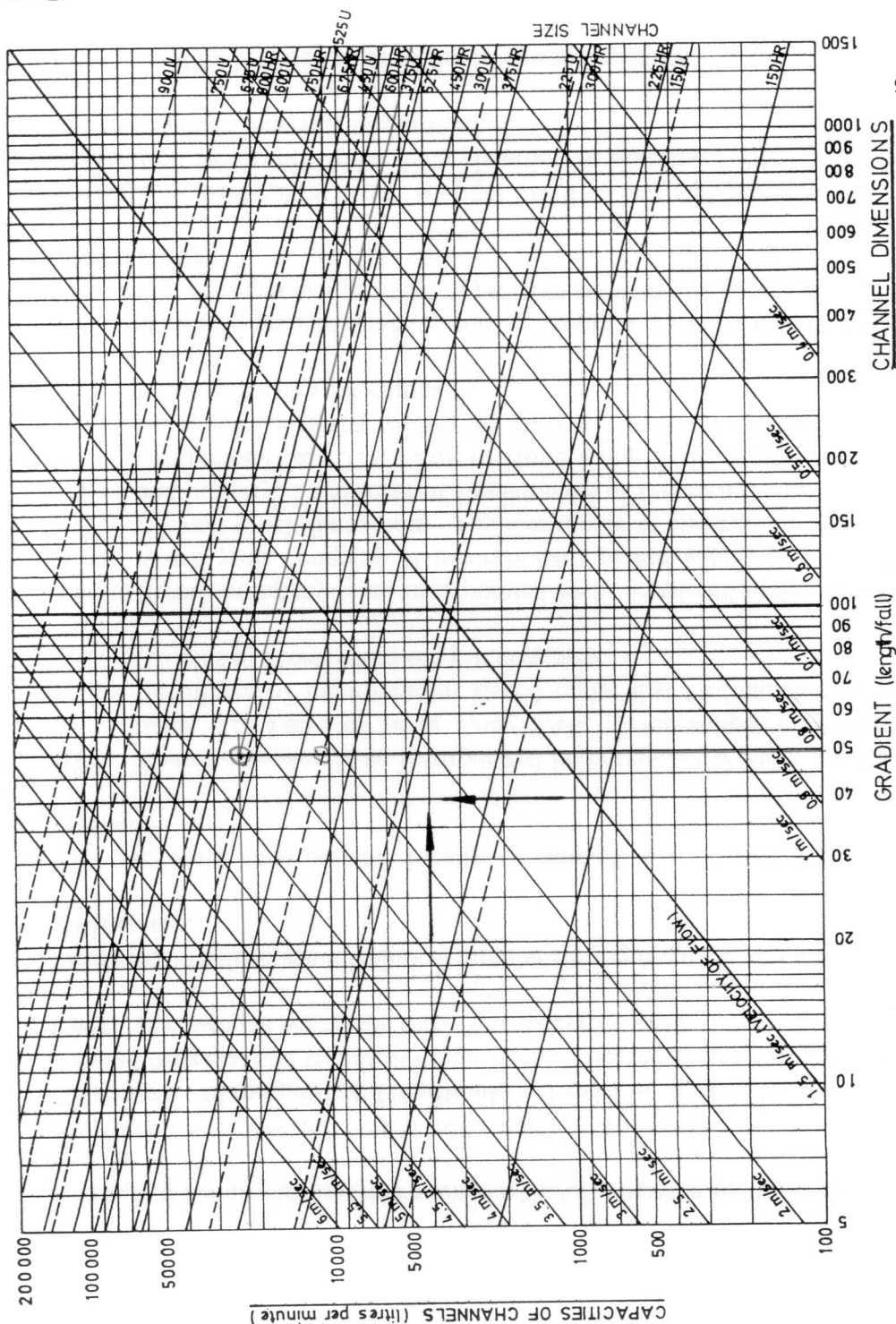


Figure 8.6 Chart for the rapid design of channels

Job Title	Job No.	Sheet No.	Rev.
	J0770A	3	
	Member / Location		
LANDFILL APPLICATION No. A/YL-MP/72 DESIGN OF U-channel on G.L.	Drg. Ref.		
	Made by	Date	Chd.

$$\text{CATCHMENT AREA} = 17461 + 14388 + 2303 + 2100 + 2000 + 7995 \\ = 46244 \text{ m}^2$$

$$L = 120 \text{ m}$$

$$H \approx 20 \text{ m}/100 \text{ m}$$

$$t_d = \frac{0.14465 \times 120}{20^{0.2} 46244^{0.1}} = 3.3 \text{ min}$$

$$i = \frac{68.7}{(3.3 + 4.2)^{0.42}} = 295 \text{ mm}$$

$$Q = kiA = 1 \times 0.295 \times 46244 \div 3600 = 3.8 \text{ m}^3/\text{sec}$$

$$\text{Assume } S = 0.01 \text{ (i.e. 1:100)}$$

$$\text{say } B/d = 2.0 \text{ concrete U-channel } k_s = 6.0 \text{ mm}$$

$$\text{From Fig 18 } P/R = 8$$

$$\text{From Fig 11 } R \approx 0.55 \text{ m say provide } 0.6 \text{ m}$$

$$B = 2 \times 0.6 = 1.2 \text{ m}$$

* In consideration of existing ground surface level
Depth of U-channel to be 0.3 m at
start point CP1 to full depth of 0.6 m
at CP2

J0770 A

4

Member / Location

Job Title

Land Fill Application No A/YL-PP/172

Drg. Ref.

check capacity of existing stream

Made by

HYN

Date

18/5/2009

Chd.

Assume run-off coefficient $K = 1.0$

Frequency = 1:50 yr.

$$\text{Let } a = 687 \\ b = 4.2 \\ c = 0.42$$

$$i = \frac{a}{(td+b)^c}$$

$$\begin{aligned} \text{Total catchment area} &= 19820 + 17461 + 14388 + 7995 + 2100 + 2000 \\ &\quad + 2300 + 2900 \\ &= 67164 \text{ m}^2 \end{aligned}$$

$$L = 120 \text{ m}$$

$$H = 2/40 = 20 \text{ m/100 m}$$

$$td = \frac{0.14465 L}{H^{0.2} A^{0.1}} = \frac{0.14465 (120)}{20^{0.2} 67164^{0.1}} = 3.14 \text{ min}$$

$$i = 297 \text{ mm/hr}$$

$$Q = kiA = 5550 \text{ l/sec.} = 5.6 \text{ m}^3/\text{sec.}$$

Assume $S = 0.01$ (i.e. 1:100)Assume (i) $k_s = 60 \text{ mm}$ for trapezoidal channel with stone pitching surface

$$\begin{aligned} \text{(ii) side slope of stream} &= 1:1 \Rightarrow P/R = 7.2 \\ \text{(iii) } B &= d \end{aligned}$$

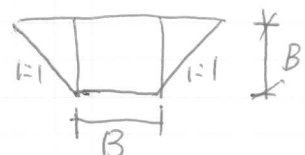
From design chart Fig 14

$$V = 2.7 \text{ m/sec} > 1 \text{ m/sec} \quad \text{O.K.}$$

$$R = 0.52 \text{ m}$$

$$= A/p = \frac{2B^2}{3.83B} \approx 0.6B$$

$$\Rightarrow B \approx 0.9 \text{ m}$$



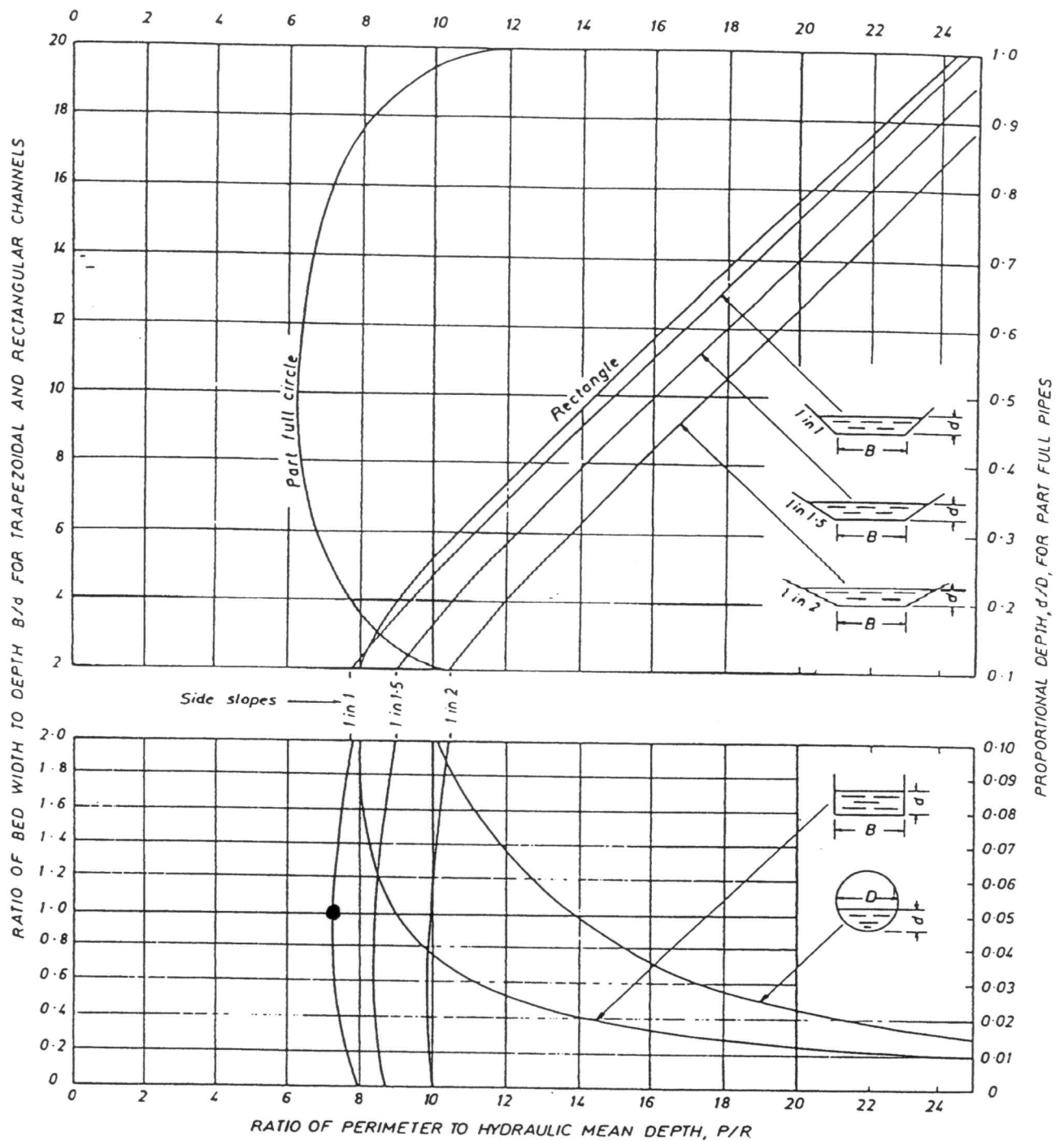
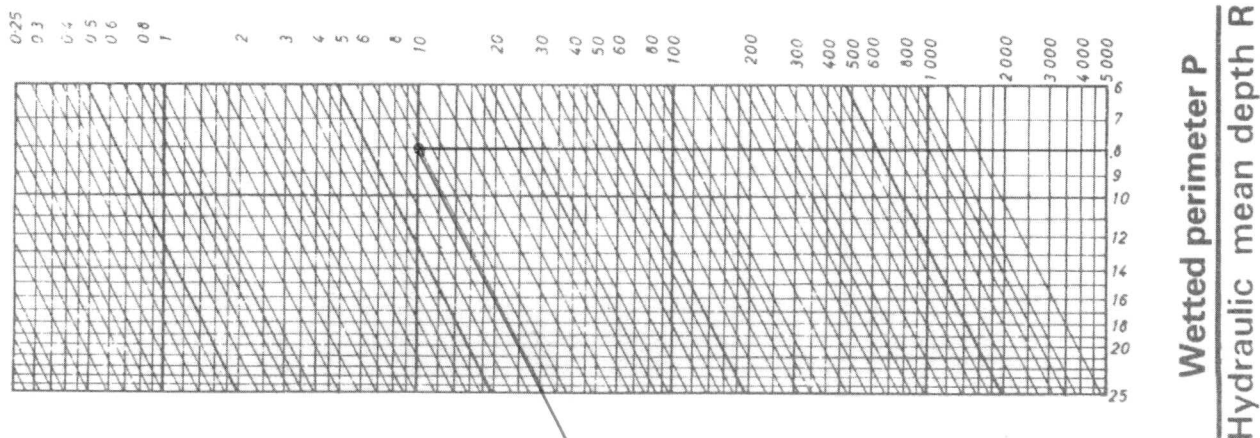
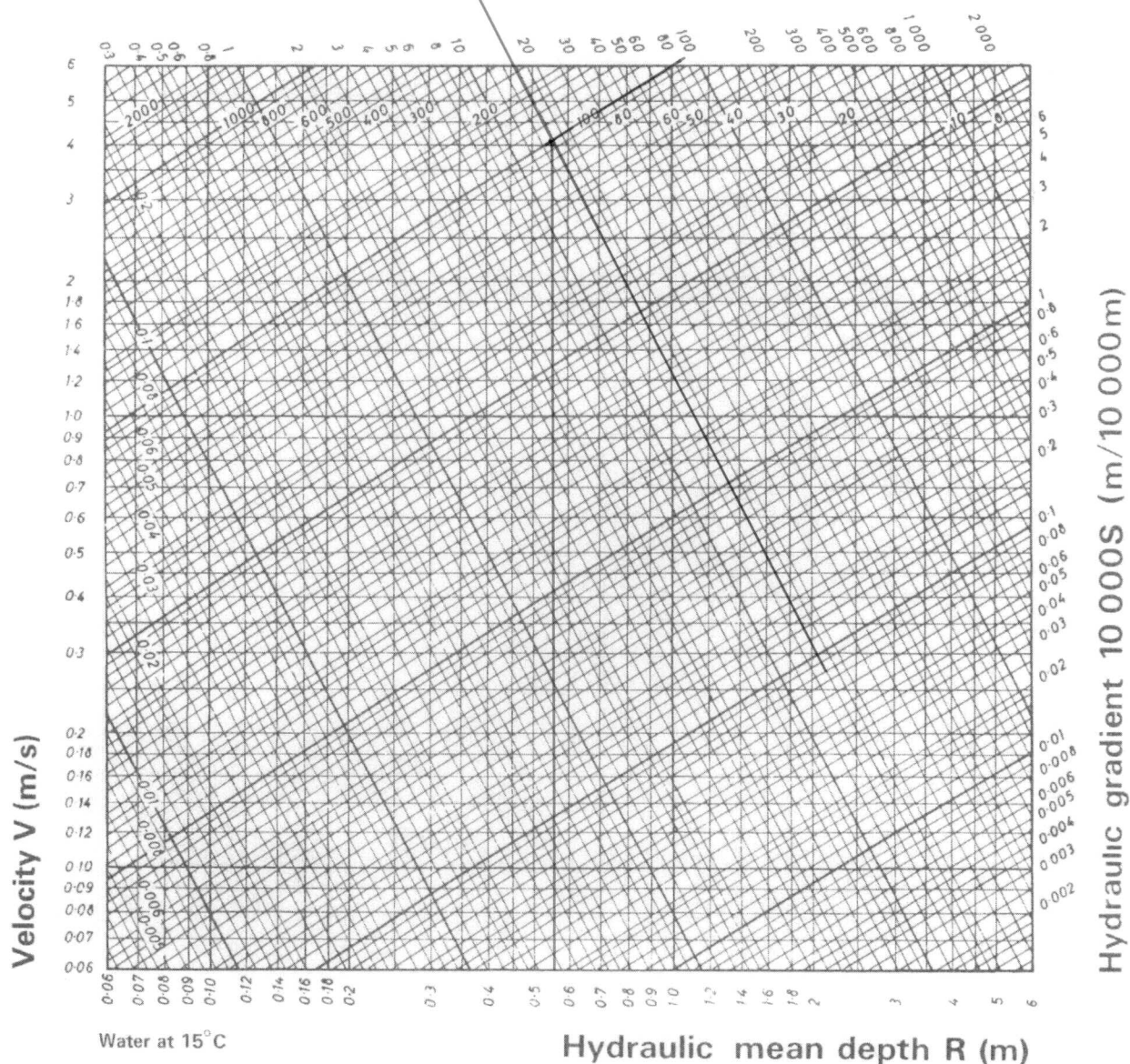


Fig 18 Shape co-efficient P/R for non-circular sections

Discharge Q (m^3/s)

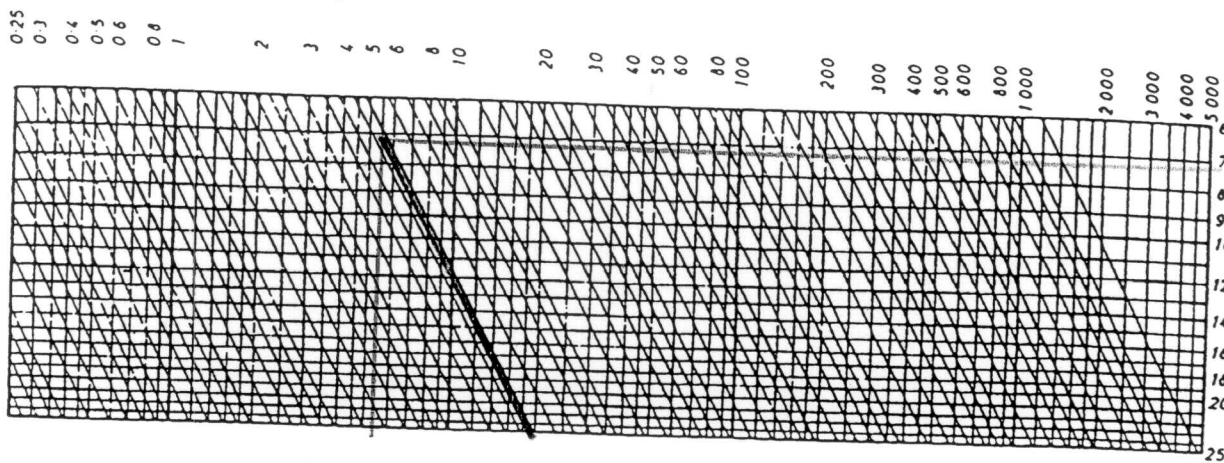


$\frac{4\pi R}{P} \times Q$ (m^3/s) for non-circular sections



$k_s = 6.0 \text{ mm}$ Fig 11

Discharge Q (m^3/s)



$\frac{4 \pi R}{P} \times Q$ (m^3/s) for non-circular sections

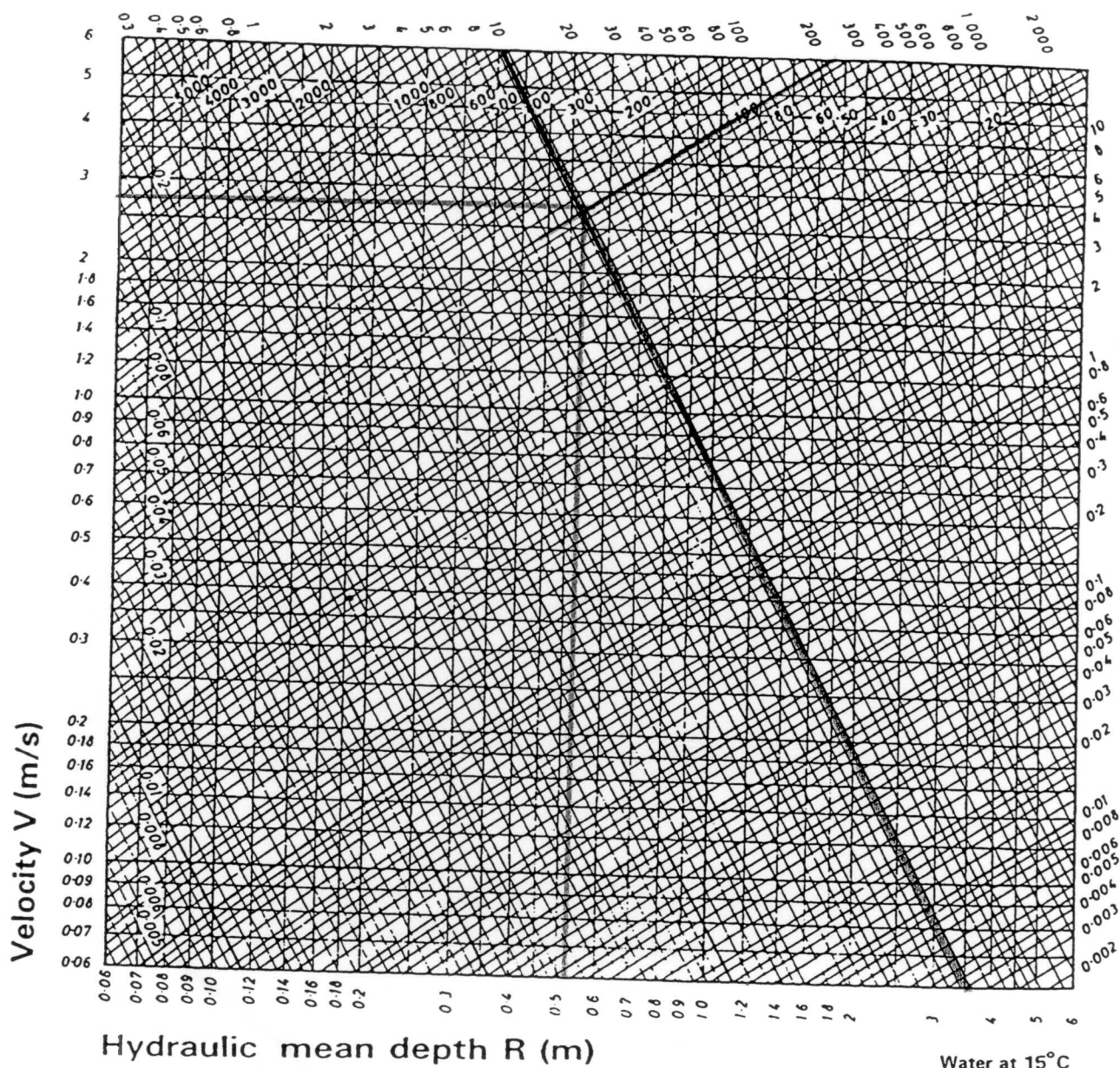
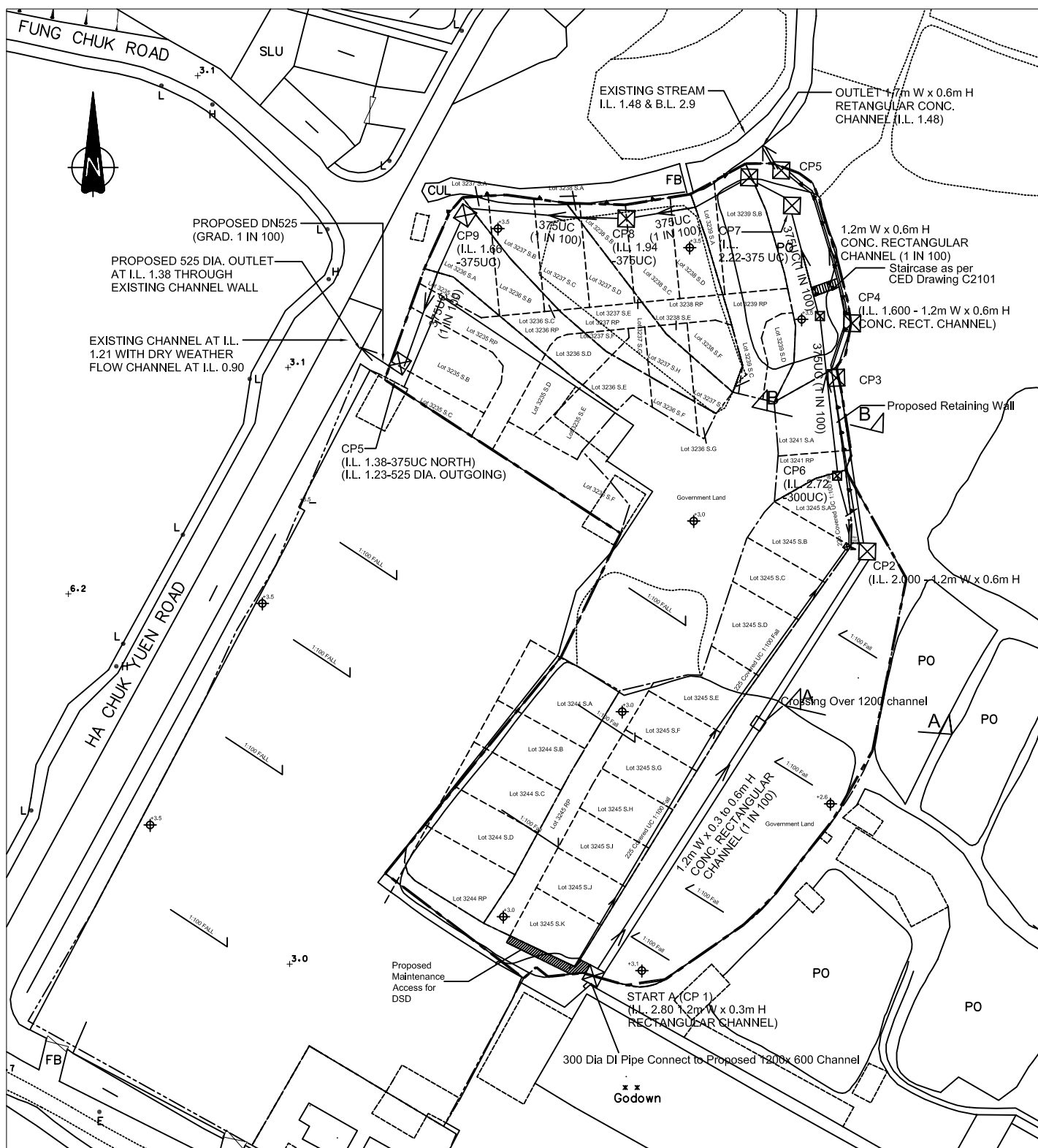


Fig 14 $k_s = 60 \text{ mm}$

Figures



NOTE : 1 Standard Catchpit Details as per CED Drawing C2405
 2 Precast Concrete Cover as per CED Drawing C2407
 3 Standard U-Channel as per CED Drawing C2409
 4 All Works shall comply with General Specification For Civil Engineering Works, 2006, Hong Kong Government

LEGEND

☒ PROPOSED CATCHPIT

NOTE

THE PROPOSED DRAINAGE WORKS AS INDICATED FOR ALIGNMENT IS PRELIMINARY AND TO BE VERIFIED ON SITE TO SUIT OTHER PROPOSED WORKS AND EXISTING SITE CONDITIONS.



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 Consulting Engineers

Title

DRAINAGE PROPOSAL

Scale 1 : 1000

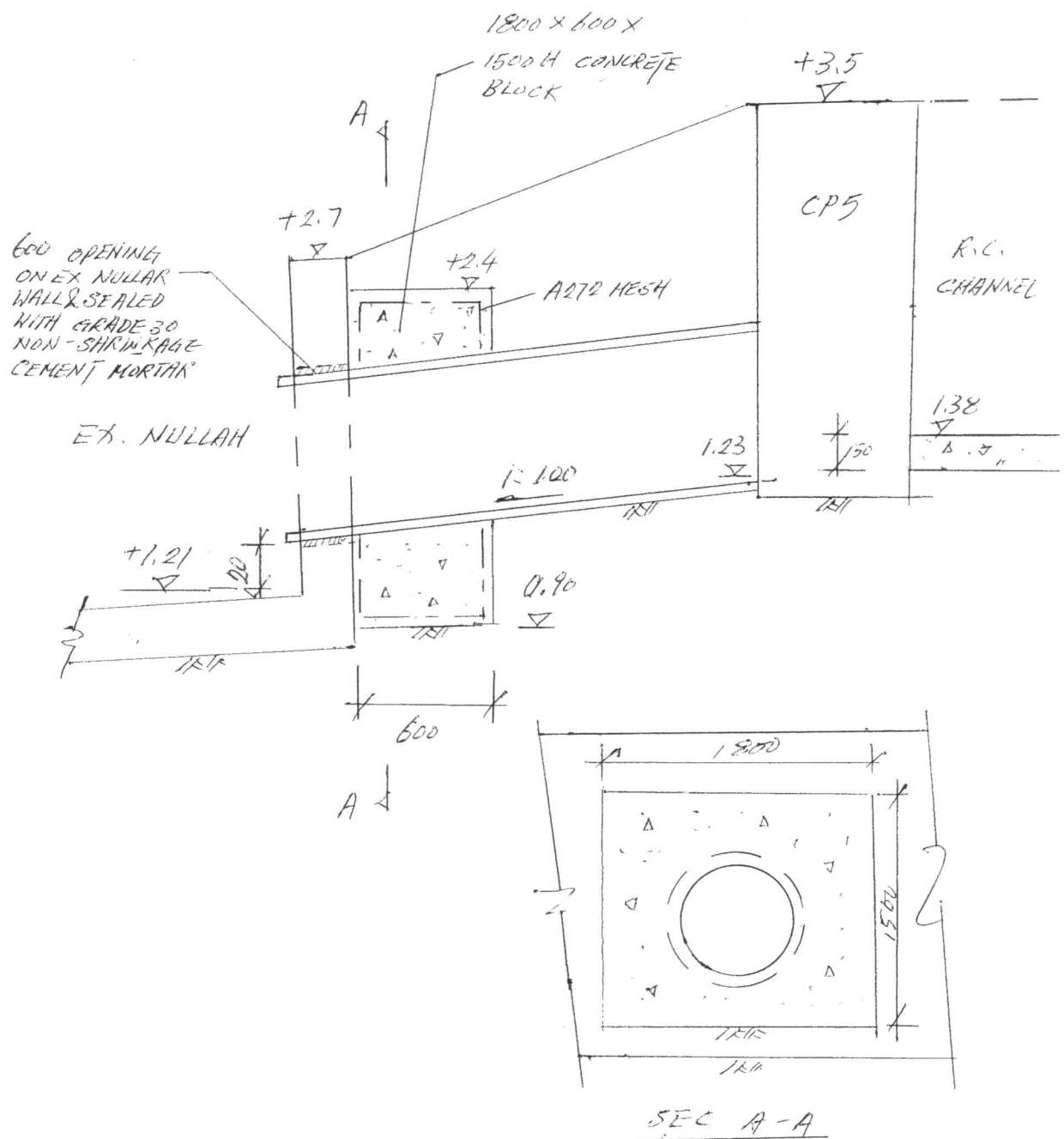
Figure No.J0770A-1

Date 23-03-09

Revision G

Project Title

POND LAND AND POND FILLING FOR PERMITTED NEW TERRITORIES EXEMPTED HOUSE DEVELOPMENT IN 'VILLAGE TYPE DEVELOPMENT' ZONE, VARIOUS LOT NO. IN DD 104 AND ADJOINING GOVERNMENT LAND, SAN TIN, YUEN LONG (PLANNING APPLICATION NO. A/YL-MP/172)



CONNECTION DETAILS BETWEEN PROPOSED 525 PIPE AND EX NULLAH
 LAND FILLING APPLICATION A/NL-MP/172

1:30

SKETCH JOTTA-2



TROIKA ENGINEERING LIMITED
Consulting Engineers

Title
TYPICAL DETAILS OF DRAINAGE ARRANGEMENT
ON GOVERNMENT LAND

Scale 1 : 25

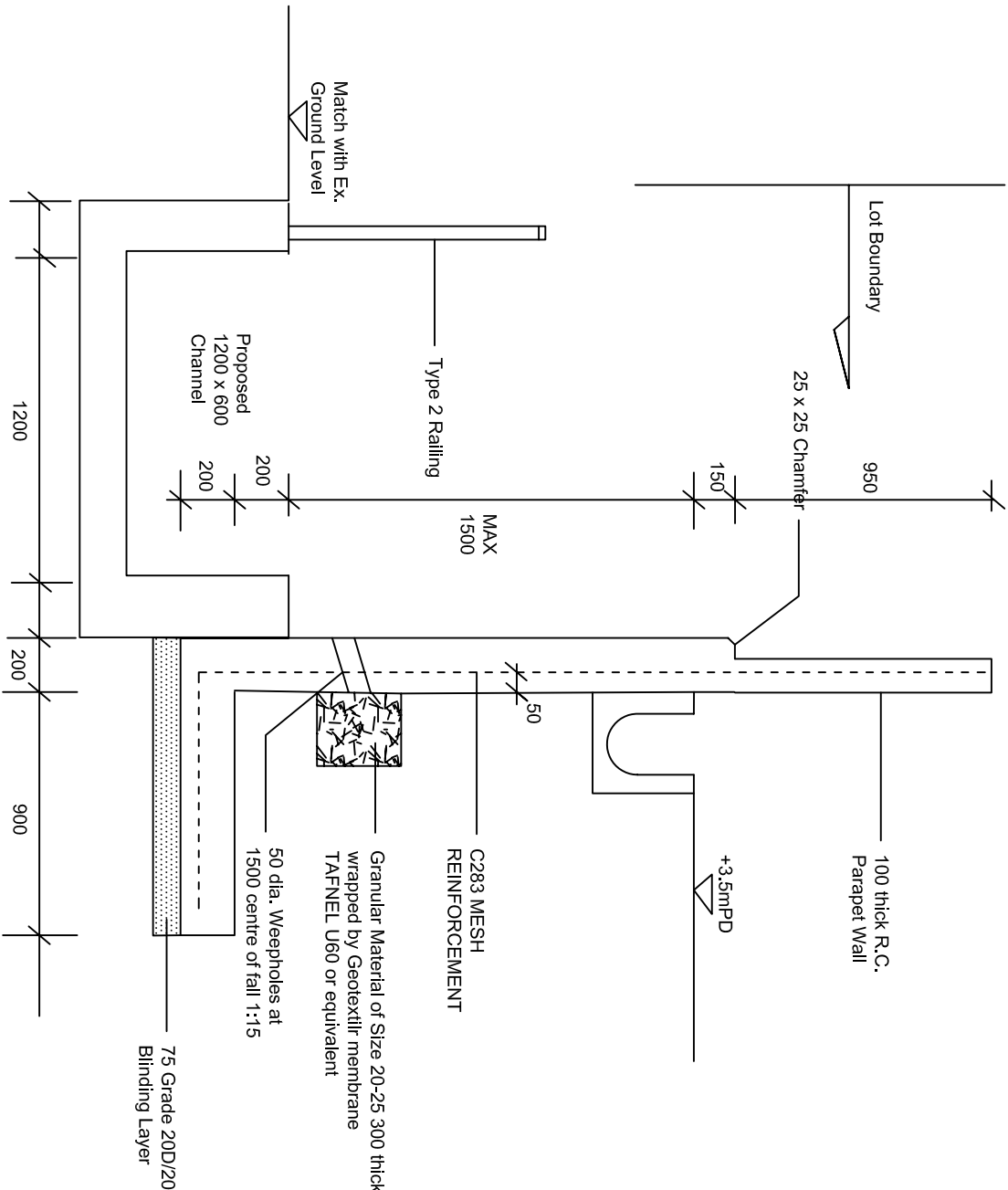
Figure No.J0770A-3

Date 5-04-09

Revision G

Project Title

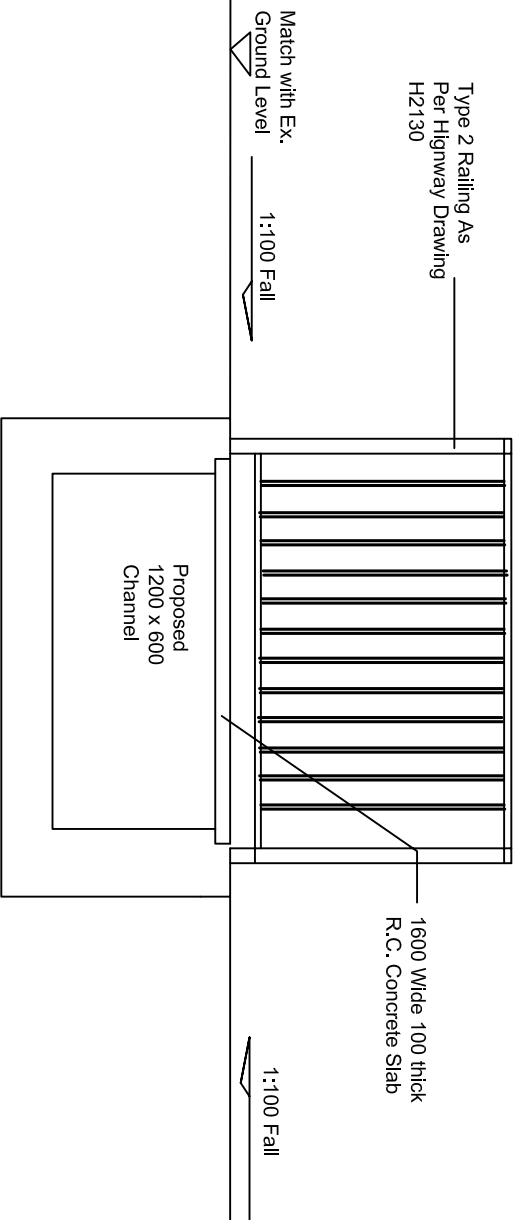
POND LAND AND POND FILLING FOR PERMITTED NEW TERRITORIES EXEMPTED HOUSE DEVELOPMENT
IN 'VILLAGE TYPE DEVELOPMENT' ZONE, VARIOUS LOT NO. IN DD 104 AND ADJOINING
GOVERNMENT LAND, SAN TIN, YUEN LONG (PLANNING APPLICATION NO. AYL-MP/172)



 TROIKA ENGINEERING LIMITED Consulting Engineers	Title		SECTION B-B	
	TYPICAL DETAILS OF DRAINAGE ARRANGEMENT ON PRIVATE LOTS		Scale	1 : 25
			Date	8-04-09
			Revision	-

Project Title

POND LAND AND POND FILLING FOR PERMITTED NEW TERRITORIES EXEMPTED HOUSE DEVELOPMENT IN 'VILLAGE TYPE DEVELOPMENT' ZONE, VARIOUS LOT NO. IN DD 104 AND ADJOINING GOVERNMENT LAND, SAN TIN, YUEN LONG (PLANNING APPLICATION NO. AYL-MP/172)



TROIKA ENGINEERING LIMITED
Consulting Engineers

Title

Section A-A
TYPICAL DETAILS OF CROSSING
ON GOVERNMENT LAND

Scale 1 : 25

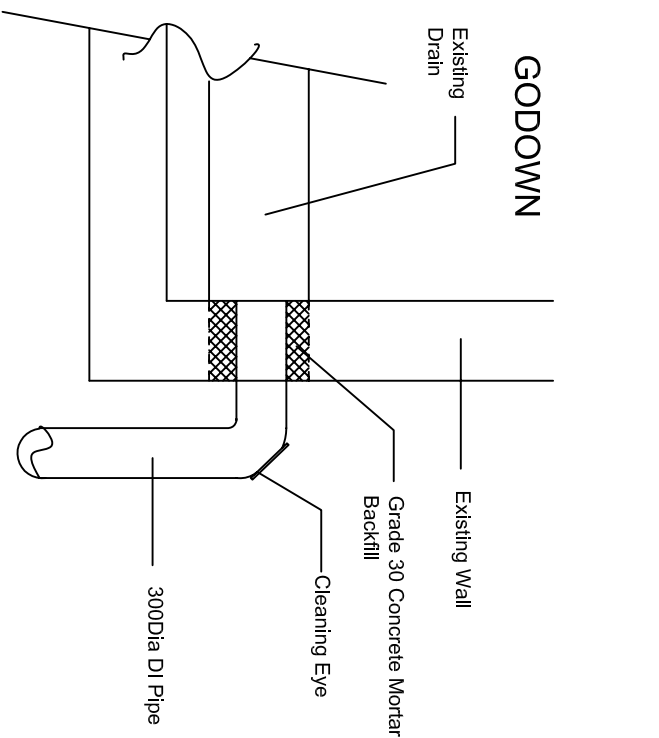
Figure No.J0770A-5

Date 5-04-09

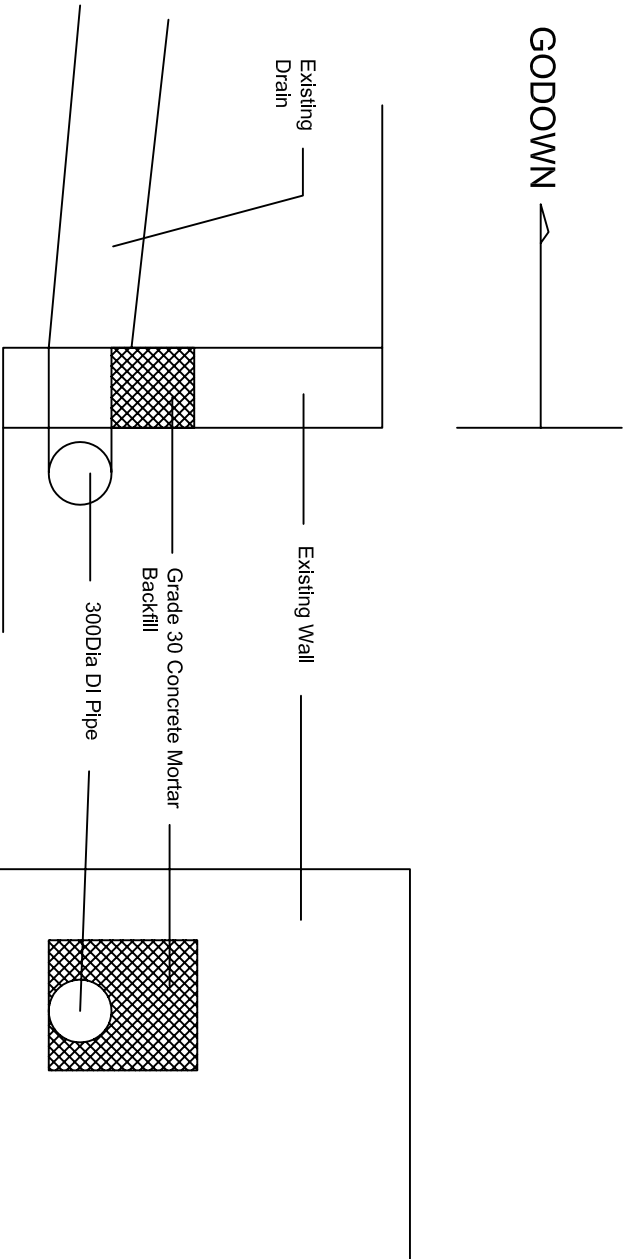
Revision E

Project Title

POND LAND AND POND FILLING FOR PERMITTED NEW TERRITORIES EXEMPTED HOUSE DEVELOPMENT
IN 'VILLAGE TYPE DEVELOPMENT' ZONE, VARIOUS LOT NO. IN DD 104 AND ADJOINING
GOVERNMENT LAND, SAN TIN, YUEN LONG (PLANNING APPLICATION NO. AYL-MP/172)



PLAN



PLAN

ELEVATION

 TROIKA ENGINEERING LIMITED Consulting Engineers	Title	
	Connection Details of Proposed DI Pipe to Discharge Point of the Existing Godown	
	Scale	N.T.S
	Date	19-05-09
		Revision
		-

Project Title

POND LAND AND POND FILLING FOR PERMITTED NEW TERRITORIES EXEMPTED HOUSE DEVELOPMENT IN 'VILLAGE TYPE DEVELOPMENT' ZONE, VARIOUS LOT NO. IN DD 104 AND ADJOINING GOVERNMENT LAND, SAN TIN, YUEN LONG (PLANNING APPLICATION NO. AYL-MP/172)