渠務署及城市規劃委員會:

有關 A/YL-KTN/989 的擬議渠務建議詳細

在申請地點北面是規劃申請編號 A/YL-KTN/891 的申請範圍,基準水平 高本申請範圍約1米,並設有鐵絲網。申請地點東面是道路。申請地點南面為 耕種用地,申請地點北面為金屬實心的圍板,沒有留有去水位,因此沒有流水 從北、南及西面進入申請地點。

總集水面積約 11,819 平方米,集水區主要分為兩部分:申請地點外上流的水流及申請地點內。集水區主要是由草地及混凝土作表面面層,請參考 Appendix 5.2。

申請地點計劃舖設 375mm 及 450mmUC 引導及收集雨水及地面水,根 據 STORMWATER DRAINAGE MANUAL – Seation 7.5.2 Rational Method 計算,現時的渠道有足夠的容量處理集水區內的水流量。

現場相片請參考文件尾端。

R to C:

	<u> </u>	申請人回覆
(1)	The proposed UC appears to be undersized.	請參考本文件尾端,已修正該錯
	Please review the hydraulic calculations. Please	。 誤 。
	clarify why rainfall intensity equals to 71.	
(2)	Please provide proposed catchment areas for	請參考 Appendix 5.2。
	comment.	
(3)	Please submit calculation demonstrating the	請參考本文件尾端,已修正該錯
	downstream drainage system receiving the	誤。現場觀察點及現有自然溪流評
	discharge from the development has adequate	估位置請參考 Appendix 5.3。
	spare capacity to accommodate the runoff.	

(4)	The level difference of invert levels of catchpit	已依照 貴署的意見更改。
	are consistently to be 0.1m while the distance of	
	UC is varying which is not logically. Please review	
	all catchpit invert levels accordingly.	
(5)	Please indicate clearly the full alignment of the	請參考 Appendix 5 及 5.3。
	discharge path from the application site all the	
	way down to the ultimate discharge point (e.g. a	
	well-established stream course/public drainage	
	system).	
(6)	The existing drainage facilities, to which the	本人了解現有的渠道設施不是由
	stormwaterof thedevelopment fromthesubject	貴署所興建及保護。如興建及接駁
	site would discharge, are not maintained by this	到其他私人或其他有關政府部門的
	office. The applicant should identify the owner	渠道, 命 向右關
	of the existing drainage facilities to which the	
	proposed connection will be made. Also, DSD	反取侍回息俊才曾進行怕關上住。
	noticed that the proposed drainage	
	connection(s) to the surrounding/downstream	
	area(s) will run through other private lot(s). The	
	applicant shall demonstrate that the proposed	
	drainage construction / improvement /	
	modification works and the operation of the	
	drainage can be practicably implemented.	
(7)	Please justify the size of existing 600mm UC.	本人會在申請後安排清理及維護有
	Also, the existing 600mm UC is full of debris and	關渠道。
	leaves so the condition is considered not	
	acceptable.	
(8)	Please indicate clearly on plan that the proposed	請參考 Appendix 5。
	size of discharge outlets.	
(9)	Please clarify whether any walls or hoarding	申請地點未有圍封的地方將會以實
	would be erected along the site	心金屬板圍起,並會留有不少過
	boundary. Where walls or hoarding are erected	10cm 的空間讓水流通過。
	are laid along the site boundary, adequate	
	opening should be provided to intercept the	
	existing overland flow passing through the site.	

(10)	Please provide more cross sections including	請參考 Appendix 5.1。
	adjacent areas for reference. All proposed/	
	existing drainage facilities should be indicated on	
	section drawings.	
(11)	The development should neither obstruct	本申請不會影響水流。
	overland flow nor adversely affect existing	
	natural streams, villagedrains, ditches and the	
	adjacent areas, etc.	
(12)	The applicant(s) shall resolve any	如興建及接駁到其他私人或其他有
	conflict/disagreement with relevant lot owner(s)	關政府部門的渠道,會向有關持分
	and seek LandsD's permission for laying new	 者或部分了解及取得同意後才會谁
	drains/channels and/or modifying/upgrading	行机圆工积。
	existing ones in other private lots or on	
	Government land (where required) outside the	
	application site(s).	
(14)	According to our record, the drainage proposal	現已將相關的水流納入,請參考
	of A/YL-KTN/891 has not been submitted and	Appendix 5.2 °
	approved, so this application should also	
	consider all external catchment areas in the	
	assessment as appropriate.	

希望此附加文件能釋除 貴署的隱憂。

二零二四年六月三日

Calculation of Peak Runoff, Qp (Rational Method)

Rainfall Intensity, i

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

Wherei=extreme mean intensity in mm/hr, t_d =duration in minutes ($t_d \le 240$), anda, b, c=storm constants given in Table 3 of SMD, as shown below

for 50 year Design Return Period (Using Table 3a – Storm Constants for Different Return Periods of HKO Headquarters on SDM)

a=	451.3
b=	2.46
с=	0.337

Calculation of Peak Runoff, Qp (Rational Method)

According to Section 7.5.2(b) of the Stormwater Drainage Manual (SDM), Fifth Edition January 2018

Surface Characteristics	<u>Runoff coefficient, C</u>
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

For catchment area of the site at the proposed development, the Concrete runoff coefficient is taken as 0.95, Grassland (heavy soil) with flat surface as 0.25 and Asphalt (small rock) as 0.95.

Peak Runoff, QP

 $Q_P = 0.278 C i A$

Where	Q_P	=	Peak runoff in km ³ /s
	С	=	Runoff coefficient (dimensionless)
	i	=	Rainfall intensity in mm/hr
	Α	=	Catchment area in km ²

The total design runoff of the catchment area (upstream) is 0.261 m^3 /s, which is around 14,040 liter/min.

According to GEO Technical Guidance Note No. 43 (TGN 43), For gradient 1:200, a 450UC will be suitable.

The total design runoff of the catchment area (application) is 0.121 m^3/s , which is around 7,260 liter/min.

According to GEO Technical Guidance Note No. 43 (TGN 43), For gradient 1:200, a 375UC will be suitable.

本申請會採用 375mm 及 450mmUC。

Check The Capacity of Existing Natural Stream

Manning Equation is used in hydraulic design and analysis. The cross-sectional mean velocity is given in the following expression:

$$V = \frac{R^{1/6}}{n} \sqrt{RS_f}$$

Where

R = hydraulic radius (m) N = Manning coefficient (s/m1/3), refer Table 13 of SDM Sf = friction gradient (dimensionless)

Using Manning's Equation

 $V = R^{2/3} * S_f^{0.5} / n$

 $A = 1.05 m^2$ = A/P = 0.362 mWhere R P = 2.9 m $= 0.03775 \text{ s/m}^{1/3}$ n (Table 13 of Stormwater Drainage Manual) = 0.013 S_{f} Therefor V $= 0.362^{2/3} * 0.013^{0.5} / 0.03775$ = 3.12 m/sec Maximum Capacity (Qmax) = V*A = 3.28 m³/sec > Q total

The Existing Natural Stream has enough capacity.

















来庭田園 柴庭田園	ATTER ATTER	Location 3	大江端の東京大規一員の					
音樂農田	<u>新田南温定位参考站</u> 旧天宫	Location 2						
金河路 総世際国								
Scale: Undefined @A4 Captured from map.gov.hk on 17 th January 2024								
Appendix 5 On-Site Notice Location	Location: D.D. 109 Lot 1051 RP (Part), 1052 and 1057 OZP: S/YL-KTN/11 District: Kam Tin North Zoning: Agriculture	Project: Proposed Temporary Warehouse (excluding Dangerous Goods Godown) with Ancillary Facilities for a Period of 3 Years and Filling of	Map Legend: Site Boundary On-site Notice Location 1 On-site Notice Location 2 On-site Notice Location 3	Drawing No.: 5-01 For Identification Only				

Proposed Structures Details					Legend:					
	Structures	Gross Floor Area (GFA)	<u>Height (Not</u> Exceeding)	No. of Storey	••••• Emergency Vehicular Access Route					
1	Warehouse (Excluding D.G.G.)	About 18m x 12m = 216 m ²	8m	1	O 5 kg Portable Dry Powder Type Fire Extinguisher (6 in Total)					
2	Warehouse (Excluding D.G.G.)	About 21m x 10m = 210 m ²	8m	1	Emergency Lighting (5 in Total) (in accordance with BS 5266-1:2016, BS EN 1838:2013 and					
3	Warehouse (Excluding D.G.G.)	About 25m x 8.7m = 217.5 m ²	8m	1	the FSD Circular Letter No. 4/2021)					
4	Electric Meter Room	About 2.8m x 3m = 8.4 m ²	3.5m	1						
5	Ancillary Office	About 6m x 6m = 36 m ²	3.5m	1						
6	Warehouse (Excluding D.G.G.)	About 10m x 7m = 70 m ²	4m	1						
	Total	<u>About 757.9 m²</u>								
	Private Car Parking Space	Unit(s): 2								
	LGV L/UL Space	Unit(s): 2								
	LGV Parking Space	Unit(s): 3								
*A	*All FSI (includes installation/maintenance/modification/repair work) will be completed by RFSIC.									
For Emergency Vehicular Access, Please see Appendix 6.1 *All the enclosed structures are provided with access for emergency vehicles to reach within 30m travel distance from the structures.										
Pr	Appendix 6 oposed Fire Service	Location: D.D. 109 Lot 1051 RP (Pa 1052 and 1057	ırt),	擬議臨時貨倉 連附屬設施(▲ (危險品倉庫除外) ▲ Legend: ▲ Ingress/egress (About 5.5m) ▲ Proposed Structures 					
	Installation Plan	OZP: S/YL-KTN/11 District: Kam Tin North Zoning: Agriculture		Proposed Tempo Dangerous Good for a Period of 3	rary Warehouse (excluding ds Godown) with Ancillary FacilitiesPrivate Car Parking SpaceFor Identification OnlyS Years and Filling of LandS Car Parking SpaceS Car Parking SpaceFor Identification Only					

1 For	Catchment Area A							Ref.
Dista	Area, Average slope, ance on the line of natural flow,	A H L	= = =	243 0.1 per 100m 32 m				
	Time of concentraction,	t _o	= =	0.14465L/(H ^{0.2} A ^{0.2}) 4.2 min	= 0.14465	5(32) / (0.14	^0.2*243^0.1)	SDM 7.5.2 (d)
2 For	Proposed U-Channel in catch	nment	area A	A				
	Ground level (mPD) Invert level (mPD)		From 10.60 10.40	To 10.70 10.13				
	Width of u-channel, Radius of u-channel,	w r	= =	200 mm 100 mm				
Dep	Length of u-channel, oth of vertical part of u-channel,	L _c d	=	55 m 200 mm				
	Gradient of u-channel,	S _f	=	(10.40-10.13)/55	=	0.005		
	Cross-Section Area,	а	= =	0.5 πr ² + w d 0.056 m ²	=	0.5 x 3.14	x 100^2 + 200 x 200	
	Wetted Perimeter,	p P	= = -	πr+2d 0.714 m a / p	=	3.14 x 100	0 + 2 x 200	SDM 8 2 1
	nyuraiic radius,	R	=	0.078 m				3DW 0.2.1
3 Use	Manning Equation for estima	ating v	elocit	y of stormwater				
	Take Allowable velcoity,	n v	= = -	0.016 R ^{1/6} x (RS _f) ^{1/2} /n	for concre =	ete lined ch 0.078^1/6	annels:- x (0.078 x 0.005)^1/2 / 0.016	SDM Table 13 SDM Table 12
	Time of flow,	t _f	=	0.9 min				
4 Use	Rational Method" for calcul	ation	of des	ign flow				
	Design intensity,	i	= = =	a / (t _o + t _f + b) ^c 451.3 / (4.2+0+2.46) 228	^9.337	for return	period T = 50 years	SDM 4.3.2 SDM Table 3(a)
<u>Type</u> Stee Con	<u>e of surface</u> <u>F</u> ep Grassland (heavy soil) crete Paving	Runoff	<u>Coeffic</u> 0.35 0.95	cient C Catch	<u>ment Area</u> 0.0 243.0	<u>A (m2)</u>	s <u>CxA</u> 0 230.85	SDM 7.5.2 (d)
						SUM=	230.85	
	Upstream flow,	Q _u	=	0 m ³ /s				
	Design flow,	Q _d	= = =	0.278i ΣC _j A _j + Q _u 0.278 x 228 x 230.8 0.015 m ³ /s	where A _j i 5 /1000000	s in km ₂) + 0		SDM 7.5.2 (a)
	Allowable flow,	Q _a	= = =	a x v 0.06 x 0.80 0.045 m ³ /s				
			>	Q _d				
Refe	erence was made to Stormwate	er Drair	nage M	lanual (SDM) by DSD				
Sc	cale: N/A		D	Prainage Calculation				
	Aug-24		D.D.	109 Lot 1051 RP (Pa 1052 and 1057	rt),		Page 1	

$\begin{array}{rcl} & Aras, A & = & 347 \\ Avarage along, H & = & 0.1 \text{per 100m} \\ \text{Distance on the line of number low, L & = & 35 \text{m} \\ \hline \\ & \text{Time of concentraction, } I, & = & 0.14465(J/(H^{12}A^{12}) = 0.14465(35) / (0.1^{10}.2^{13}47^{10}.1) \\ & = & 4.5 \text{m} \\ \hline \\ & \text{2 For Proposed U-Channel in catchment area B \\ \hline \\ & \text{Ground level (mPD)} & \hline \\ & 10.70 & 10.80 \\ & 10.713 & 9.90 \\ \hline \\ & \text{Woth of u-channel, } r & = & 100 \text{mm} \\ & \text{Redues of u-channel, } r & = & 100 \text{mm} \\ & \text{Redues of u-channel, } r & = & 40 \text{mm} \\ & \text{Depth of vertical part of u-channel, } d & = & 200 \text{mm} \\ & \text{Ground level (mPD)} & \hline \\ & \text{Ground level, } r & = & 100 \text{mm} \\ & \text{Redues of u-channel, } S_1 & = & (10.13 \cdot 9.90)^{1/4} & = & 0.5 \text{s} \cdot 3.14 \text{t} 100^{1.2} \text{2200 } \text{2200} \\ \hline & \text{Ground level, } r & = & 0.056 \text{m}^2 \text{wd} & = & 0.55 \text{s} \cdot 3.14 \text{t} 100^{1.2} \text{2200 } \text{2200} \\ \hline & \text{Ground level, } r & = & 0.056 \text{m}^2 \text{wd} & = & 0.55 \text{s} \cdot 3.14 \text{t} 100^{1.2} \text{2200 } \text{2200} \\ \hline & \text{Wetted Perimeter, } p & = & m^{17} \text{c} \text{m}^2 \text{s} & 3.14 \text{t} 100^{1.2} \text{2.200} \text{cons} \\ \hline & \text{Hydralic radius, R} & = & 0.016 & \text{for concrete lined channels} \\ \hline & \text{Allowabel valuely, V} & = & 1.1 \text{min} \\ \hline \\ \hline & \text{Lue Rational Method 'for calculation of design flow} \\ \hline & \text{Les "Rational Method" for calculation of design flow} \\ \hline & \text{Lue area for } return period T = 50 \text{years} \\ & = & 24 \frac{1}{2} \frac{1}{3.745 (5.54^{1.2} -2.69^{1.1} 3.77 \text{for return period T = 50 years} \\ \hline & \text{SDM T} \\ \hline \\ \hline & \text{SDM T} \\ \hline \\ \hline $	1	For Catchment Area B					Ref.
$ \begin{array}{rcl} \mbox{Time of concentraction, } t_{v} & = & 0.14465(25) / (0.1^{v} 0.2^{v} 34^{v_0} 1) \\ & = & 4.5 \mbox{ min} \end{array} \\ \end{tabular} \label{eq:concentraction} \label{eq:concentraction} \\ \end{tabular} \label{eq:concentraction} \label{eq:concentraction} \\ \end{tabular} \label{eq:concentraction} \label{eq:concentraction} \\ \end{tabular} \label{eq:concentraction} $		Area, Average slope, Distance on the line of natural flow,	A = H = L =	347 0.1 per 100m 35 m	I		
$ \begin{array}{cccccc} 2 & \mbox{From To} & \mbox{To To} & \m$		Time of concentraction,	t _o = =	0.14465L/(H ^{0.2} A ^{0.2}) 4.5 min	= 0.14465(35) / (0.1	^0.2*347^0.1)	SDM 7.5.2 (d)
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	2	For Proposed U-Channel in catchn	nent area	В			
$ \begin{array}{rcl} \mbox{Width of u-channel, } r &= 100 \mbox{ mm} \\ \mbox{Radius of u-channel, } r &= 100 \mbox{ mm} \\ \mbox{Length of u-channel, } L &= 46 \mbox{ m} \\ \mbox{Depth of vertical part of u-channel, } d &= 200 \mbox{ mm} \\ \mbox{Gradient of u-channel, } S_1 &= (10.13-9.90)/46 = 0.005 \\ \mbox{Cross-Section Area, } a &= 0.5 \mbox{m}^2 + w = 0.5 \mbox{x} 3.14 \mbox{ x} 100^{+}2 + 200 \mbox{ x} 200 \\ &= 0.056 \mbox{ m}^2 \\ \mbox{Wetted Perimeter, } p &= \mbox{m}^{-r+2d} &= 3.14 \mbox{ x} 100^{+}2 + 200 \mbox{ x} 200 \\ = 0.714 \mbox{ m} \\ \mbox{Hydralic radius, } R &= 0.714 \mbox{ m} \\ = 0.078 \mbox{ m} \\ \mbox{Hydralic radius, } R &= 0.016 \\ \mbox{ for concrete lined channels:-} \\ \mbox{Allowable velocity, } v &= \mbox{R}^{18} \mbox{(RS)}^{10} \mbox{ m} \\ = 0.078 \mbox{ m} \\ \mbox{ mm} \\ \mbox{ Time of flow, } t &= 1.1 \mbox{ min} \\ \mbox{ Time of flow, } t &= 1.1 \mbox{ min} \\ \mbox{ Design intensity, } i &= a / (t_{1} + t_{1} + b)^{6} \\ = 224 \mbox{ s} \\ \mbox{ SDM T} \\ \\ \mbox{ Zet} \\ \mbox{ Type of surface } \\ \mbox{ Supt flow y soll) } 0.35 \mbox{ m} \\ \mbox{ Sup} \\ \mbox{ Sup} \\ \mbox{ Sup} \\ \mbox{ Design flow, } Q_{0} &= 0.015 \mbox{ m}^{9} \mbox{ s} \\ \mbox{ Sup} \\ \mbox{ Sup}$		Ground level (mPD) Invert level (mPD)	From 10.70 10.13	To 10.80 9.90			
Length of u-channel, $L_{e} = 46 m$ Depth of vericial part of u-channel, $S_{r} = (10.13-9.90)46 = 0.005$ Cross-Section Area, $a = 0.5 \pi r^{2} + w d = 0.5 \times 3.14 \times 100^{\circ}2 + 200 \times 200$ $= 0.066 m^{2}$ Wetted Perimeter, $p = 0.714 m$ Hydralic radius, $R = a/p$ = 0.078 m 3 Use Manning Equation for estimating velocity of stormwater Take $n = 0.016$ for concrete lined channels:- Allowable velocity, $v = R^{10} \frac{K}{K} (RS)^{1/2} n = 0.078 ^{1/6} \times (0.078 \times 0.005)^{1/2} / 0.016$ = 0.81 m/s Time of flow, $t = 1.1 min$ 4 Use "Rational Method" for calculation of design flow Design intensity, $i = a/(t_{b} + t_{r} + b)^{\circ}$ $= 451.3 / (4.5+1+2.46)^{1/1.337}$ for return period T = 50 years = 224 $\frac{V}{Steep Grassiand (heavy soil)}$ $\frac{0.95}{0.95}$ $\frac{0.00}{347.0}$ $\frac{0.00}{0}$ $\frac{0.015}{5}$ $\frac{0.00}{329.65}$ $\frac{0.078 \times 20.278 \times 224 \times 329.65}{5}$ $Upstream flow, Q_{a} = 0.2781 ZC/A_{1} + Q_{a} where A is in km2= 0.278 \times 224 \times 329.65 / SUM = 329.65\frac{0.0278 \times 224 \times 329.65 / SUM = 329.65}{5}\frac{0.005 m^{3}}{8}Allowable flow, Q_{a} = a \times v= 0.005 m^{3}$		Width of u-channel, w Radius of u-channel,	w = r =	200 mm 100 mm			
$\begin{array}{rcl} & & & & & & & & & & & & & & & & & & &$		Length of u-channel, L Depth of vertical part of u-channel,	L _c = d =	46 m 200 mm			
$\begin{array}{rcrc} Cross-Section Area, a & = & 0.5 \mathrm{m}^2 + \mathrm{w} \mathrm{d} & = & 0.5 \mathrm{x} 3.14 \mathrm{x} 100^{+} 2 \mathrm{x} 200 \mathrm{x} 200 \\ & = & 0.056 \mathrm{m}^2 \\ Wetted Perimeter, p & = & \mathrm{m}^{+2} \mathrm{d} & = & 3.14 \mathrm{x} 100 \mathrm{x} 2 \mathrm{x} 200 \\ & = & 0.714 \mathrm{m} \\ Hydralic radius, R & = & a / p \\ & = & 0.078 \mathrm{m} \end{array}$ $\begin{array}{rcrc} SDM \\ \textbf{3} & \textbf{Use Manning Equation for estimating velocity of stormwater} \\ Take n & = & 0.016 & \text{for concrete lined channels:-} \\ Allowable velocity, v & = & R^{16} \mathrm{x} (RS_{1})^{10}/n & = & 0.078^{-1/6} \mathrm{x} (0.078 \mathrm{x} 0.005)^{-1/2} / 0.016 \\ & = & 0.81 \mathrm{m/s} \end{array}$ $\begin{array}{rcrc} \textbf{M} & $		Gradient of u-channel, S	S _f =	(10.13-9.90)/46	= 0.005		
Wetted Perimeter, $p = mr+2d = 3.14 \times 100 + 2 \times 200$ = 0.714 m Hydralic radius, $R = a/p$ = 0.078 m 3 Use Manning Equation for estimating velocity of stormwater Take $n = 0.016$ for concrete lined channels:- Allowable velocity, $v = R^{1/5} x (RS_0)^{1/2}/n = 0.078^{1/6} x (0.078 \times 0.005)^{1/2} / 0.016$ = 0.81 m/s Time of flow, $t_r = 1.1 min$ 4 Use "Rational Method" for calculation of design flow Design intensity, $i = a/(t_o + t_i + b)^c$ $= 451.3 / (4.5+1+2.46)^{1.337}$ for return period T = 50 years = 224 S DM T SDM T SDM T = 224 S DM T SDM T = 224 S DM T = 224 S DM T $= 0.015 m^3/s$ Design flow, $Q_u = 0.015 m^3/s$ Design flow, $Q_u = 0.278 \times 224 \times 329.65$ Upstream flow, $Q_u = 0.278 \times 224 \times 329.65$ / 1000000 + 0.015 $= 0.036 m^3/s$ Allowable flow, $Q_a = a \times v$ $= 0.06 \times 0.81$ $= 0.045 m^3/s$ Allowable flow, $Q_a = a x v$ $= 0.045 m^3/s$		Cross-Section Area,	a = =	0.5 πr ² + w d 0.056 m ²	= 0.5 x 3.14	x 100^2 + 200 x 200	
Hydraic radius, R=a / pstarta0.078 mm0.078 m3Use Manning Equation for estimating velocity of stormwaterTake n=0.016for concrete lined channels:-Allowable velocity, v=R ^{1/6} x (RS) ^{1/2} /n=0.078^{h/6} x (0.078 x 0.005)^{h/2} / 0.016=0.81 m/s=0.078^{h/6} x (RS)^{1/2}/n=0.078^{h/6} x (0.078 x 0.005)^{h/2} / 0.0163Use "Rational Method" for calculation of design flowSDM T4Use "Rational Method" for calculation of design flowSDM T2=451.3 / (4.5+1+2.46)^{h1.337} for return period T = 50 years =2243Type of surfaceSumf Coefficient CCatchment Area A (m2)CxA5Steep Grassland (heavy soil)0.350.0329.650.95347.0329.65SUM=329.65Upstream flow, Qu=0.078 x 224 x 329.65 / 1000000 + 0.015 =0.036 m ³ /sAllowable flow, Qa=a x v =0.065 x.081 =SDM 720.045 m ³ /s>Qu		Wetted Perimeter,	p = =	πr+2d 0.714 m	= 3.14 x 100	0 + 2 x 200	0514.0.0.4
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		Hydralic radius, I	R = =	a / p 0.078 m			SDM 8.2.1
Take n = 0.016 for concrete lined channels:- Allowable velocity, v = $R^{1/6}x (RS_i)^{1/2}/n$ = 0.078^1/6 x (0.078 x 0.005)^1/2 / 0.016 = 0.81 m/s Time of flow, t _t = 1.1 min 4 Use "Rational Method" for calculation of design flow Design intensity, i = a / (t _s + t _t + b) ^c = 451.3 / (4.5+1+2.46)^1.337 for return period T = 50 years = 224 Type of surface SDM T SDM T SDM T support surface Concrete Paving 0.95 347.0 329.65 SUM= 329.65 Upstream flow, Q _a = 0.278 i SC/A ₁ + Q _a where A ₁ is in km ₂ = 0.278 x 224 x 329.65 / 1000000 + 0.015 = 0.036 m ³ /s Allowable flow, Q _a = a x v = 0.06 x 0.81 = 0.045 m ³ /s Allowable flow, Q _a = a x v = 0.045 m ³ /s	3	Use Manning Equation for estimat	ing veloci	ty of stormwater			
$= 0.81 \text{ m/s}$ Time of flow, $t_r = 1.1 \text{ min}$ 4 Use "Rational Method" for calculation of design flow $Design intensity, i = a / (t_s + t_r + b)^c$ $= 451.3 / (4.5+1+2.46)^{A}1.337 \text{ for return period T} = 50 \text{ years}$ $= 224$ s SDM 7 Steep Grassland (heavy soil) 0.35 0.0 0 0 0 SDM 7 Steep Grassland (heavy soil) 0.95 347.0 329.65 SUM= 329.65 Upstream flow, $Q_u = 0.015 \text{ m}^3/s$ Design flow, $Q_d = 0.278 \text{ i} \Sigma C_i A_i + Q_u$ where $A_i \text{ is in } \text{km}_2$ $= 0.278 \times 224 \times 329.65 / 1000000 + 0.015$ $= 0.036 \text{ m}^3/s$ Allowable flow, $Q_a = a \times v$ $= 0.06 \times 0.81$ $= 0.045 \text{ m}^3/s$		Take Allowable velcoity,	n = v =	0.016 R ^{1/6} x (RS _f) ^{1/2} /n	for concrete lined ch = 0.078^1/6	annels:- 5 x (0.078 x 0.005)^1/2 / 0.016	SDM Table 13 SDM Table 12
4 Use "Rational Method" for calculation of design flow $Design intensity, i = a / (t_o + t_f + b)^c$ $= 451.3 / (4.5+1+2.46)^{\Lambda} 1.337 \text{ for return period T} = 50 \text{ years}$ $= 224$ s SDM 7 Steep Grassland (heavy soil) 0.35 Concrete Paving 0.95 347.0 329.65 Upstream flow, Q _u = 0.015 m ³ /s Design flow, Q _d = 0.278i \Sigma C_f A_j + Q _u where A_j is in km ₂ $= 0.278 \times 224 \times 329.65 / 1000000 + 0.015$ $= 0.036 m^3/s$ Allowable flow, Q _a = a x v $= 0.06 \times 0.81$ $= 0.045 m^3/s$ $> Q_d$		Time of flow	= t. =	0.81 m/s 1 1 min			
$\begin{array}{rcl} & \text{Loc Function network of energy network} \\ & \text{Design intensity, i} & = & a / (t_o + t_f + b)^o \\ & = & 451.3 / (4.5 + 1 + 2.46)^{h} 1.337 & \text{for return period T} = 50 \text{ years} \\ & = & 224 & s \\ & \text{SDM T}_{2} \\ & \text{SDM T}_{2} \\ & \text{SDM T}_{3} \\ &$	4	Use "Rational Method" for calculat	tion of de	sian flow			
$\begin{array}{rcl} \text{Dosign Initiality, I} & = & 4513/(4.5+1+2.46)^{\text{A}}1.337 & \text{for return period T} = 50 \text{ years} \\ & = & 224 & \text{s} \\ \hline \text{Steep Grassland (heavy soil)} & 0.35 & 0.0 & 0 \\ \text{Concrete Paving} & 0.95 & 347.0 & 329.65 \\ \hline \text{Upstream flow, } Q_u & = & 0.015 & \text{m}^3/\text{s} \\ \hline \text{Design flow, } Q_d & = & 0.278i \Sigma C_j A_j + Q_u & \text{where } A_j \text{ is in } \text{km}_2 \\ & = & 0.278 \times 224 \times 329.65 / 1000000 + 0.015 \\ & = & 0.036 & \text{m}^3/\text{s} \\ \hline \text{Allowable flow, } Q_a & = & a \times v \\ & = & 0.06 \times 0.81 \\ & = & 0.045 & \text{m}^3/\text{s} \\ \hline \text{Allowable flow, } Q_a & = & a \times v \\ & = & 0.045 & \text{m}^3/\text{s} \\ \hline \text{Allowable flow, } Q_a & = & a \times v \\ & = & 0.045 & \text{m}^3/\text{s} \\ \hline \text{Allowable flow, } Q_a & = & a \times v \\ & = & 0.045 & \text{m}^3/\text{s} \\ \hline \text{Allowable flow, } Q_a & = & a \times v \\ & = & 0.045 & \text{m}^3/\text{s} \\ \hline \text{Allowable flow, } Q_a & = & a \times v \\ & = & 0.045 & \text{m}^3/\text{s} \\ \hline \text{Allowable flow, } Q_a & = & a \times v \\ & = & 0.045 & \text{m}^3/\text{s} \\ \hline \text{Allowable flow, } Q_a & = & a \times v \\ & = & 0.045 & \text{m}^3/\text{s} \\ \hline \text{Allowable flow, } Q_a & = & a \times v \\ & = & 0.045 & \text{m}^3/\text{s} \\ \hline \text{Allowable flow, } P_a & = & a \times v \\ \hline Allow$	-	Design intensity	i =	a / (t ₋ + t ₄ + b) ^c			SDM 4 3 2
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			- = =	451.3 / (4.5+1+2.46 224)^1.337 for return	period T = 50 years	SDM Table 3(a)
$\begin{array}{llllllllllllllllllllllllllllllllllll$		<u>Type of surface</u> <u>Ru</u> Steep Grassland (heavy soil) Concrete Paving	<u>inoff Coeff</u> 0.35 0.95	icient C Catch	<u>ment Area A (m2)</u> 0.0 347.0 SUM=	s <u>CxA</u> 0 329.65 329.65	SDM 7.5.2 (d)
$\begin{array}{llllllllllllllllllllllllllllllllllll$		Upstream flow, G	Q _u =	0.015 m ³ /s			
Allowable flow, $Q_a = a \times v$ = 0.06 × 0.81 = 0.045 m ³ /s > Q_d		Design flow, C	Q _d = = =	0.278i ΣC _j A _j + Q _u 0.278 x 224 x 329.6 0.036 m ³ /s	where A _j is in km ₂ 5 /1000000 + 0.015		SDM 7.5.2 (a)
> Q _d		Allowable flow, C	Q _a = = =	a x v 0.06 x 0.81 0.045 m ³ /s			
			>	Q _d			
Reference was made to Stormwater Drainage Manual (SDM) by DSD		Reference was made to Stormwater	Drainage I	- Manual (SDM) by DSD			
Scale: N/A Drainage Calculation		Scale: N/A		Drainage Calculation			
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1	For Catchment Area C							Ref.
	Area, Average slope, Distance on the line of natural flow,	, A , H , L	= = =	495 0.2 per 100m 42 m				
	Time of concentraction,	t _o	= =	0.14465L/(H ^{0.2} A ^{0.2}) 4.5 min	= 0.14465	(42) / (0.24	^0.2*495^0.1)	SDM 7.5.2 (d)
2	For Proposed U-Channel in catc	hmer	nt area (;				
	Ground level (mPD) Invert level (mPD)		From 10.80 9.90	To 10.70 9.64				
	Width of u-channel, Radius of u-channel,	w , r	= =	200 mm 100 mm				
	Length of u-channel,	, L _c	=	53 m				
	Gradient of u-channel,	, u , S _f	=	(9.90-9.64)/53	=	0.005		
	Cross-Section Area,	, а	=	$0.5 \pi r^2 + w d$	=	0.5 x 3.14	x 100^2 + 200 x 400	
	Wetted Perimeter,	р	= =	πr+2d 1.114 m	=	3.14 x 100	0 + 2 x 400	
	Hydralic radius,	, R	=	a / p 0.086 m				SDM 8.2.1
3	Use Manning Equation for estim	ating	velocit	y of stormwater				
	Take	n	=	0.016	for concre	te lined ch	annels:-	SDM Table 13
	Allowable velcoity,	, v	=	R ^{1/6} x (RS _f) ^{1/2} /n 0 85 m/s	=	0.086^1/6	x (0.086 x 0.005)^1/2 / 0.016	SDM Table 12
	Time of flow,	, t _f	=	1.0 min				
4	Use "Rational Method" for calcu	latior	n of des	ign flow				
	Design intensity,	, i	=	a / $(t_{o} + t_{f} + b)^{c}$		-		SDM 4.3.2
			=	451.3 / (4.5+1+2.46) 225)^0.337	for return	period T = 50 years	SDM Table 3(a)
	<u>Type of surface</u> Steep Grassland (heavy soil) Concrete Paving	Runol	f <u>f Coeffic</u> 0.35 0.95	<u>cient C</u> Catch	<u>ment Area /</u> 0.0 495.0	<u>A (m2)</u> SUM=	s <u>CxA</u> 0 470.25 470.25	SDM 7.5.2 (d)
	Upstream flow	, Q _u	=	0.036 m ³ /s				
	Design flow,	, Q _d	= = =	0.278i ΣC _j A _j + Q _u 0.278 x 225 x 470.2 0.065 m ³ /s	where A _j is 5 /1000000	s in km ₂ + 0.036		SDM 7.5.2 (a)
	Allowable flow,	, Q _a	= = =	a x v 0.10 x 0.85 0.082 m³/s				
			>	Q _d				
	Reference was made to Stormwate	er Dra	ainage N	lanual (SDM) by DSD				
	Scale: N/A		C	Prainage Calculation				
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	· ••• g = ·							

1	For Catchment Area D							Ref.
	Area, Average slope,	A H	= =	362 0.1 per 100m	I			
	Distance on the line of natural flow,	L	=	31 m				
	Time of concentraction,	t _o	= =	0.14465L/(H ^{0.2} A ^{0.2}) 3.9 min	= 0.14465	5(31) / (0.14	^0.2*362^0.1)	SDM 7.5.2 (d)
2	For Proposed U-Channel in catch	nmen	nt area [)				
			From	То				
	Ground level (mPD) Invert level (mPD)		10.70 10.50	10.70 10.29				
	Width of u-channel,	w	=	200 mm				
	Radius of u-channel,	r	=	100 mm				
	Length of u-channel,	L _C	_	42 m				
	Gradient of u-channel,	u S _f	=	(10.50-10.29)/42	=	0.005		
		·		. ,				
	Cross-Section Area,	а	=	$0.5 \pi r^2 + w d$	=	0.5 x 3.14	x 100^2 + 200 x 200	
	Wetted Perimeter,	р	=	0.056 m πr+2d	=	3.14 x 100) + 2 x 200	
		•	=	0.714 m				
	Hydralic radius,	R	=	a/p				SDM 8.2.1
			-	0.078 m				
3	Use Manning Equation for estimation	ating	velocit	y of stormwater				
	Take	n	=	0.016	for concre	ete lined ch	annels:-	SDM Table 13
	Allowable velcoity,	V	=	R ^{1/6} x (RS _f) ^{1/2} /n	=	0.078^1/6	x (0.078 x 0.005)^1/2 / 0.016	SDM Table 12
	— (a		=	0.81 m/s				
	Hee "Betienel Method" for coloui	4 ation	_ f . d	1.2				
4		auor	i oi ues	igii now				
	Design intensity,	i	=	a / (t _o + t _f + b) ^c				SDM 4.3.2
			=	451.3 / (3.9+1+2.46) 228)^2.337	for return	period T = 50 years	SDM Table 3(a)
				220			S	
	<u>Type of surface</u> <u>F</u>	Runof	f Coeffic	cient C Catch	<u>ment Area</u>	<u>A (m2)</u>	CXA	SDM 7.5.2 (d)
	Concrete Paving		0.95		362.0		343.9	
	C C					SUM=	343.9	
	Upstream flow,	Qu	=	0 m ³ /s				
	Decign flow	0	_	0 278ί ΣΟΔ. + Ο	whore A i	o in km		SDM 7 = 2 (a)
	Design llow,	Qd	_	$0.270120_{j}A_{j} + Q_{u}$	/1000000	+ 0		SDW 7.5.2 (a)
			=	0.022 m ³ /s	/1000000	. 0		
		~						
	Allowable flow,	Qa	=	a x v				
			=	0.06×0.81 0.045 m ³ /s				
				0.010 111/3				
			>	Q _d				
	Reference was made to Stormwate	r Dra	iinage N	lanual (SDM) by DSD				
	Scale: N/A		C	Prainage Calculation				-
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1	For Catchment Area E							Ref.			
	Area Average slope Distance on the line of natural flow	a, A e, H /, L	= = =	1017 0.2 per 100m 105 m	1						
	Time of concentraction	ı, t _o	= =	0.14465L/(H ^{0.2} A ^{0.2}) 10.5 min	4 ^{0.2}) = 0.14465(105) / (0.2^0.2*1017^0.1)			SDM 7.5.2 (d)			
2	For Proposed U-Channel in cate										
	Ground level (mPD) Invert level (mPD)		From 10.60 10.40	To 10.60 9.47							
	Width of u-channe Radius of u-channe Length of u-channe Depth of vertical part of u-channe Gradient of u-channe	l, w l, r l, L _c l, d	= = = =	300 mm 150 mm 211 m 300 mm (10 40-9 47)(211	_	0.004					
	Cross-Section Area	, о _г , а	=	$0.5 \pi r^2 + w d$	=	0.5 x 3.14	x 150^2 + 300 x 300				
	Wetted Perimeter	г, р _	= = =	0.125 m ² πr+2d 1.071 m	=	3.14 x 150	0 + 2 x 300				
	Hydralic radius	s, R	=	a / p 0.117 m				SDM 8.2.1			
3	Use Manning Equation for estin	nating	y velocity	y of stormwater							
	Take Allowable velcoity	e n /, v	= = =	0.016 R ^{1/6} x (RS _f) ^{1/2} /n 0.99 m/s	for concre =	ete lined ch 0.117^1/6	annels:- x (0.117 x 0.004)^1/2 / 0.016	SDM Table 13 SDM Table 12			
	Time of flow	ı, t _f	=	0.3 min							
4	Use "Rational Method" for calc	Use "Rational Method" for calculation of design flow									
	Design intensity	= = =	a / (t _o + t _f + b) ^c 451.3 / (10.5+0+2.4 189	6)^3.337	for return	period T = 50 years	SDM 4.3.2 SDM Table 3(a)				
	<u>Type of surface</u> Steep Grassland (heavy soil) Concrete Paving	<u>Runo</u>	o <u>ff Coeffic</u> 0.35 0.95	cient C Catch	<u>iment Area</u> 0.0 1017.0	<u>A (m2)</u> SUM=	s <u>CxA</u> 0 966.15 966.15	SDM 7.5.2 (d)			
	Upstream flow	ı, Q _u	=	0.065 m ³ /s							
	Design flow	SDM 7.5.2 (a)									
	Allowable flow	/, Q _a	= = =	a x v 0.13 x 0.99 0.124 m ³ /s							
			>	Q _d							
Reference was made to Stormwater Drainage Manual (SDM) by DSD											
	Scale: N/A	D .D.	rainage Calculation 109 Lot 1051 RP (Pa	art),		Page 5					
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1	For Catchment Area F								Ref.
	Area Average slope Distance on the line of natural flow	a, A e, H v, L	= = =	267 0.1 per 100m 29 m					
	Time of concentraction	n, t _o	= =	0.14465L/(H ^{0.2} A ^{0.2}) 3.8 min	= 0.1446	5(29) / (0.1 [,]	^0.2*267^0.1)		SDM 7.5.2 (d)
2	For Proposed U-Channel in cat	or Proposed U-Channel in catchment area F							
	Ground level (mPD) Invert level (mPD)		From 10.60 9.47	To 10.90 9.28					
	Width of u-channe Radius of u-channe	l, w l, r	= =	300 mm 150 mm					
	Length of u-channe Depth of vertical part of u-channe	l, L _c I. d	=	41 m 400 mm					
	Gradient of u-channe	el, S _f	=	(9.47-9.28)/41	=	0.005			
	Cross-Section Area	a, a	= =	0.5 πr ² + w d 0 155 m ²	=	0.5 x 3.14	x 150^2 + 300 x 400		
	Wetted Perimete	r, p	= =	πr+2d 1.271 m	=	3.14 x 150	0 + 2 x 400		0004000
	Hydralic radius	s, R	=	a / p 0.122 m					SDM 8.2.1
3	Use Manning Equation for estir	nating	velocit	y of stormwater					
	Take Allowable velcoity	en y,v	= =	0.016 R ^{1/6} x (RS _f) ^{1/2} /n	for concre =	ete lined ch 0.122^1/6	annels:- x (0.122 x 0.005)^1/2 / 0	0.016	SDM Table 13 SDM Table 12
	Time of flow	v.tr	= =	1.05 m/s 1.5 min					
4	Use "Rational Method" for calc	ulation	of des	ian flow					
-	Design intensity	vi	=	$a / (t_{a} + t_{e} + b)^{c}$					SDM 4 3 2
	g	, .	= =	451.3 / (3.8+1+2.46) 226)^5.337	for return	period T = 50 years		SDM Table 3(a)
	<u>Type of surface</u> Steep Grassland (heavy soil) Concrete Paving	<u>Runof</u>	<u>f Coeffic</u> 0.35 0.95	<u>cient C</u> Catch	<u>ment Area</u> 0.0 267.0	<u>i A (m2)</u> SUM=	s <u>CxA</u> 0 253.65 253.65		SDM 7.5.2 (d)
	Upstream flov	v, Q _u	=	0.138 m ³ /s					
	Design flov	v, Q _d	= = =	0.278i ΣC _j A _j + Q _u 0.278 x 226 x 253.6 0.154 m ³ /s	where A _j 5 /100000	is in km ₂ 0 + 0.138			SDM 7.5.2 (a)
	Allowable flov	v, Q _a	= = =	a x v 0.16 x 1.05 0.163 m ³ /s					
			>	Q _d					
	Reference was made to Stormwa	ter Dra	inage N	lanual (SDM) by DSD					
	Scale: N/A Drainage Calculation								
	Scale: N/A		D	Prainage Calculation					

1	For Connection between CP12 and Existing Culvert							Ref.	
	Area	А	=	0					
	Average slope,	н	=	0.1 per 100m					
	Distance on the line of natural flow,	L	=	0 m					
	Time of concentraction,	t _o	= =	0.14465L/(H ^{0.2} A ^{0.2}) 0.0 min	= 0.1446	5(0) / (0.1^(0.2*0^0.1)	SDM 7.5.2 (d)	
2	For Proposed U-Channel between CP12 and Existing Culvert								
			From	То					
	Ground level (mPD)		10.90	10.40					
	Invert level (mPD)		9.01	8.86					
	Width of u-channel,	w	=	700 mm					
	Radius of u-channel,	r	=	350 mm					
	Length of u-channel,	L _c	=	30 m					
	Depth of vertical part of u-channel,	d	=	1190 mm					
	Gradient of u-channel,	S _f	=	(9.01-8.86)/30	=	0.005			
	Cross-Section Area,	а	=	0.5 πr ² + w d	=	0.5 x 3.14	x 350^2 + 700 x 1190		
			=	1.025 m ²					
	Wetted Perimeter,	р	=	πr+2d	=	3.14 x 350	0 + 2 x 1190		
	Literature Research and	_	=	3.479 m				0014004	
	Hydralic radius,	R	=	a/p 0.295 m				SDM 8.2.1	
_				0.200 11					
3	Use Manning Equation for estimating velocity of stormwater								
	Take	n	=	0.016	for concr	ete lined ch	annels:-	SDM Table 13	
	Allowable velcoity,	v	=	R ^{1/6} x (RS _f) ^{1/2} /n	=	0.295^1/6	x (0.295 x 0.005)^1/2 / 0.016	SDM Table 12	
			=	1.96 m/s					
	lime of flow,	t _f	=	3.9 min					
4	Use "Rational Method" for calcu	latio	n of des	ign flow					
	Design intensity,	i	=	a / (t _o + t _f + b) ^c				SDM 4.3.2	
			=	451.3 / (0.0+3+2.46 242)^9.337	for return	period T = 50 years	SDM Table 3(a)	
	Turne of ourface		ff Cooffi	aiont C Catab	mont Aro	- A (m2)	s CxA	SDM 7 5 2 (d)	
	Steep Grassland (heavy soil)	Vullo	0.35			<u>a A (IIIZ)</u>	0	3DIVI 7.3.2 (u)	
	Concrete Paving		0.95		0.0		0		
	Ū					SUM=	0		
	Upstream flow	Q	=	1.785 (from Existing	CP11)+	0.154 (Fron	n new CP11)		
	•		=	1.939	,	`			
	Design flow	Q_d	=	0.278i ΣC _j A _i + Q _u	where A _i	is in km ₂		SDM 7.5.2 (a)	
	. .		=	ew CP11)					
			=	1.939 m ³ /s		,			
	Allowable flow	Qa	=	axv					
			=	1.03 x 1.96					
			=	2.007 m ³ /s					
			>	Q _d					
	Reference was made to Stormwate	er Dra	ainage N	lanual (SDM) by DSD					
	Scale: N/A		г		<u> </u>				
			D.D.	109 Lot 1051 RP (Pa		Page 7			
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