Sent: 2024-07-09 星期二 15:53:16
To: tpbpd/PLAND <tpbpd@pland.gov.hk>

Subject: RE: Departmental Comments_Planning Application No. A/YL-PH/1013
Attachment: 2529CL04.pdf

Dear Sir/ Madam,

Attached please find our letter to your office for your reference.

Should you have any further queries, feel free to contact the undersigned

Best Regards,
Wesley Tang

Lanbase Surveyors Ltd

L A N B A S E
Surveyors Limited
宏 基 測 量 師 行

Our Ref.: YL/TPN/2529C/L04

5 July 2024

Secretary
Town Planning Board
15/F, North Point Government Offices
333 Java Road, North Point
Hong Kong

By Email and by Post

Dear Sir/Madam,

Planning Application (No. A/YL-PH/1013) for
Temporary Wholesale Trade (Food) for a Period of Five Years
Lot Nos. 872, 873, 875, 876, 877, 878, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891 s.A, 892 s.A, 893 s.A, 3049 and 3050 in DD 111 and Adjoining Government Land
Pat Heung, Yuen Long, New Territories

We would like to respond to the departmental comments received on the captioned planning application as follows:-

	Departmental Comments	**Response**
-	**Environmental Protection Department**	
(i)	the sewerage arrangement of the proposed use. If septic tank and soakaway system would be used, whether the requirements set out in *Professional Persons Environmental Consultative Committee Practice Notes 1/23 (Drainage Plans subject to Comment by the Environmental Protection Department -Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations)* would be followed.	If septic tank and soakaway system is used, the requirements set out in *Professional Persons Environmental Consultative Committee Practice Notes 1/23 (Drainage Plans subject to Comment by the Environmental Protection Department -Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations)* **will be followed**.

Our Ref.: YL/TPN/2529C/L04

	Departmental Comments	Response
-	**Environmental Protection Department**	
(ii)	whether public announcement system, portable loudspeakers or any form of audio amplification system would be used at the application site	**No** public announcement system, portable loudspeakers or any form of audio amplification system will be used at the application site.
(iii)	any mitigation measures for minimising the potential environmental impacts arising from the proposed use.	The mitigation measures as stipulated in the "Code of Practice on Handling the Environmental Aspects of Temporary Uses and Open Storage Sites" issued by the Environmental Protection Department will be adopted to minimize the potential environmental impacts arising from the proposed use, if any.
-	**Transport Department**	
(a)	The applicant should demonstrate the smooth manoeuvring of vehicles to / from Fan Kam Road, along the local access and within the site;	Please see the swept path along the local access and within the site at **Appendix 1**.
(b)	The applicant should indicate the clear width of the vehicular ingress / egress on the layout plan;	Please see the revised layout plan with the about 9m clear width of the ingress/ egress including 7.3m for vehicular access and 1.7m for pedestrian access at **Appendix 2**.

Our Ref.: YL/TPN/2529C/L04

	Departmental Comments	Response
-	**Transport Department**	
(c)	The applicant should note the local access between Fan Kam Road and the site is not managed by this Department.	Noted.
-	**Fire Services Department**	
(i)	The standards and specifications of the proposed emergency lighting shall be revised to "BS 5266-1:2016, BS EN 1838:2013 and the FSD Circular Letter No. 4/2021";	Please see the revised fire services installation proposal (revised fire notes no. 1) at **Appendix 3**.
(ii)	The standards and specifications of the proposed fire alarm system shall be revised to 'BS 5839-1:2017 and the FSD Circular Letter No. 6/2021'; and	Please see the revised fire services installation proposal (revised fire notes no. 7) at **Appendix 3**.
(iii)	Sufficient directional and exit signs shall be provided in accordance with BS 5266-1:2016 and the FSD Circular Letter No. 5/2008.	Please see the revised fire services installation proposal (revised fire notes no. 2) at **Appendix 3**.

Our Ref.: YL/TPN/2529C/L04

	Departmental Comments	Response
-	**Drainage Services Department**	
(a)	The applicant should confirm whether they are committed to implement the proposed retention drainage system.	Having reviewed the available capacity of the watercourse after receiving the boundary condition provided by DSD in February 2024 (refer to DSD"s email at **Appendix 4**), based on the estimation of watercourse capacity, we found that there is sufficient capacity to support and therefore the proposed retention drainage system is not necessary. Therefore, the proposed retention drainage system will not be implemented. On the other hand, there is a rainwater harvest recycling system on-site which also supports to reduce discharge of surface runoff. Please see the revised DIA Report at **Appendix 5**.
(b)	Supporting calculation and documents to justify the applicant's assumption on the existing watercourse capacity should be given. The drainage impact caused to the existing watercourse by the proposed development, for both option 1 and option 2 without the retention tank, have yet been ascertained.	Having reviewed the available capacity of the watercourse after receiving the boundary condition provided by DSD in February 2024 (refer to DSD"s email at **Appendix 4**), we have prepared the supporting calculations for estimation of watercourse capacity. Please see the revised DIA Report at **Appendix 5**.
(c)	30 minutes retention time is proposed for storage of the addition runoff on site. Please justify with supporting calculation and documents.	Based on the calculations of the existing watercourse capacity, it shows that there is adequate capacity to support the proposed development, 30 min retention time is no longer required.

L | A | N | B | A | S | E

Our Ref.: YL/TPN/2529C/L04

Should you have any queries, please contact our Mr. Wesley Tang Thank you.

Yours faithfully,
For and on behalf of
LANBASE SURVEYORS LIMITED

Rock K.M. Tsang
Director
RK/WT
Encl.

Appendix 1

Swept Path

Project Title: COMBOXX

Figure Title: SWEPT PATH OF CONTAINER VEHICLE TRAVELING ALONG THE RIGHT-OF-WAY FROM FAN KAM ROAD

Figure No.	Revision
R1	A

Designed by	Drawn by	Checked by
L C H	N C M	K C

Scale in A3	Date
1 : 1000	21 SEP 2023

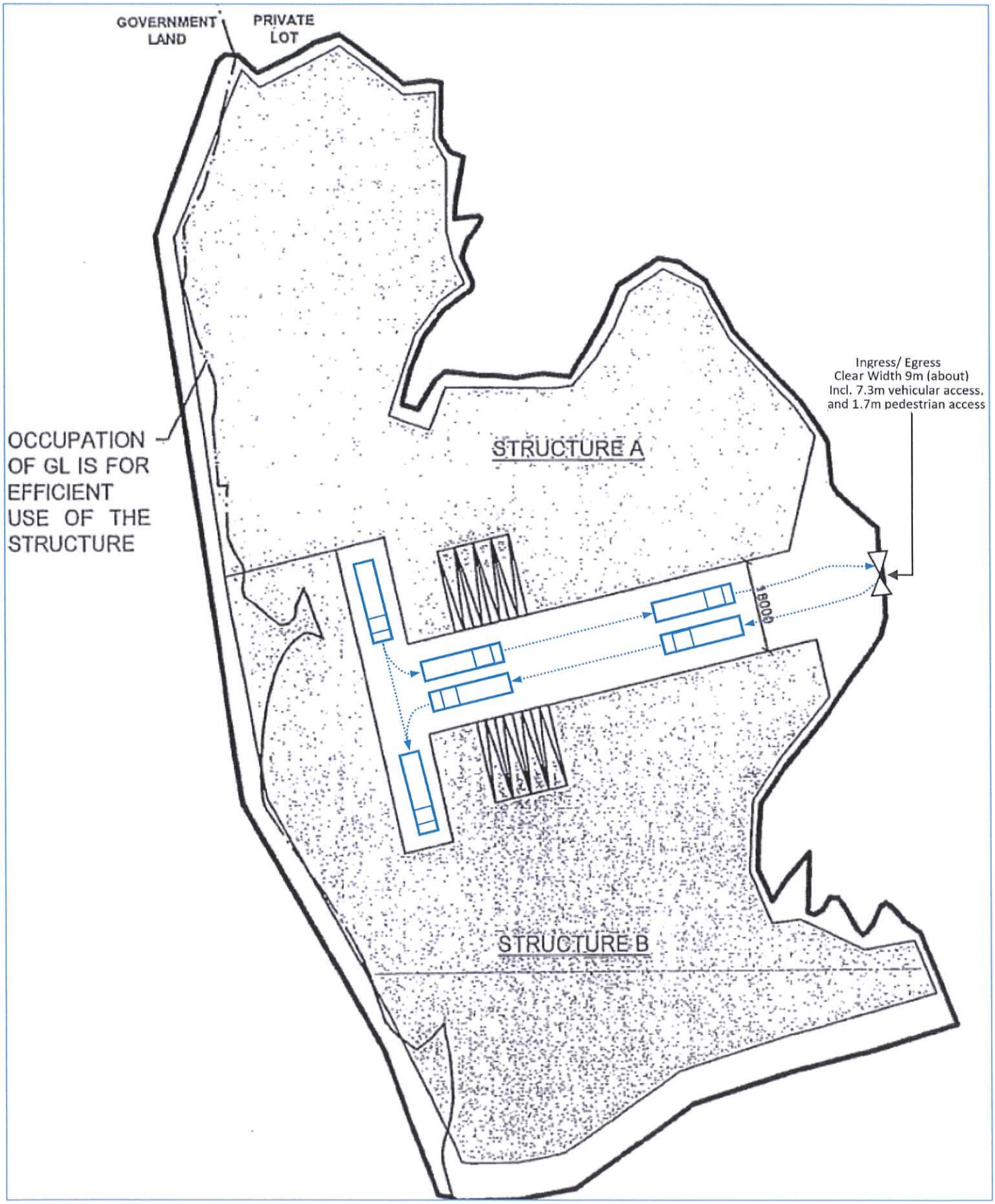
CKM Asia Limited
Traffic and Transportation Planning Consultants

T:\JOBS\J7200-J7249\J7210\2023 09\Fig R1 - R2 RevA.dwg

Project Title	COMBOXX	Figure No. R2	Revision A
Figure Title	SWEPT PATH OF CONTAINER VEHICLE TRAVELING ALONG THE RIGHT-OF-WAY TO FAN KAM ROAD	Designed by L C H / Drawn by N C M / Checked by K C	CKM Asia Limited Traffic and Transportation Planning Consultants
		Scale in A3 1 : 1000 / Date 21 SEP 2023	

T:\JOBs\J7200-J7249\J7210\2023 09\Fig R1 - R2 RevA.dwg

Swept Path of Container Vehicle (within Site)



Appendix 2

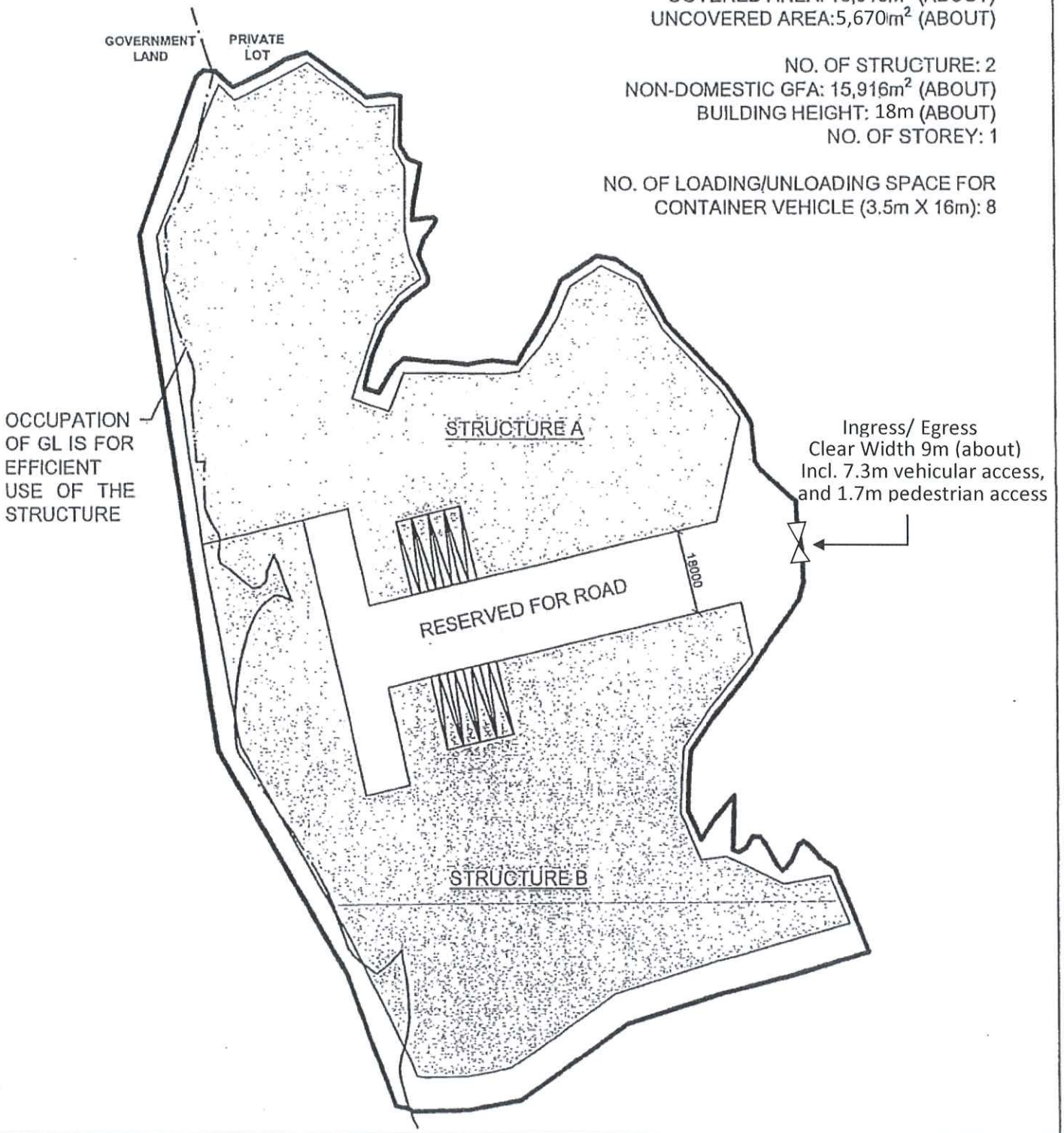
Revised layout plan

DEVELOPMENT PARAMETERS

APPLICATION SITE AREA:21,586m^2 (ABOUT)
COVERED AREA: 15,916m^2 (ABOUT)
UNCOVERED AREA:5,670m^2 (ABOUT)

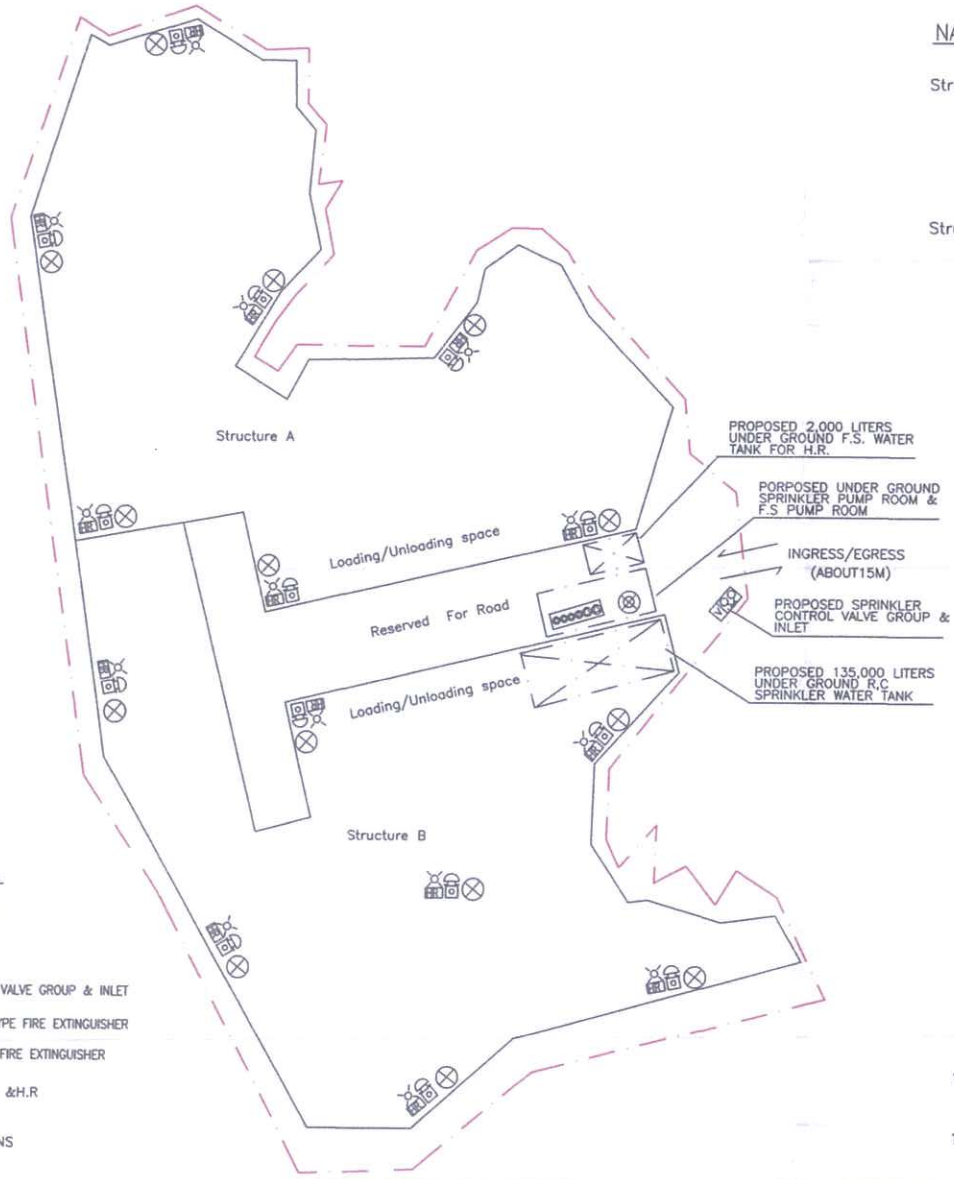
NO. OF STRUCTURE: 2
NON-DOMESTIC GFA: 15,916m^2 (ABOUT)
BUILDING HEIGHT: 18m (ABOUT)
NO. OF STOREY: 1

NO. OF LOADING/UNLOADING SPACE FOR CONTAINER VEHICLE (3.5m X 16m): 8



Appendix 3

Revised Fire Services Installation Proposal



LEGEND

- FLASHING LIGHT
- FIRE ALARM BELL
- MFA CALL POINT
- HOSE REEL SET (30M LENGTH)
- SPRINKLER CONTROL VALVE GROUP & INLET
- 4KG DRY POWDER TYPE FIRE EXTINGUISHER
- 5KG CO2 GAS TYPE FIRE EXTINGUISHER
- SPRINKLER PUMP &H.R PUMP SET
- NEW INSTALLATIONS
- BOUNDARY LINE

NATURE OCCUPANCY:

Structure A: Single storey structure for wholesale trade (food)
(GFA:7888 sq.m,Height:18m)
The aggregate area of openable window about 500 s.q.m exceeding 6.25% of the floor area of the Structure A.(7888sq.m x 6.25% =493sq.m)

Structure B: Single storey structure for wholesale trade (food)
(GFA:8028 sq.m,Height:18m)
The aggregate area of openable window about 520 s.q.m exceeding 6.25% of the floor area of the Structure B.(8028sq.m x 6.25% =501.75sq.m)

Fire Notes:

1. Sufficient emergency lighting shall be provided throughout the entire building in accordance with BS5266-1:2016, BS EN 1838:2013 and FSD Circular Letter No. 4/2021.
2. Sufficient directional and exit sign shall be provided in accordance with BS 5266-1:2016 and FSD Circular letter 5/2008.
3. Sufficient portable hand-operated approved appliance shall be provided as required by occupancy and as marked on plans.
4. An Automatic Sprinkler System Supplied by existing 135 m3 Sprinkler Water Tank and Hazard Class OH 3 shall be provided to the building/structure A & B in accordance with BS EN 12845:2015 and FSD Circular Letter No.5/2020. The Sprinkler Water Tank,Sprinkler Pump Room,Sprinkler Inlet and Sprinkler Control Valve Group shall be clearly marked on plans.
5. The storage configuration is ST1:free standing or block stacking with reference to the section 6.3.2 of B.S 12845.and storage pattern is the maximum storage heights shall not exceed 4 m & the maximum storage areas shall be 50m2 for any single block.with no less than 2.4m clearance around the block as Ordinary Hazard Group 3 in accordance with LPC BS EN 12845.(Storage Category : Category I)
6. A hose reel system should be supplied by a 2.0m3 F.S Water tank. There shall be sufficient hose reel to ensure that every part of each buillding can be reached by a length of not more than 30m of hose reel tubing.The F.S water tank, F.S pump room and hose reel shall be clearly marked on plans.
7. Fire alarm system shall be provided throughout the entire building in accordance with BS 5839-1:2017 and FSD Circular Letter 6/2021 . One actuation point and one audio warning device to be located at each hose reel point.The actuation point should include facilities for fire pump start and audio/visual warning device initiation.
8. One no.5.0 kg CO2 F.E. shall be provided at spinkler pump room & F.S pump room.
9. Sprinkler Tank water supply pipe should be connected to Town Main.
10. A Secondary electrical supply tee-off before main switch will be provided to maintain operation of fire service system in the event of normal power fuilure.
11. No Smoke extraction system will be provided for the structure A & B as the aggregate area of openable windows of structure A&B exceeding 6.25% of the floor area of the structure A&B. (Detail see Drawing No. 2021-FS/24-02)

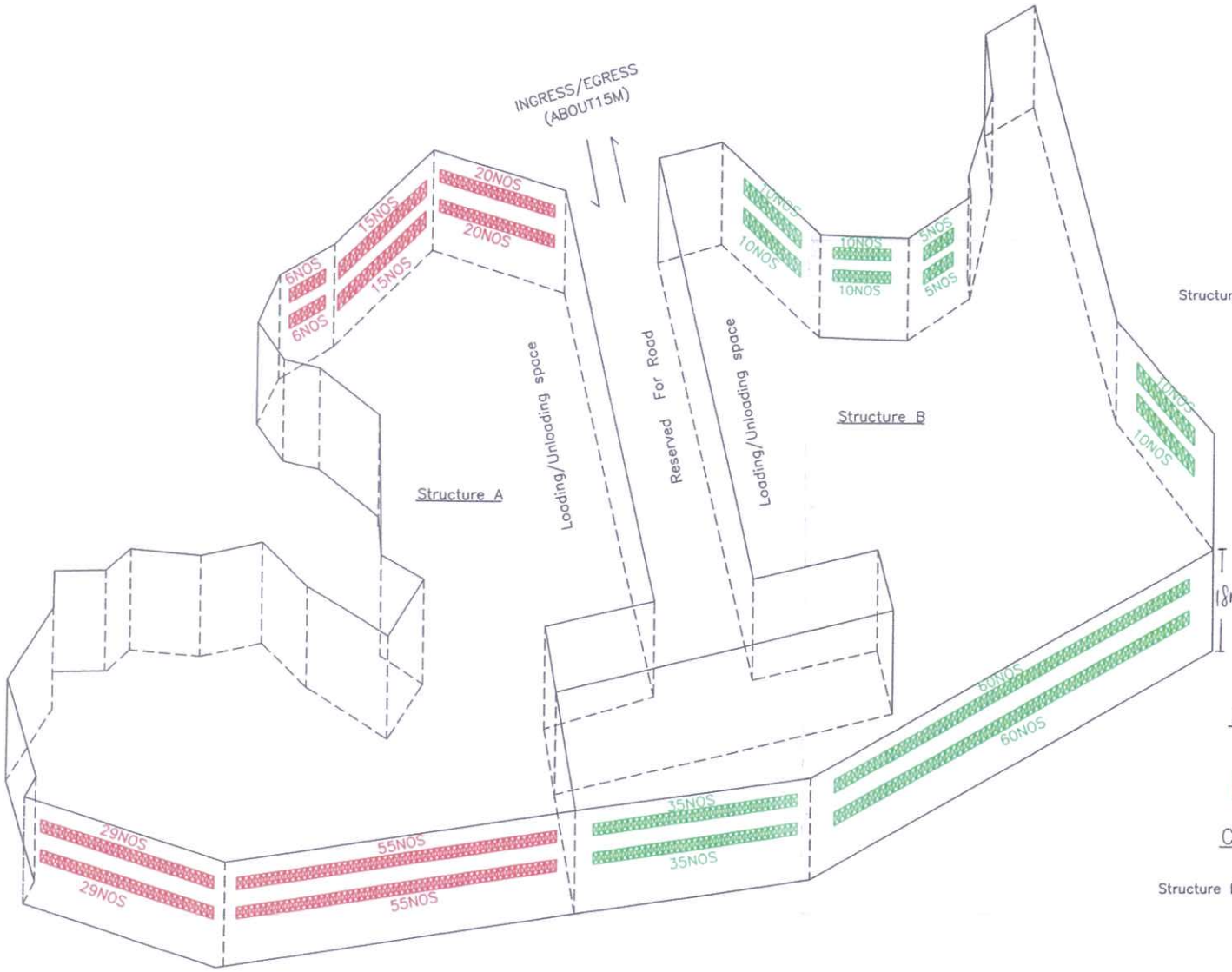
Project :

PROPOSED TEMPORARY WHOLESALE TRADE(FOOD) FOR A PERIOD OF 5 YEARS AT LOTS 872,873,875,876,877,878,880,881,882,883,884,885,886, 887,888,889,890,891(PART),892(PART),893(PART),3049 AND 3050 IN D.D. 111 AND ADJOINING GOVERNMENT LAND ,PAT HEUNG ,YUEN LONG.

TITLE :

PROPOSED FIRE SERVICE INSTALLATION LAYOUT PLAN.

Date:	26/6/2024
Scale:	1:1000 @ A3
Ref No:	A/YL-PH/1013
Drawing No:	2021-FS/24-01



OPENABLE WINDOWS OF STRUCTURE A & B LAYOUT PLAN

LEGEND

OPENABLE WINDOW (Area:1m x 2m=2sq.m)

CALCULATE:

Structure A: The aggregate area of openable window is:

2sq.m x 250nos =500sq.m

6.25% of the floor area is:

7888sq.m x 6.25% =493sq.m

500sq.m > 493sq.m

LEGEND

OPENABLE WINDOW (Area:1m x 2m=2sq.m)

CALCULATE:

Structure B: The aggregate area of openable window is:

2sq.m x 260nos =520sq.m

6.25% of the floor area is:

8028sq.m x 6.25% =501.75sq.m

520sq.m > 501.75sq.m

Project : PROPOSED TEMPORARY WHOLESALE TRADE(FOOD) FOR A PERIOD OF 5 YEARS AT LOTS 872,873,875,876,877,878,880,881,882,883,884,885,886, 887,888,889,890,891(PART),892(PART),893(PART),3049 AND 3050 IN D.D. 111 AND ADJOINING GOVERNMENT LAND ,PAT HEUNG ,YUEN LONG.	TITLE : PROPOSED FIRE SERVICE INSTALLATION LAYOUT PLAN.
Date:	26/6/2024
Scale:	A3 (NO SCALE)
Ref No:	A/YL-PH/1013
Drawing No:	2021-FS/24-02

Appendix 4

DSD's Email in 2/2024

Wesley Tang

寄件者:
寄件日期: 2024年2月21日星期三 10:34
收件者: Tommy KONG
副本: Kitty LEE
主旨: Re: [Internet]7076764 - Request for Information - Watercourse Boundary Condition at Pat Heung (Planning Application No.: A/YL-PH/804)
附件: Pat Heung Boundary Condition A-YL-PH-804(M2024-11).xlsx

Dear Tommy,

Please find the boundary conditions as attached.

Regards,
William CY Wong
E/DSP3
Land Drainage Division, DSD

Zero "O" 意外
ACCIDENT
地盤零意外 關懷建未來
Zero Accident, we Build, we Care

From:
To:
Cc:
Date: 30/01/2024 16:19
Subject: [Internet]7076764 - Request for Information - Watercourse Boundary Condition at Pat Heung (Planning Application No.: A/YL-PH/804)
Serial No.:

Dear Mr. Wong,

As discussed yesterday, we have been appointed to conduct a Drainage Impact Assessment (DIA) for a

development on Pat Heung, Yuen Long. The location of the proposed site (https://www.map.gov.hk/gm/s/hk80/834717/827782) and existing watercourse (https://www.map.gov.hk/gm/s/hk80/834698/827903) is shown in the attached location plan.

Could you please provide the condition of the existing watercourse near the proposed site with the return periods of 2, 10, and 50 years in support of the DIA? We would like to have the following information to support our DIA:

1. Cross-section of the watercourse;
2. Section flows;
3. Section water level;
4. Section flow velocity;
5. Surface runoff from the nearby catchment to the watercourse.

Should you have any enquiries regarding the above, please do not hesitate to contact the undersigned or our Ms Kitty Lee

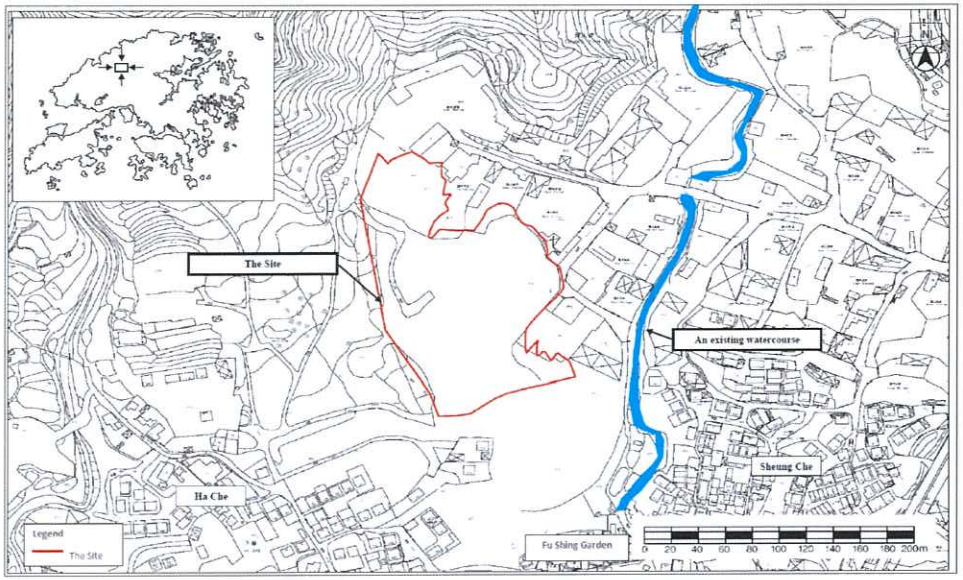
Thank you.

Regards,

Tommy KONG
Assistant Environmental Consultant

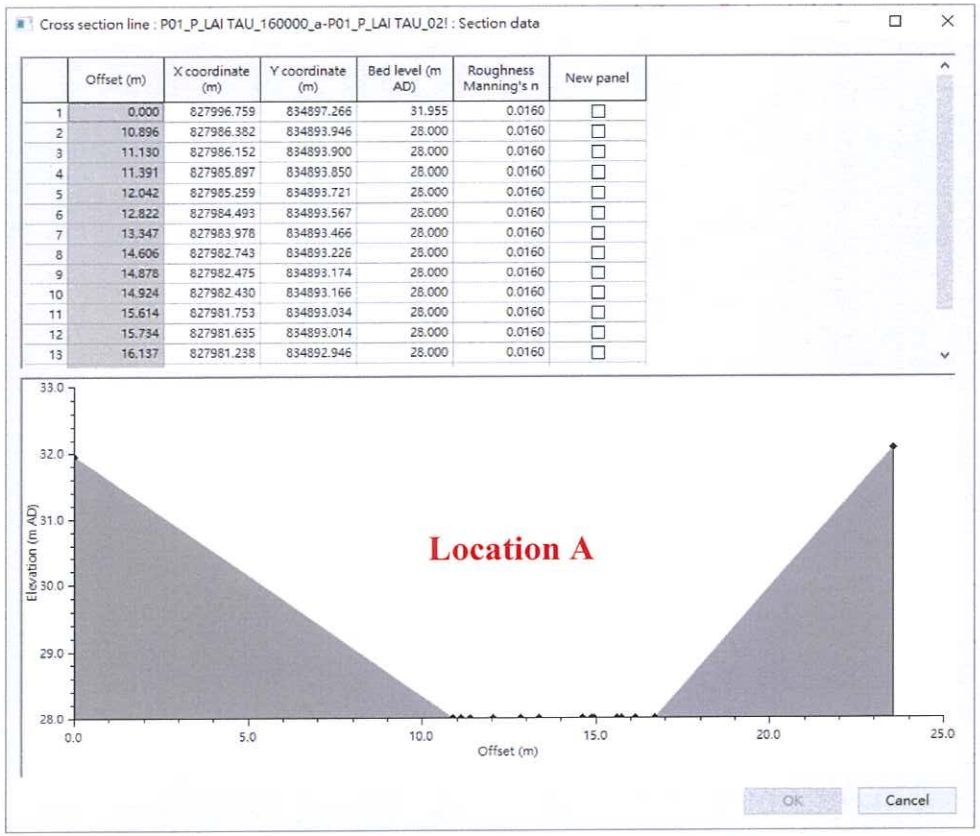
SMEC Hong Kong

[attachment "240201_Location Plan.pdf" deleted by Ching Yu WONG/LDD/DSD/HKSARG]



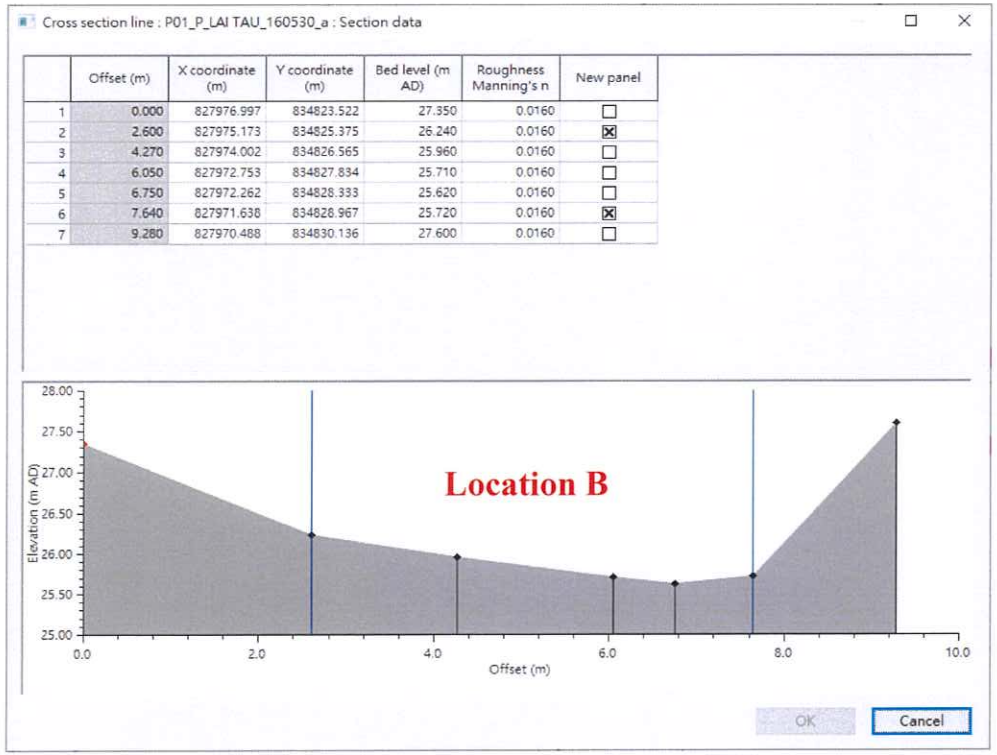
Location Plan provided by Consultant

Loation Reference for Boundary Conditon



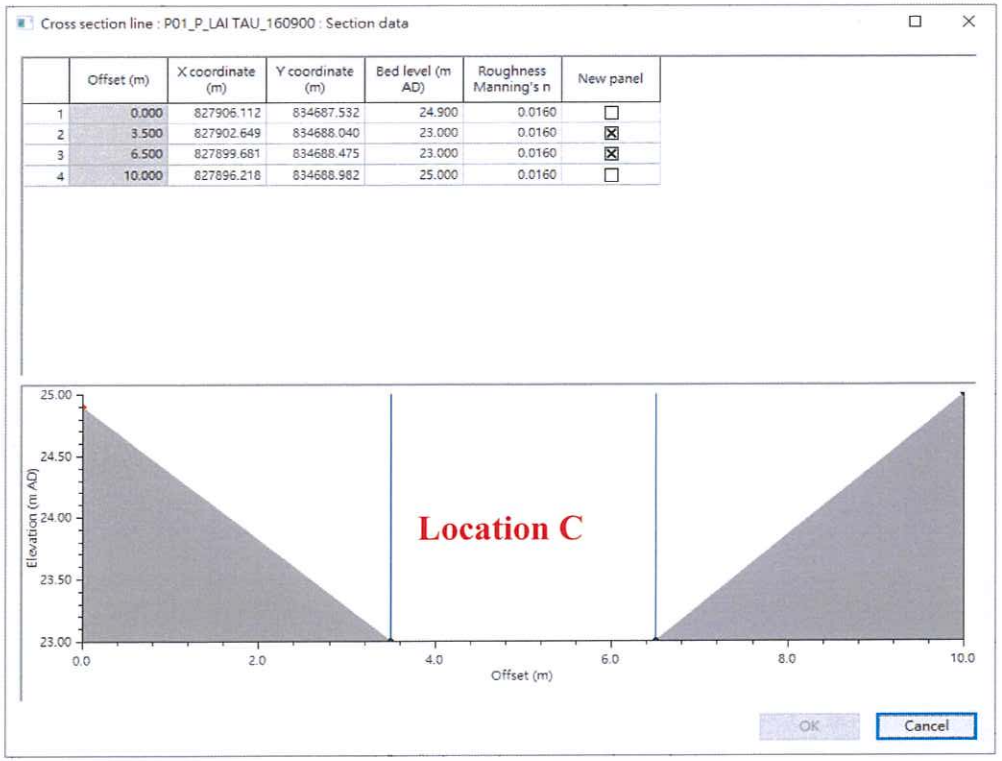
Offset (m)	X coordinate (m)	Y coordinate (m)	Bed level (m PD)
0.00	827996.76	834897.27	31.96
10.90	827986.38	834893.95	28.00
11.13	827986.15	834893.90	28.00
11.39	827985.90	834893.85	28.00
12.04	827985.26	834893.72	28.00
12.82	827984.49	834893.57	28.00
13.35	827983.98	834893.47	28.00
14.61	827982.74	834893.23	28.00
14.88	827982.48	834893.17	28.00
14.92	827982.43	834893.17	28.00
15.61	827981.75	834893.03	28.00
15.73	827981.64	834893.01	28.00
16.14	827981.24	834892.95	28.00
16.69	827980.69	834892.85	28.00
23.54	827974.06	834891.14	32.08

Location A : Section ID - P01_P_LAI TAU_160000_a-P01_P_LAI TAU_02!



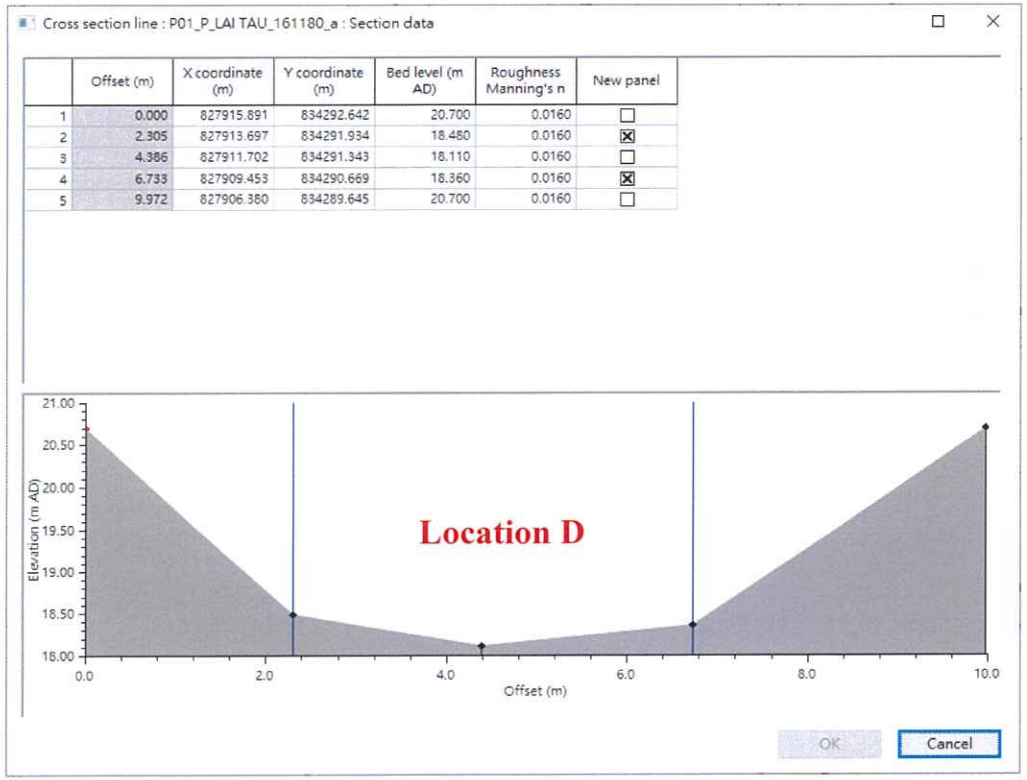
Offset (m)	X coordinate (m)	Y coordinate (m)	Bed level (m PD)
0.00	827976.997	834823.522	27.35
2.60	827975.173	834825.375	26.24
4.27	827974.002	834826.565	25.96
6.05	827972.753	834827.834	25.71
6.75	827972.262	834828.333	25.62
7.64	827971.638	834828.967	25.72
9.28	827970.488	834830.136	27.60

Location B : Section ID - P01_P_LAI TAU_160530_a



Offset (m)	X coordinate (m)	Y coordinate (m)	Bed level (m PD)
0.00	827906.112	834687.532	24.90
3.50	827902.649	834688.04	23.00
6.50	827899.681	834688.475	23.00
10.00	827896.218	834688.982	25.00

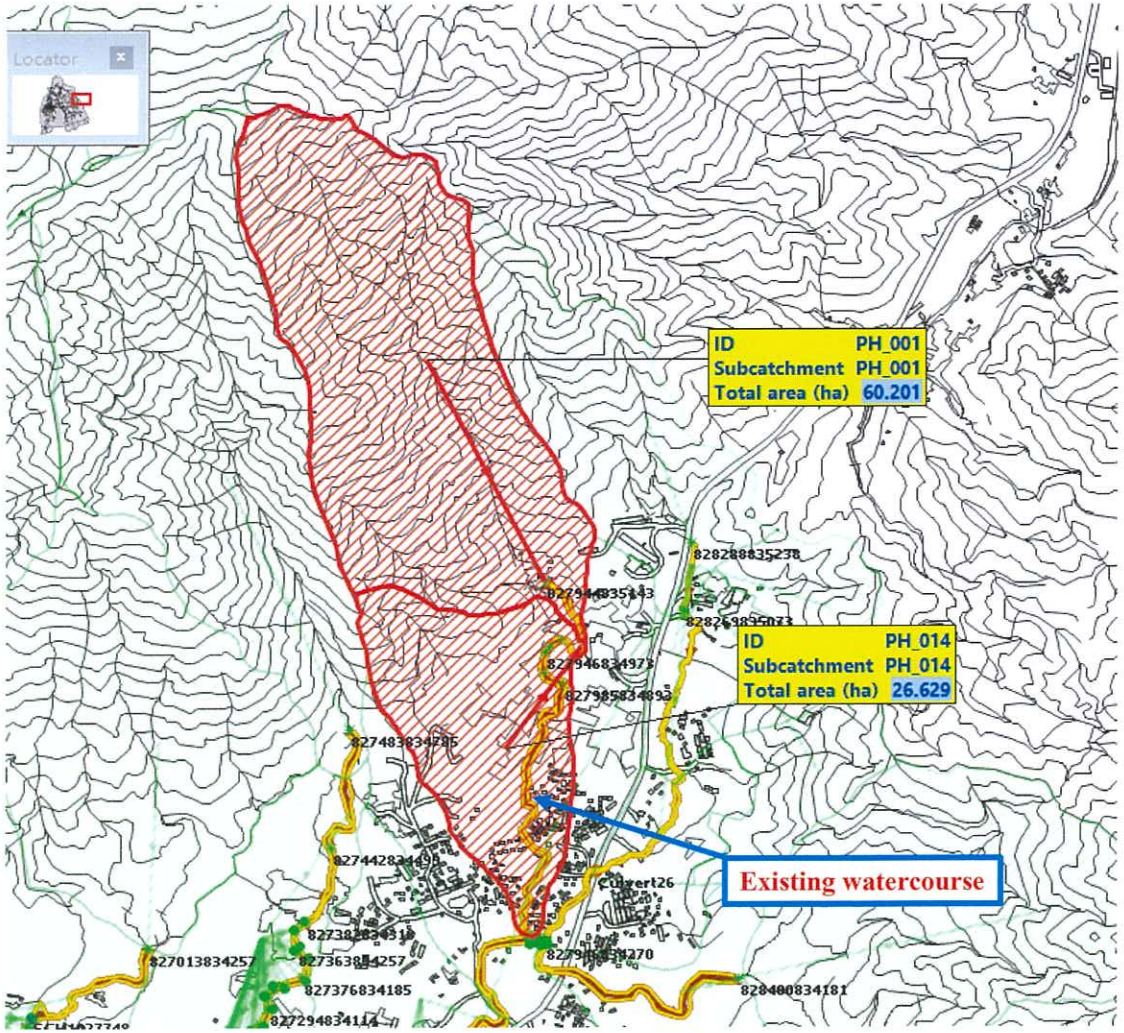
Location C : Section ID - P01_P_LAI TAU_160900



Offset (m)	X coordinate (m)	Y coordinate (m)	Bed level (m PD)
0.00	827915.89	834292.64	20.70
2.31	827913.70	834291.93	18.48
4.39	827911.70	834291.34	18.11
6.73	827909.45	834290.67	18.36
9.97	827906.38	834289.65	20.70

Location D : Section ID - P01_P_LAI TAU_161180_a

Location	Section ID	Return Period														
		2AB			10A			10B			50A			50B		
		Peak Water Level (mPD)	Peak Flow (m3/s)	Peak Velocity (m/s)	Peak Water Level (mPD)	Peak Flow (m3/s)	Peak Velocity (m/s)	Peak Water Level (mPD)	Peak Flow (m3/s)	Peak Velocity (m/s)	Peak Water Level (mPD)	Peak Flow (m3/s)	Peak Velocity (m/s)	Peak Water Level (mPD)	Peak Flow (m3/s)	Peak Velocity (m/s)
A	P01_P_LAI TAU_160000_a-P01_P_LAI TAU_02!	28.413	14.807	5.250	28.534	22.903	6.066	28.413	14.807	5.250	28.596	28.076	6.540	28.534	22.903	6.066
B	P01_P_LAI TAU_160530_a	26.415	14.807	4.864	26.578	21.151	5.682	26.415	14.806	4.864	26.673	28.825	6.121	26.578	23.151	5.682
C	P01_P_LAI TAU_160900	23.756	14.803	4.428	23.959	23.146	5.055	23.756	14.803	4.428	24.074	28.848	5.399	23.959	23.147	5.055
D	P01_P_LAI TAU_161180_a	19.534	14.849	2.118	19.966	23.219	2.395	19.534	14.850	2.118	20.232	28.989	2.543	19.966	23.220	2.395



Return Period	Runoff Flow (m3/s)	
	Sub-catchment : PH_001	Sub-catchment : PH_014
2AB	7.478	7.498
10A	13.813	10.945
10B	7.478	7.498
50A	18.796	13.157
50B	13.813	10.945

Appendix 5

Revised DIA Report

SMEC

Member of the Surbana Jurong Group

local people
global experience

D01 – Drainage Impact Assessment

Proposed Temporary Wholesales Trade (Food) in D.D. 111 and Adjoining Government Land, Pat Heung, Yuen Long

Reference No. 7076764
Prepared for Reitar Logtech Group Ltd
1 March 2024

SMEC INTERNAL REF. 7076764

Document Control

Document:	D01 – Drainage Impact Assessment
Project Name:	Proposed Temporary Wholesales Trade (Food) in D.D. 111 and Adjoining Government Land, Pat Heung, Yuen Long
Project Number:	7076764
Revision Number:	0

Revision History

REVISION NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED FOR ISSUE BY
0	1 March 2024	LUO, KAICHAO	Tommy KONG	Kitty LEE

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Important Notice

This report is confidential and is provided solely for the purposes of supporting Proposed Temporary Wholesales Trade (Food) in D.D. 111 and Adjoining Government Land, Pat Heung, Yuen Long. This report is provided pursuant to a Consultancy Agreement between SMEC Asia Limited ("SMEC") and Reitar Logtech Group Ltd, under which SMEC undertook to perform specific and limited tasks for Reitar Logtech Group Ltd. This report is strictly limited to the matters stated in it and subject to the various assumptions, qualifications and limitations in it and does not apply by implication to other matters. SMEC makes no representation that the scope, assumptions, qualifications and exclusions set out in this report will be suitable or sufficient for other purposes nor that the content of the report covers all matters which you may regard as material for your purposes.

This report must be read as a whole. Any subsequent report must be read in conjunction with this report.

The report supersedes all previous draft or interim reports, whether written or presented orally, before the date of this report. This report has not and will not be updated for events or transactions occurring after the date of the report or any other matters that might have a material effect on its contents or which come to light after the date of the report. SMEC is not obliged to inform you of any such event, transaction or matter nor to update the report for anything that occurs, or of which SMEC becomes aware, after the date of this report.

Unless expressly agreed otherwise in writing, SMEC does not accept a duty of care or any other legal responsibility whatsoever in relation to this report, or any related enquiries, advice or other work, nor does SMEC make any representation in connection with this report, to any person other than Reitar Logtech Group Ltd. Any other person who receives a draft or a copy of this report (or any part of it) or discusses it (or any part of it) or any related matter with SMEC, does so on the basis that he or she acknowledges and accepts that he or she may not rely on this report nor on any related information or advice given by SMEC for any purpose whatsoever.

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1 PROJECT BACKGROUND

1.1 Introduction

1.1.1 A temporary wholesale trade (food) development (the Proposed Use) has been proposed for a period of five years at Lots 872, 873, 875, 876, 877, 878, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891 (Part), 892 (Part), 893 (Part), 3049 and 3050 in DD 111 and adjoining government land, Pat Heung, Yuen Long ("the Site"). The Site is zoned "Open Storage" (OS) on the Approved Pat Heung Outline Zoning Plan (OZP) No. S/YL-PH/11. A planning application (no. A/YL-PH/804) for the Proposed Use was submitted under Section 16 of the Town Planning Ordinance (TPO) and was approved with conditions by the Town Planning Board (TPB) on 12 April 2019. Two of the approval conditions related to drainage issues are as follows:

(c) The submission of drainage proposal within 6 months from the date of planning approval to the satisfaction of the Director of Drainage Services or of the Town Planning Board by 12.10.2019; and

(d) In relation to (c) above, the implementation of drainage proposal within 9 months from the date of planning approval to the satisfaction of the Director of Drainage Services or of the Town Planning Board by 12.10.2019.

1.1.2 A drainage proposal has been submitted to Drainage Service Department (DSD) to discharge Approval condition (c). The submitted drainage proposal with a commitment made in the RtC was considered acceptable by DSD on 11 October 2021.

1.1.3 Further to the commitment in providing supplementary information to address comments from DSD (dated on 29 August 2023) and the comment from DSD dated 6 October 2023, the applicant is required to justify the capacity of the existing watercourse and taking into account the current revised design of the Proposed Development. SMEC Asia Ltd has been commissioned by Reitar Logtech Group Ltd to prepare a new Drainage Impact Assessment for the current revised design of the Proposed Development and justify the capacity of the existing watercourse

1.2 Site Description

1.2.1 The Site location and its environs are shown on ***Figure 1-1*** which the uses surrounding the Site include:

- To the North and East: Various open storage / storage yards, workshops, container trailers / tracker park.
- To the South: Village houses in Fu Shing Garden and Ha Che.
- To the West: Vacant land covered with vegetation under "Green Belt" zone.

1.2.2 The Site area is 21,586m^2 and the General Building Plan (GBP) has been submitted to Building Department in January 2024.

1.3 Objectives of this Report

1.3.1 The objectives of this new Drainage Impact Assessment are to:

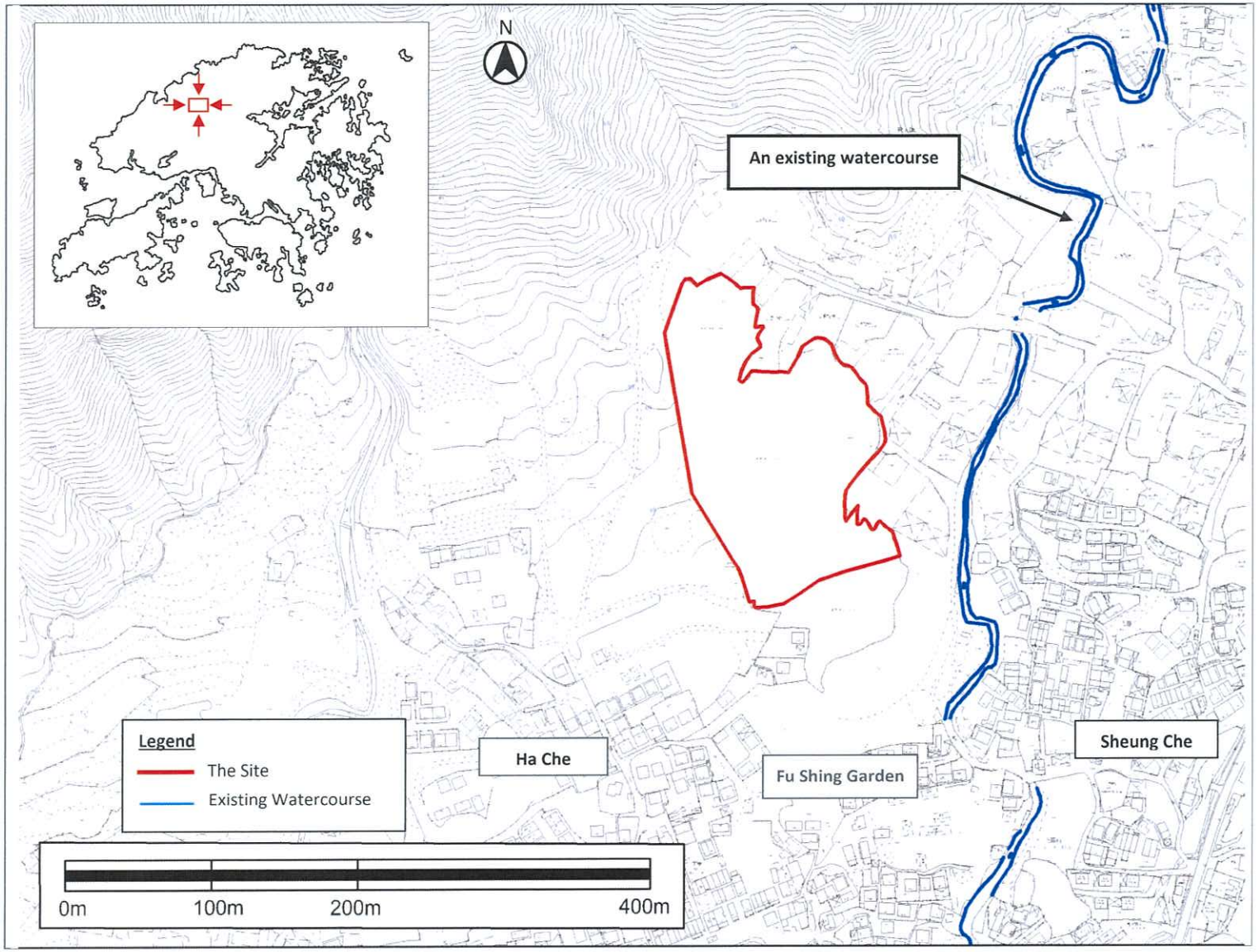
- Assess the potential drainage impacts arising from the Proposed Development taking in account the current revised design and justify the capacity of the existing watercourse.
- Recommend the necessary mitigation measures to alleviate any impacts.

1.4 Reference Materials

1.4.1 In evaluating the drainage impact arising from the Proposed Use, the following materials have been referred to:

- Drainage Services Department (DSD) publication Stormwater Drainage Manual (with Eurocodes incorporated) – Planning, Design and Management (2018 Edition).
- DSD Stormwater Drainage Manual Corrigendum No. 1/2022
- DSD Advice Note No. 1 – Application of the Drainage Impact Assessment Process to Private Sector Projects.
- DSD publication Technical Note to prepare a "Drainage Submission".
- GeoInfo Map reviewed on 05 February 2024.
- Boundary conditions of the existing watercourse provided by DSD on 21 February 2024.
- Pre-CCTV Survey Report carried by Pipeline Drainage Ltd. conducted on 23 September 2020 for the existing pipe near the Site.
- Topographical Survey near Lot No. 858, 861 S. A, 864 S.C, 862, 872-873, 875-878, 880-893, 894 S. A & S. B, 895, 3049-3050, 3083 in D.D.111, Ha Che, Yuen Long, prepared by Keyland Surveying, Planning & GIS Co. Ltd on 24 January 2019.

Figure 1-1: Site Location and its Environs



2 DESCRIPTION OF EXISTING ENVIRONMENT AND DRAINAGE CONDITIONS

2.1 Site Topography and Characteristics

2.1.1 As illustrated on ***Figure 1-1***, the Site is situated on a vacant land to the north of Ha Che in Pat Heung, Yuen Long and surrounded by various open storage / storage yards, workshops, container trailers / tracker park, village houses and vacant land. As the planning application has been approved in 2019, the construction works has already commenced. The site is currently undergoing site formation in February 2024.

2.1.2 The land survey conducted before the commencement of construction indicated that the site surface before proposed development was generally coarse and uneven with small gradient. The elevation ranged from the highest 39.33mPD at the north west corner of the site to the lowest 28.13mPD was at the south east corner. Referring to the site investigation in 2020, the Site was covered with mostly grassland.

2.1.3 After the proposed development, the site will experience excavation and backfilling to enable the construction of power cap and superstructure. Within the building line, the ground level will be flattened to 34.0mPD while the uneven topographic level along the site boundary will be constructed as an emergency vehicle access (EVA) ramp, enclosing the superstructure of the proposed development. 1,058m^2 of the site area will be reserved for greenery. The 1st floor layout plan and section plan of the proposed project has been extracted from the submitted GBP and presented as ***Appendix A***.

2.2 Baseline Drainage Conditions

2.2.1 With reference to GeoInfo Map and review on drainage layout records in DSD drawing office in May 2020 and February 2024, there is no municipal drainage system in the vicinity of the Site.

2.2.2 Based on the site observation and CCTV pipe inspection provided as ***Appendix B*** in this report, there is an existing precast concrete pipe connecting the eastern boundary of the Site to an existing watercourse to the east of the Site as shown on ***Figure 2-1***. The dimension of the precast concrete pipe is Ø1,800mm in diameter starting from the Site and then change to Ø600mm in diameter near the outlet at the watercourse. Hence, under the past drainage arrangement of the site, the runoff collected in site would be conveyed to by the precast concrete pipe, and discharged to the existing watercourse at the east of the Site. Siltation and collapse of the existing pipe was observed during the CCTV inspection.

Figure 2-1: Existing Drainage Arrangement of the Site

3 DRAINAGE IMPACT

3.1 Assumptions and Methodology

3.1.1 Peak instantaneous runoff before and after the Proposed Use was calculated based on the Rational Method. The recommended physical parameters, including runoff coefficient (C) and storm constants for different return periods, are as per the *Stormwater Drainage Manual*.

3.1.2 The Rational Method has been adopted for hydraulic analysis and the peak runoff is given by the following expression:

$$Q_p = 0.278\, C\, i\, A \qquad \text{--- Equation 1}$$

where Q_p = peak runoff in m^3/s
C = runoff coefficient
i = rainfall intensity in mm/hr
A = catchment area in km^2

3.1.3 Rainfall intensity is calculated using the following expression:

$$i = \frac{a}{(t_d + b)^c} \qquad \text{--- Equation 2}$$

where i = rainfall intensity in mm/hr
t_d = duration in minutes ($t_d \leq 240$)
a, b, c = storm constants given in Table 3 of SDM

3.1.4 For a single catchment, duration (td) can be assumed equal to the time of concentration (tc) which is calculated as follows:

$$t_c = t_0 + t_f \qquad \text{--- Equation 3}$$

where t_c = time of concentration
t_0 = inlet time (time taken for flow from the remotest point to reach the most upstream point of the urban drainage system)
t_f = flow time

3.1.5 Generally, t0 is much larger than tf. As shown in Equation 2, td is the divisor. Therefore, larger td will result in smaller rainfall intensity (i) as well as smaller Qp. For the worst-case scenario, tf is assumed to be negligible and so:

$$t_d = t_c = t_0$$

$$t_0 = \frac{0.14465\, L}{H^{0.2} A^{0.1}} \qquad \text{--- Equation 4}$$

where A = catchment area (m^2)
H = average slope (m per 100 m), measured along the line of natural flow, from the summit of the catchment to the point under consideration
L = distance (on plan) measured on the line of natural flow between the summit and the point under consideration (m)

3.1.6 The capacities of the drainage pipes have been calculated using the Colebrook-Whit Equation, assuming full bore flow with no surcharge, as follows, in accordance with the Stormwater Drainage Manual:

$$V = -\sqrt{32gRs} \times \log\left(\frac{k_s}{14.8R} + \frac{1.25\upsilon}{R\sqrt{32gRs}}\right) \qquad \textbf{--- Equation 5}$$

where
- V = mean velocity (m/s)
- g = gravitational acceleration (m/s^2)
- R = hydraulic radius (m)
- k_s = hydraulic pipeline roughness (m)
- υ = kinematic viscosity of fluid (m^2/s)
- s = hydraulic gradient (energy loss per unit length due to friction)

3.1.7 On the other hand, the capacity of open channel has been calculated using the Manning's Equation:

$$V = \frac{R^{2/3} \times S^{1/2}}{n} \qquad \textbf{--- Equation 6}$$

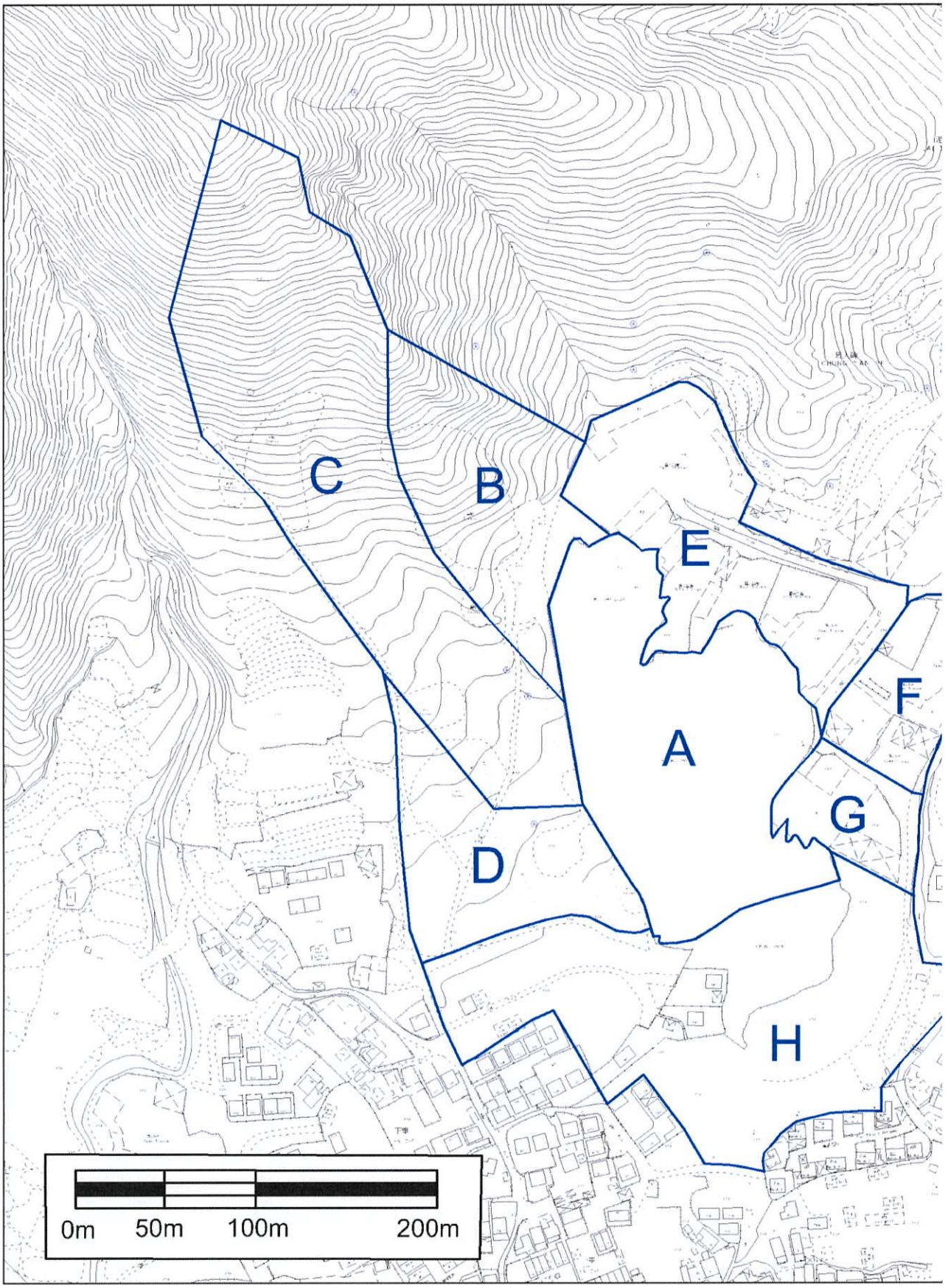
where
- V = mean velocity (m/s)
- R = hydraulic radius (m)
- n = Manning coefficient ($s/m^{1/3}$)
- s = hydraulic gradient (energy loss per unit length due to friction)

3.1.8 Since ***Equation 4*** is derived for natural catchment. It will no longer be valid for the site after the proposed development. Making reference to the rainfall intensity estimation approach in Highway Department *Guidance Notes on Road Pavement Drainage Design*, an arbitrary 5 minutes inlet time will be adopted for the calculation of runoff from the Site after proposed development.

3.2 Assessment Assumptions

Identification of Catchments

3.2.1 A total of 8 Catchments were identified in reference to the basemap obtained from Lands Department Hong Kong Map Service website in February 2024. The identified catchments as well as their flow paths has been drawn in ***Figure 3-1: Identified Catchments***



3.2.2 As no other identified stream or drainage system at the vicinity of the Site, it is anticipated all the

runoff from the identified catchments is collected through the nearby watercourse described in ***Section 2.2*** and presented in ***Figure 2-1***.

3.2.3 Catchment A is the Site. Before the proposed development, its central and south eastern corner was at lower elevation than its edge. The runoff collected in Catchment A was conveyed through the precast concrete pipe. Catchment B, C and D are the hillside and footing of Kai Kung Leung. It is estimated that the runoff generated from Catchment B, C, D will be intercepted by Catchment A. Catchment E, F, G is the open storage area at the vicinity of the site. Since the precast concrete pipe passes through Catchment G and two connection points to the pipe is found within Catchment F. The runoff from Catchment F is very likely conveyed through the concrete pipe to the watercourse. The Catchment H is currently a construction site embraced by large area of greenery before development. Based on desktop study, the site formation on the Site has already commenced, and there is concurrent construction activity within Catchment H. The photo taken in September 2020 showing the previous condition of the Site and the surrounding catchments before commencement of construction are provided in ***Appendix C***.

3.2.4 After the Proposed Development, it is anticipated that surface characteristic of the Site will be changed. After the Proposed Development, the Site will become mostly paved. The runoff coefficient of the Site will change from 0.15 to 0.91 accordingly. Even though there is concurrent construction activity on Catchment H, as a conservative approach, the surface characteristic of the construction area within Catchment H (around 30% of the Catchment H area) is assumed to be paved area. Making reference to *Stormwater Drainage Manual*, the runoff coefficient of each identified catchment at the vicinity of the site is calculated and shown in ***Table 3-1***.

Table 3-1: Surface Characteristic of Identified Catchments

Catchment ID	Area (km^2)	Surface Characteristics	Runoff Coefficient
A (before proposed development)	21586	100% flat grassland	0.15
A (after proposed development)	21586	5% flat grassland + 95% paved	0.91
B	11806	100% steep grassland	0.2
C	31282	100% steep grassland	0.2
D	10335	100% flat grassland	0.15
E	14805	100% concrete paved	0.95
F	5783	100% concrete paved	0.95
G	4190	100% concrete paved	0.95
H	27154	70% flat grassland + 30% paved	0.39

3.3 Estimation of Runoff

3.3.1 To access the drainage impact of the proposed development, the runoff generated from each catchment has been calculated with rainfall intensity of 2 years, 10 years and 50 years return period coupled with 11.1% rainfall increase projection at the middle 21st century. The design allowance is not considered in this DIA because of the temporary usage nature of the proposed development. The calculation result is shown in ***Table 3-2***. It is estimated that the proposed development will increase the runoff from the Site by 1.194m^3/s, from 0.197m^3/s to 1.391m^3/s under rainfall of 50 years returning period. The detailed calculation of runoff from each catchment under different returning period is provided in ***Appendix D***.

Table 3-2: Runoff from each Identified Catchment

Catchment	Runoff during Rainfall of each Returning Period (m^3/s)		
	2 years	10 years	50 years
A (before proposed development)	0.139	0.175	0.197

A (after proposed development)	1.01	1.253	1.391
B	0.122	0.152	0.168
C	0.25	0.318	0.361
D	0.07	0.087	0.098
E	0.649	0.813	0.911
F	0.328	0.404	0.444
G	0.225	0.278	0.307
H	0.468	0.589	0.662

3.4 Proposed Drainage Layout

Internal Drainage System

3.4.1 As mentioned in Section 3.2.3, the runoff generated in Catchment B, C, D are intercepted by Catchment A, the Site. Beside the runoff generated on site after proposed development, the internal drainage design should also take the runoff from Catchment B, C, D into consideration. Therefore, the peak runoff that will be sustained by the internal drainage system of the Site is estimated to be 2.018m^3/s.

3.4.2 In order to intercept the overland flow from the nearby catchments and convey the collected runoff to terminal manhole, two series of U-channel will be constructed along the periphery of the Site from the high point of the EVA ramp to the proposed Site entrance which is at the lowest elevation. And one additional U-channel will be constructed on the open yard of the proposed development to help convey the runoff collected in roof and rain gutters. The layout of the proposed internal drainage system has been shown in ***Figure 3-2***.

3.4.3 Based on the post development topographic level as well as the proposed U-channel layout, the site, Catchment A, can be split into 4 sub-catchments. Assuming that the distribution of runoff into each section of U-channel approximately follows the projection of catchment area on each section of channels, the required dimensions of U-channel for the internal drainage system can be estimated by the catchments they serve. The schedule of all U-channel for the proposed internal drainage system is presented in ***Table 3-3***. The sub-catchments within the Site as well as the dimension and gradient of each U-channel section is shown in ***Figure 3-3***. The typical details of the U-channel are referred to *Technical Note to Prepare a Drainage Submission* and have been provided in ***Appendix E***. The calculation of channel capacity is provided in ***Appendix F***.

Table 3-3: Channel Schedule of Proposed Internal Drainage System

Channel	Channel Section	Upstream Catchpit	Downstream Catchpit	Diameter (m)	Gradient (1 over)	Utilisation Rate
Northern Channel	01	Catchpit 09	Catchpit 08	0.225	40	61%
	02	Catchpit 08	Catchpit 07	0.225	40	61%
	03	Catchpit 07	Catchpit 06	0.225	30	53%
	04	Catchpit 06	Catchpit 05	0.3	30	64%
	05	Catchpit 05	Catchpit 04	0.3	30	64%
	06	Catchpit 04	Catchpit 03	0.375	30	61%
	07	Catchpit 03	Catchpit 02	0.375	25	55%
	08	Catchpit 02	Catchpit 01	0.375	25	55%
Southern Channel	09	Catchpit 09	Catchpit 10	0.375	30	45%
	10	Catchpit10	Point 1	0.375	30	55%
	11	Point 1	Catchpit 11	0.375	21	46%
	12	Catchpit 11	Point 2	0.45	21	39%
	13	Point 2	Catchpit 12	0.525	200	79%
	14	Catchpit 12	Catchpit 13	0.525	200	79%

	15	Catchpit 13	Catchpit 14	0.525	200	79%
	16	Catchpit 14	Catchpit 15	0.525	150	88%
	17	Catchpit 15	Catchpit 16	0.525	150	88%
Central Channel	18	Catchpit 19	Point 3	0.45	100	85%
	19	Point 3	Catchpit 18	0.45	37	52%
	20	Catchpit 18	Catchpit 17	0.45	40	54%
	21	Catchpit 17	Catchpit 16	0.45	40	54%

Note: Point 1, 2, 3 indicated the change of EVA ramp gradient. The gradient of channel is therefore changed accordingly.

External Drainage System

3.4.4 The proposed external drainage system has been drawn in ***Figure 3-4***. As mentioned in previous section, the runoff generated on site as well as the intercepting catchments will be collected by the three U-channels in the internal drainage system. The runoff collected in the U-channels will later flow through internal underground connection pipes to the terminal manhole, and will eventually flow through the external drainage system and discharge to the nearby watercourse. Since the existing precast concrete pipe on Site was found damaged during the CCTV inspection, a new external drainage system is proposed. The new discharge point is right under the footbridge across the watercourse.

3.4.5 The proposed external drainage system consists of a 1500mm underground circular precast concrete pipe in a gradient of 1:200. Because the proposed external drainage system will pass through Catchment E, the runoff generated on Catchment E will be taken into consideration in the hydraulic assessment of the external drainage system. In this regard, the total runoff flow through the 1500mm pipe will be 2.929m3/s. The calculation of flow capacity of the external drainage system is provided in **Appendix F**.

Table 3-4: Hydraulic Assessment Result of Proposed External Drainage System

From	To	Length (m)	Diameter (m)	Flow Capacity (m^3/s)	Total Runoff (m^3/s)	Utilisation Rate
Catchpit 01	Terminal Manhole	9.04	0.75	0.902	0.602	67%
Catchpit 16	Terminal Manhole	3.46	1.05	2.170	1.416	65%
Terminal Manhole	RMH-X1	1.36	1.50	5.494	2.929	53%
RMH-X1	RMH-X2	24.82	1.50	5.494	2.929	53%
RMH-X2	RMH-X3	34.09	1.50	5.494	2.929	53%
RMH-X3	RMH-X4	47.65	1.50	5.494	2.929	53%
RMH-X4	Discharge Point	6.41	1.50	5.494	2.929	53%

Existing Watercourse

3.4.6 The photos of the existing watercourse are presented in ***Figure 3-5***. The information of the existing watercourse shown in ***Appendix G*** are obtained from DSD.

3.4.7 As the proposed storm water discharge point of the proposed development is at the downstream of Location A and Location B, and at the upstream of Location C and Location D, the hydraulic assessment of the watercourse will be conducted by the estimation of available flow capacity at Location C and Location D under a 10-year sea level in conjunction with a 50-year rainfall, which is the scenario generating the maximum amount of runoff, and resulting in the highest water level in the watercourse.

3.4.8 As shown in ***Appendix G***, the peak water level at Location C of the watercourse is at 24.074mPD, and at Location D is at 20.232mPD, and the peak flow is 28.848 m^3/s and 28.990 m^3/s respectively.

The bank level of the watercourse at Location C and Location D is at 24.90mPD and 20.70mPD. Under the uniform flow condition, the velocity of an open channel depends on hydraulic radius, surface roughness, and channel gradient. With the information provided by DSD, the peak velocity and the corresponding peak water level is given, the hydraulic property of the watercourse at Location C and D can therefore be back calculated, enabling the estimation of watercourse capacity under different water level. Reserving a 300mm freeboard in reference *to Stormwater Drainage Manual*, the maximum capacity of watercourse has been calculated to be 62.72 m^3/s at Location C and 37.78 m^3/s at Location D as shown in ***Table 3-5***. The detailed calculation breakdown is shown in ***Appendix H***. Under the scenario of a 10-year sea level in conjunction with a 50-year rainfall, the available flow capacity of the watercourse at Location C and D is 33.88m^3/s and 8.8m^3/s. As Location D is at the downstream of Location C, the maximum allowable stormwater discharge to the watercourse will be 8.8m^3/s.

Table 3-5: Capacity of Watercourse at Location C and D

Location C	Water Level (mPD)	Hydraulic Radius (m)	Peak Velocity (m/s)	Peak Flow (m^3/s)	Available Capacity (m^3/s)
Existing Boundary Condition	24.074	0.71	5.40	28.85	-
300mm freeboard	24.600	0.98	6.67	62.72	33.88
Location D	**Water Level (mPD)**	**Hydraulic Radius (m)**	**Peak Velocity (m/s)**	**Peak Flow (m^3/s)**	**Available Capacity (m^3/s)**
Existing Boundary Condition	20.232	1.25	2.54	28.99	-
300mm freeboard	20.400	1.33	2.65	37.78	8.80

3.4.9 Mentioned in ***Section 3.3.1***, the additional runoff generated from the change of site characteristic during the proposed development has been estimated to be 1.194m^3/s, which is far lower than the allowable discharge 8.8m^3/s. Based on the analysis, the existing watercourse has sufficient capacity to sustain the drainage impact from the proposed development, and no adverse flooding risk due to the proposed development will be anticipated.

3.5 Summary

3.5.1 The runoff generated from the site before and after the proposed development as well as the nearby catchments has been calculated. Under rainfall intensity of 50 years returning period with consideration of climate change effect at the middle 21st century, a total of 2.018m^3/s of runoff will be intercepted by the Site, including the runoff generated on site and the adjacent hillside catchments.

3.5.2 To mitigate the drainage impact from the proposed development, three series of U-channels have been proposed as the internal drainage system to intercept overland flow and collect storm water before discharging to the existing watercourse through underground pipes.

3.5.3 The available capacity of the existing watercourse has been assessed from the information provided by DSD. It is expected that the watercourse can handle the increment of runoff caused by the proposed development.

3.5.4 No adverse impact is anticipated from the proposed development after the provision of 3 series of U-channel as internal drainage system and the proposed 1500mm underground pipe as external drainage system.

Figure 3-1: Identified Catchments

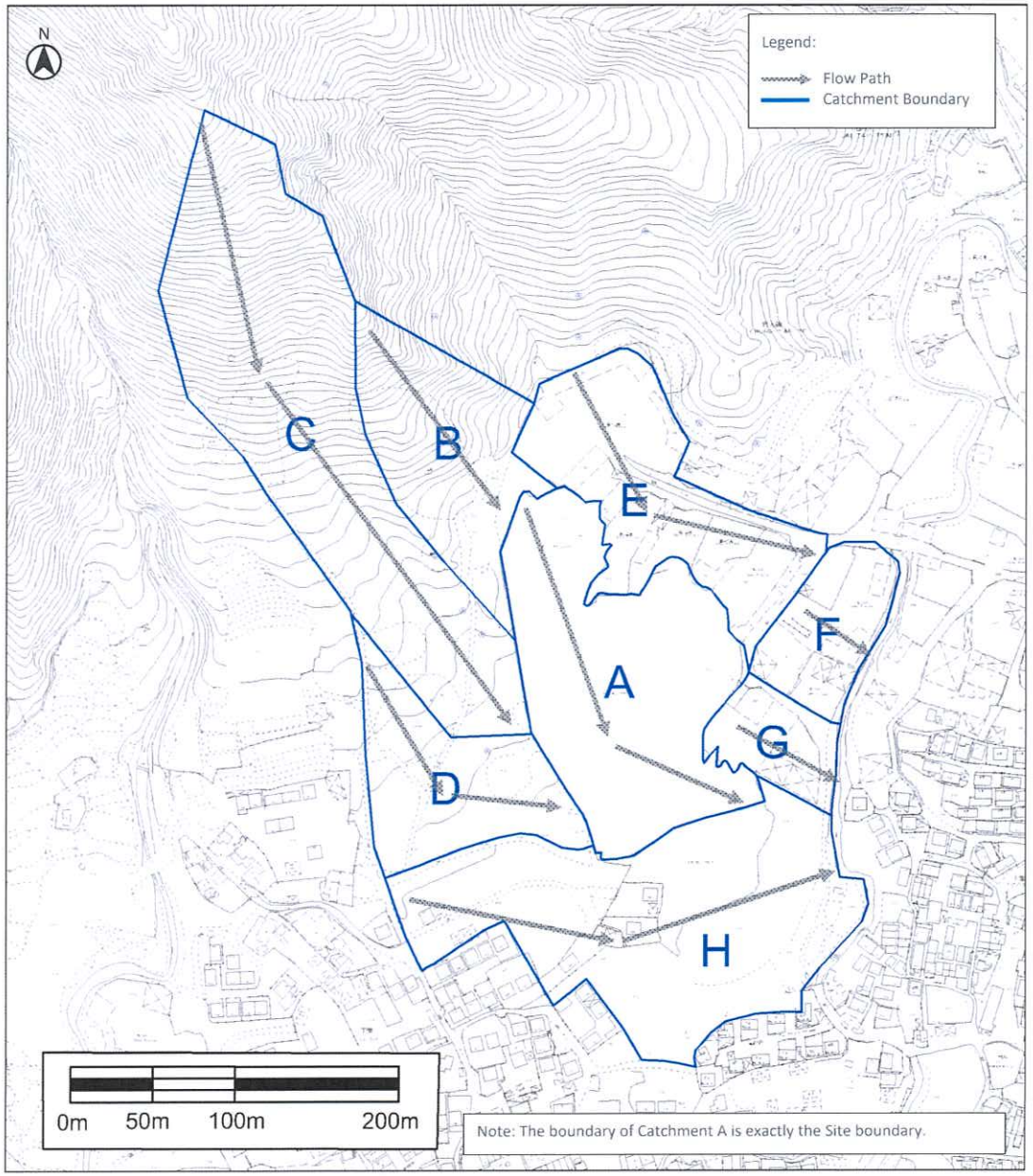


Figure 3-2: Proposed Internal Drainage System

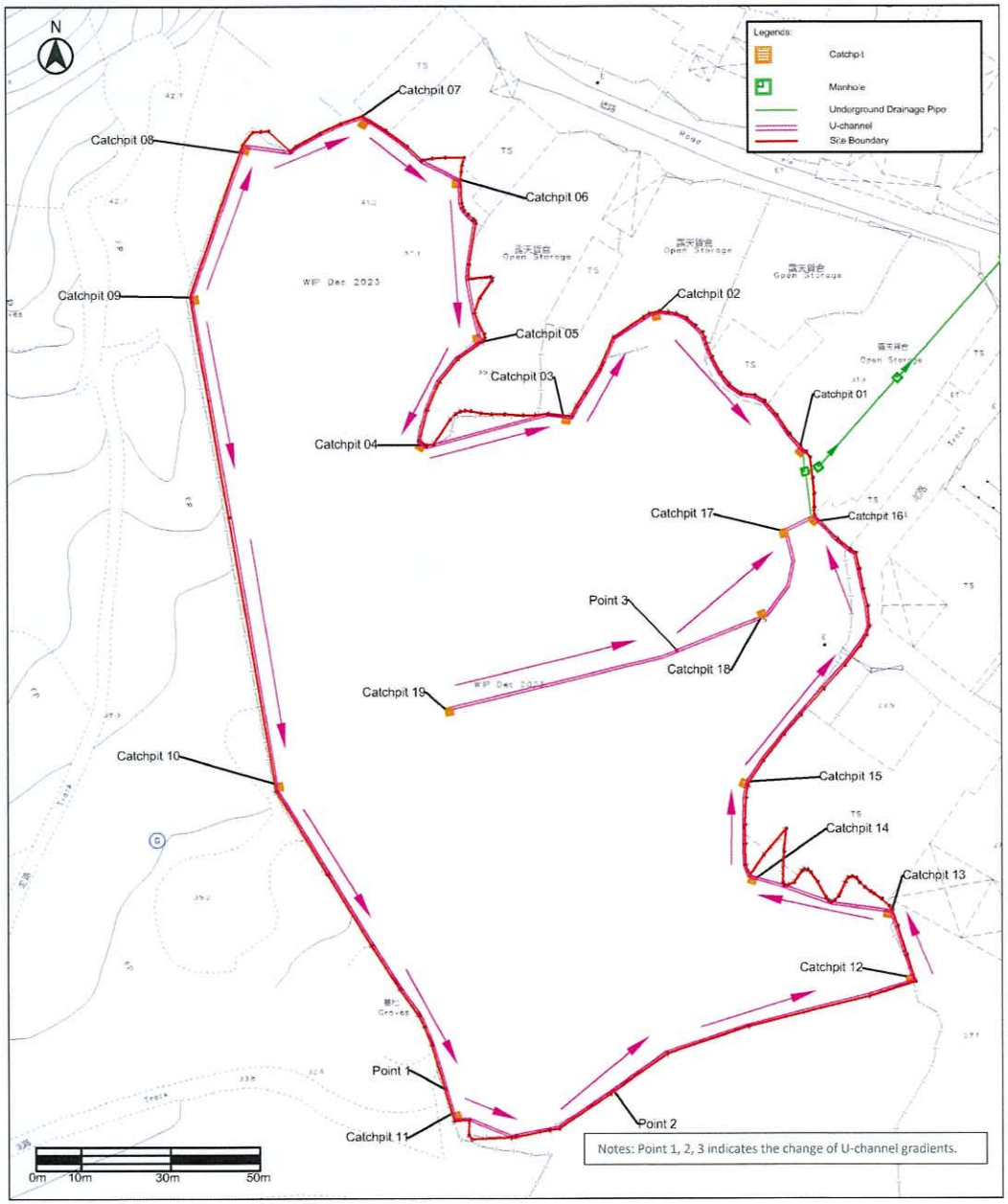


Figure 3-3: Sub-catchments within the Site

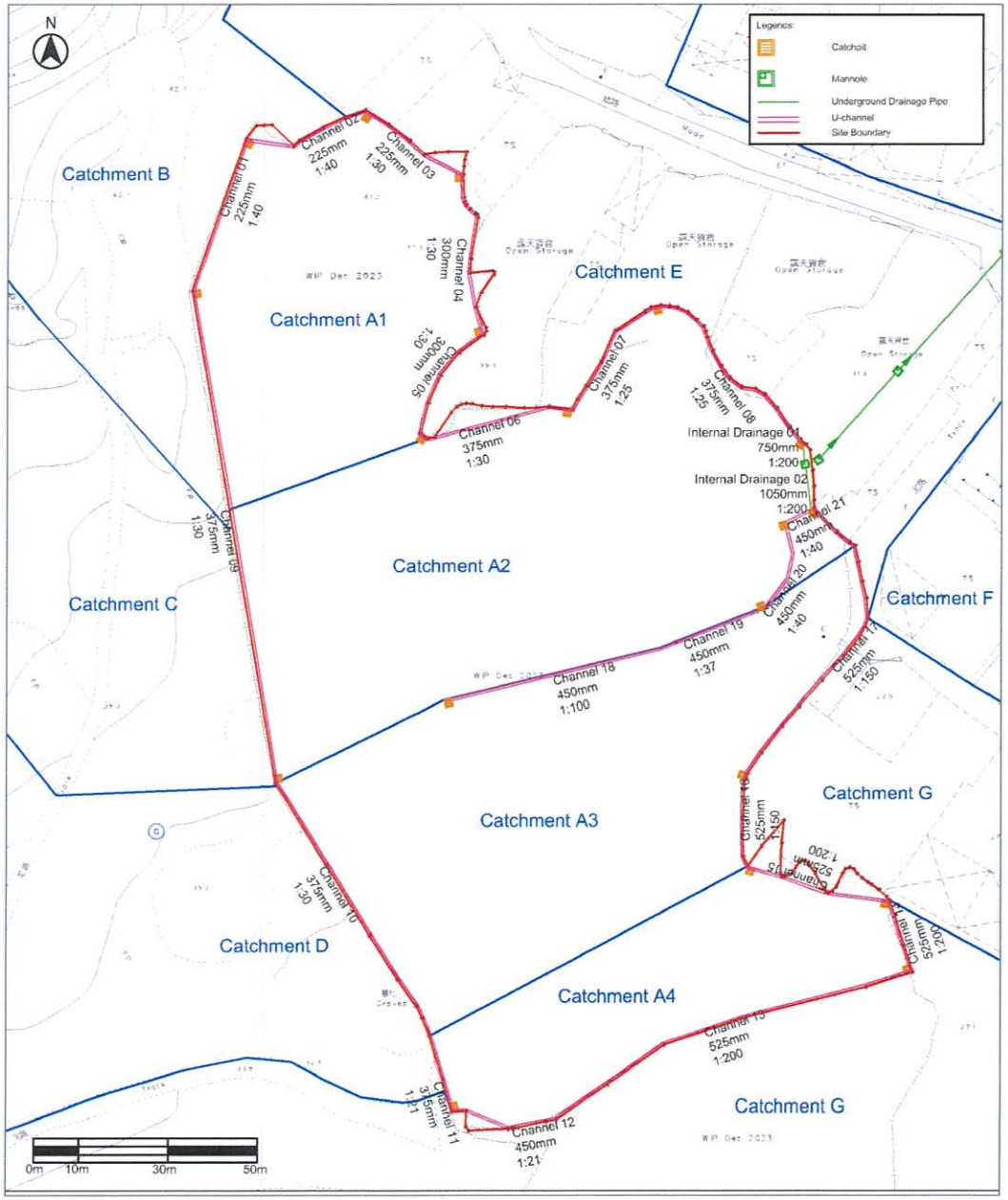


Figure 3-4: Proposed External Drainage System

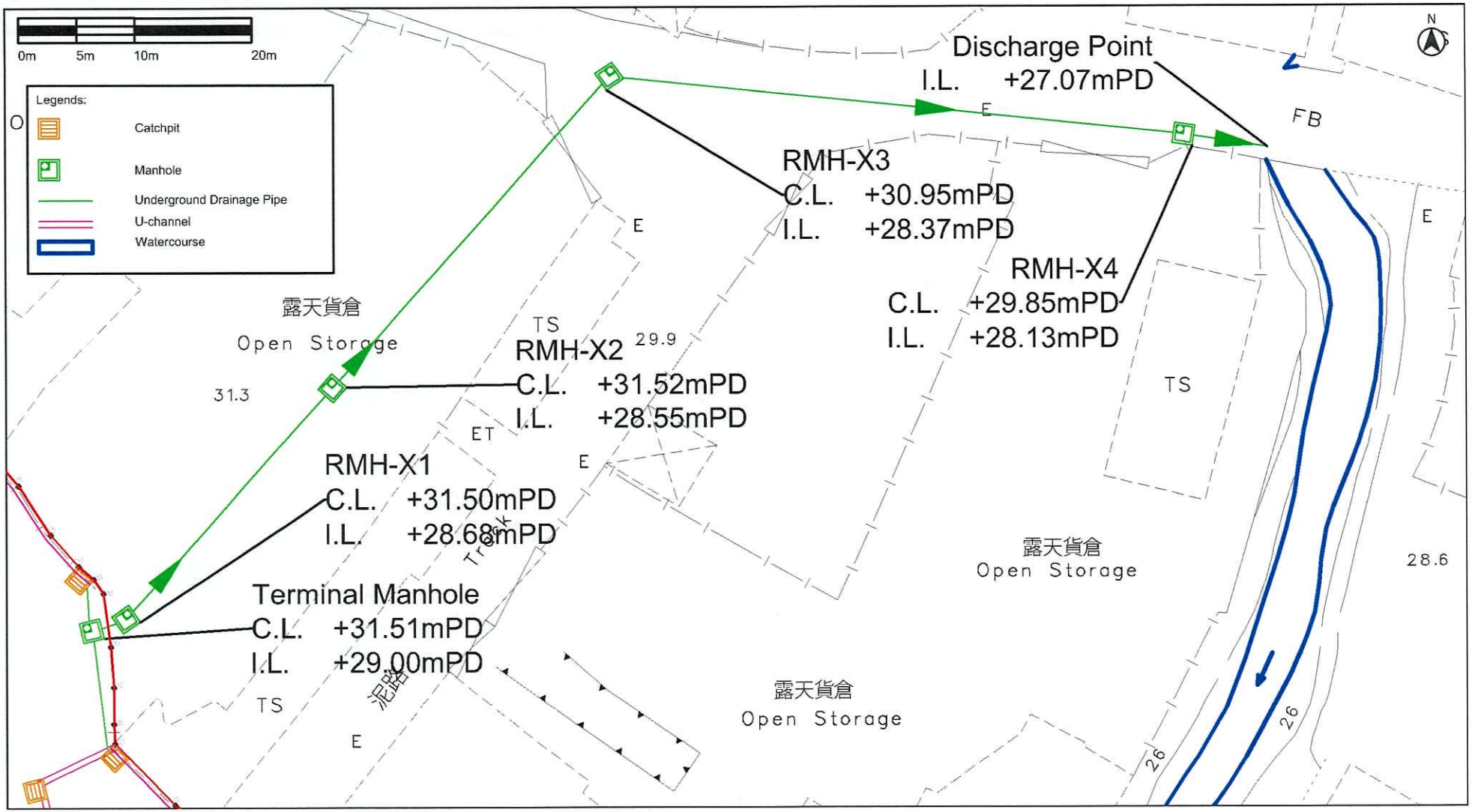
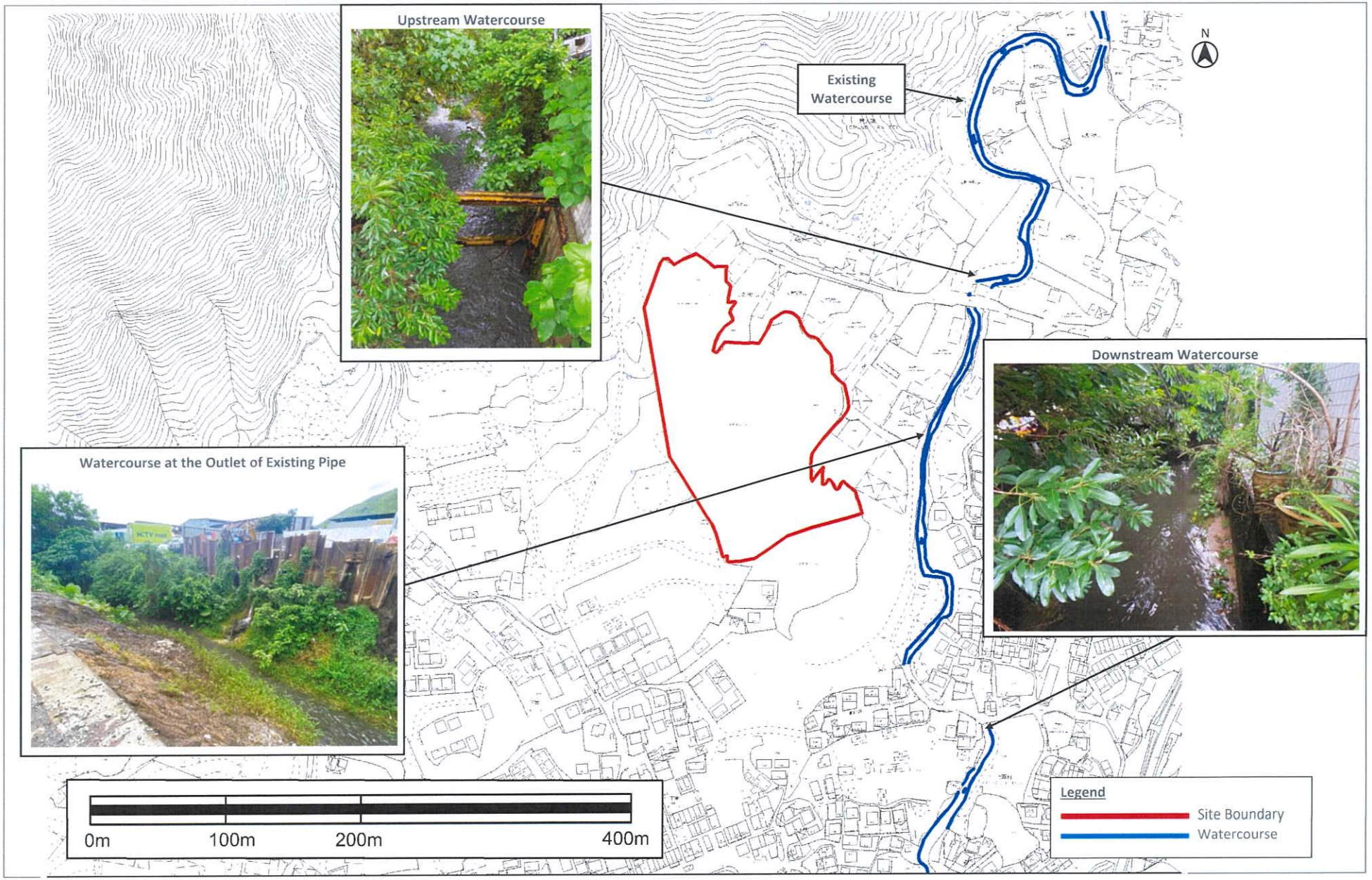


Figure 3-5: Photos of the Existing Watercourse



4 CONCLUSION

4.1.1 The surface characteristic and the drainage arrangement of the site and the nearby catchments has been discussed in this report. Potential drainage impacts that may arise from the Site after construction of the Proposed Development have been assessed.

4.1.2 The peak runoff before and after the development of the Site has been estimated using Rational Method and based on the catchment surface characteristics for the existing environment and the Proposed Development. The total runoff generated from the Site and the intercepting catchments has been estimated to be 2.018 m^3/s under the rainfall intensity of 50 years returning period with the consideration of 11.1 rainfall increase projection at the middle 21st century.

4.1.3 To mitigate the drainage impact from the proposed development, three series of U-channels have been proposed as the internal drainage system to intercept overland flow and collect storm water before discharging to the existing watercourse through underground pipes.

4.1.4 Based on the information provided by DSD, the available capacity of the existing watercourse has been assessed. It is expected that the watercourse can handle the increment of runoff caused by the proposed development.

4.1.5 No adverse impact is anticipated from the proposed development after the provision of 3 series of U-channel as internal drainage system and the construction of 1500mm underground pipe as external drainage system.

Appendix A LAYOUT PLAN OF THE PROPOSED DEVELOPMENT


WESTERN ELEVATION
SOUTHERN ELEVATION
NORTHERN ELEVATION
EASTERN ELEVATION
LEVEL-2 KEY PLAN
(TRACKING LAYOUT FOR ITSD REFERENCES ONLY)
GYU Limited
Gabriel Yu
KAMUI
"We Built It."
LEVEL-2 KEY PLAN
G04

Appendix B CCTV PIPE INSPECTION REPORT

高寶渠務工程有限公司
Pipeline Drainage Ltd.

PRE-CCTV SURVEY REPORT

Work Location: Fan Kam Road,
Fanling, N.T.

CCTV Survey Date: September 23, 2020

地點 : LOCATION	**PD796 Fan Kam Road,Fanling N.T.** 新界 粉嶺 粉錦公路	PROJECT TITLE 工程名稱 : **PRE-CCTV**	DATE 日期 : **22-09-2020**	SCALE 比例: N.T.S. ■

Summary of Defects

Works Order No.					Colour CCTV Drainage Survey																		
					Pipe									Service Condition								MISC	
Item No.	Manhole		Meters (m)	Urgent	Cracked	Fractured	Broken	Deformed	Collapsed	Hole	Surface Spalling/Wear	Joint Displaced	Open Joint	Roots	Infiltration	Encrustation	Silt	Grease	Obstruction	Water Line	Line	Survey Abandoned	camera Under Water
	From	To																					
001	S1	S2	098.8	**2**					**2**			**1**	**1**				**7**			**1**			
		Total	98.8	**2**					**2**			**1**	**1**				**7**			**1**			

Summary of Pipelines

Project/Contract/Wo No. | Slope Reference No. -

Date : 23.09.20

Location : FANLING

Drain / Sewer use : Surface water

Item	Manhole		Pipe			Manhole(From)			Grades			Remarks
	From	To	Lengths(m)	Size(mm)	Material	I.L.	C.L.	Depths(m)	SCG	ICG	SPG	
1	S1	S2	098.8	1800	CO				1	5	5	

Contract No. :
PRE-CCTV SURVEY REPORT AT
FAN KAM ROAD DD111
FANLING, N.T.

CCTV SURVEY

Works Order No. :

Summary of CCTV Survey Results:

ID	Pipe Length Ref.	Start MH	Finish MH	Survey Area	Function	Size	Grade	Length	Clean	Remarks
1	S1X	S1	S2	NT	S	1800	5	98.8m	N	FH

CCTV Survey Report

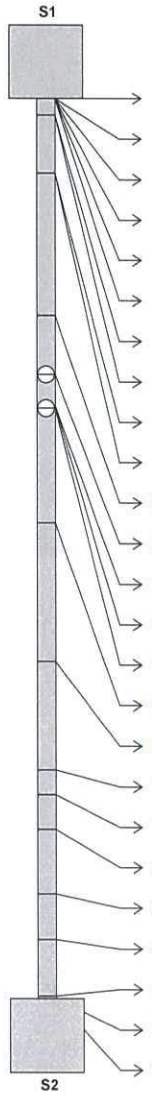
Heading

Contract No.		Operator	KELVIN LING	Date	23.09.20	ID	001
Purpose	Structural defects	Job No.		Time		PLR	S1X
Start MH	S1	Finish MH	S2	Weather	Dry	Use	Surface water
Depth		Depth		Cleaned	No	Direction	Downstream
Cover Level		Cover Level		Score	165	Pipe Length	
Invert Level		Invert Level		Grade	5	Total Length	98.8

Road	FAN KIM ROAD DD111	Size	1800 mm
Location	FANLING	Shape	Circular
Loc. Code	Light road	Material	Concrete
Area Code	-	Lining	Nil
District	NT	Comment	
Division	-	Loc. Details	
Category	Z	Tape	0001

Coding

FLOW



Video No.	1:800	Chainage	Code	Observation	Photo	Grade
0:00:00		0.0	ST	Start Of Survey		0
		0.0	MH	Manhole Remark : S1		0
		0.0	WL	Water Level, 0 % height/diameter		0
0:01:20		0.0	GP	General Photograph	001	0
		0.0	**X**	**Collapse, 15 % cross-sectional area loss, Start**		**5**
		0.0	DES	Debris Silt, 25 % cross-sectional area loss, Start		1
0:01:33		**1.8**	**X**	**Collapse, 15 % cross-sectional area loss, Finish**	**002**	**5**
		1.8	DES	Debris Silt, 25 % cross-sectional area loss, Finish		1
0:01:51		8.2	JDM	Joint Displaced Medium	003	1
		8.2	DES	Debris Silt, 05 % cross-sectional area loss		1
0:02:45		23.8	OJL	Open Joint Large	004	2
0:03:09		30.3	CN	Connection, at 12 o'clock, dia 150 mm	005	0
0:03:23		33.7	DES	Debris Silt, 05 % cross-sectional area loss	006	1
		33.7	DES	Debris Silt, 05 % cross-sectional area loss, Start		1
0:03:29		34.0	CN	Connection, at 12 o'clock, dia 150 mm	007	0
0:04:08		46.6	DES	Debris Silt, 35 % cross-sectional area loss, Change	008	1
0:04:55		61.8	DE	Debris, 40 % cross-sectional area loss	009	1
0:05:52		73.7	DES	Debris Silt, 35 % cross-sectional area loss, Finish	010	1
0:06:18		76.4	DC	Dimension Change Remark : 600MM	011	0
0:08:26		80.2	GP	General Photograph	012	0
0:09:11		87.3	GP	General Photograph	013	0
0:09:36		92.3	GP	General Photograph	014	0
0:10:06		98.5	GP	General Photograph	015	0
0:10:58		98.8	MH	Manhole Remark : S2	016	0
0:11:05		98.8	FH	Finished Survey		0

- Structural Defects
- Service Defects
- **Structural Defects with Grade 4 or 5**
- **Service Defects with Grade 4 or 5**
- Constructional Features
- Miscellaneous Features

CCTV Photographs

Road	FAN KIM ROAD DD111	Start MH	S1	Size	1800 mm	ID	001
Location	FANLING	Finish Pt.	S2	Shape	Circular	PLR	S1X
				Material	Concrete		

Photo Ref. : 001 **Video Tape :** 0001, 0:01:20
Observation : General Photograph

Photo Ref. : 002 **Video Tape :** 0001, 0:01:33
Observation : Collapse, 15 % cross-sectional area loss, Finish

- Structural Defects
- Service Defects
- **Structural Defects with Grade 4 or 5**
- **Service Defects with Grade 4 or 5**
- Constructional Features
- Miscellaneous Features

CCTV Photographs

Road	FAN KIM ROAD DD111	Start MH	S1	Size	1800 mm	ID	001
Location	FANLING	Finish Pt.	S2	Shape	Circular	PLR	S1X
				Material	Concrete		

Photo Ref. : 003 **Video Tape :** 0001, 0:01:51
Observation : Joint Displaced Medium

Photo Ref. : 004 **Video Tape :** 0001, 0:02:45
Observation : Open Joint Large

- Structural Defects
- Service Defects
- **Structural Defects with Grade 4 or 5**
- **Service Defects with Grade 4 or 5**
- Constructional Features
- Miscellaneous Features

CCTV Photographs

Road	FAN KIM ROAD DD111	Start MH	S1	Size	1800 mm	ID	001
Location	FANLING	Finish Pt.	S2	Shape	Circular	PLR	S1X
				Material	Concrete		

Photo Ref. : 005 **Video Tape :** 0001, 0:03:09
Observation : Connection, at 12 o'clock, dia 150 mm

Photo Ref. : 006 **Video Tape :** 0001, 0:03:23
Observation : Debris Silt, 05 % cross-sectional area loss

- Structural Defects
- Service Defects
- **Structural Defects with Grade 4 or 5**
- **Service Defects with Grade 4 or 5**
- Constructional Features
- Miscellaneous Features

CCTV Photographs

Road	FAN KIM ROAD DD111	Start MH	S1	Size	1800 mm	ID	001
Location	FANLING	Finish Pt.	S2	Shape	Circular	PLR	S1X
				Material	Concrete		

Photo Ref. : 007 **Video Tape :** 0001, 0:03:29
Observation : Connection, at 12 o'clock, dia 150 mm

Photo Ref. : 008 **Video Tape :** 0001, 0:04:08
Observation : Debris Silt, 35 % cross-sectional area loss, Change

- Structural Defects
- Service Defects
- **Structural Defects with Grade 4 or 5**
- **Service Defects with Grade 4 or 5**
- Constructional Features
- Miscellaneous Features

CCTV Photographs

Road	FAN KIM ROAD DD111	Start MH	S1	Size	1800 mm	ID	001
Location	FANLING	Finish Pt.	S2	Shape	Circular	PLR	S1X
				Material	Concrete		

Photo Ref. : 009 **Video Tape :** 0001, 0:04:55
Observation : Debris, 40 % cross-sectional area loss

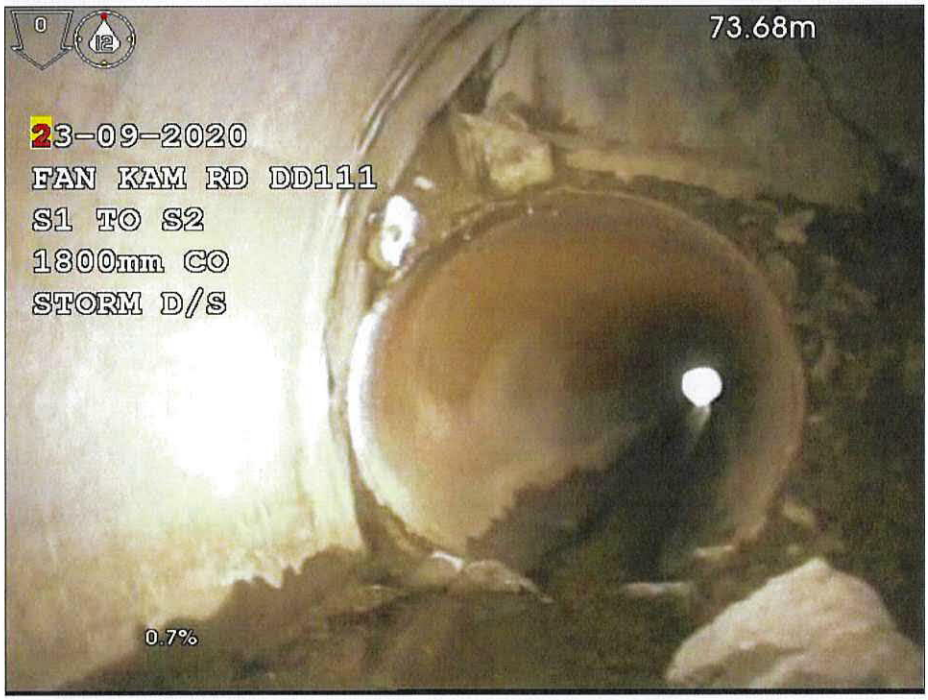


Photo Ref. : 010 **Video Tape :** 0001, 0:05:52
Observation : Debris Silt, 35 % cross-sectional area loss, Finish

- Structural Defects
- Service Defects
- **Structural Defects with Grade 4 or 5**
- **Service Defects with Grade 4 or 5**
- Constructional Features
- Miscellaneous Features

CCTV Photographs

Road	FAN KIM ROAD DD111	Start MH	S1	Size	1800 mm	ID	001
Location	FANLING	Finish Pt.	S2	Shape	Circular	PLR	S1X
				Material	Concrete		

Photo Ref. : 011 **Video Tape :** 0001, 0:06:18
Observation : Dimension Change
Remark : 600MM

Photo Ref. : 012 **Video Tape :** 0001, 0:08:26
Observation : General Photograph

- Structural Defects
- Service Defects
- **Structural Defects with Grade 4 or 5**
- **Service Defects with Grade 4 or 5**
- Constructional Features
- Miscellaneous Features

CCTV Photographs

Road	FAN KIM ROAD DD111	Start MH	S1	Size	1800 mm	ID	001
Location	FANLING	Finish Pt.	S2	Shape	Circular	PLR	S1X
				Material	Concrete		

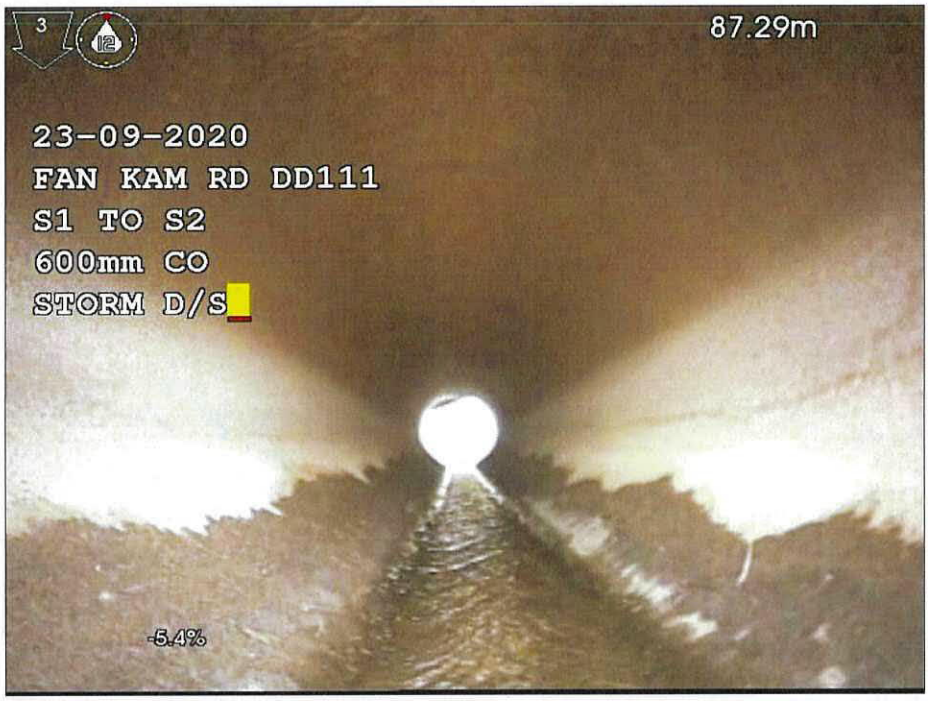


Photo Ref. : 013 **Video Tape :** 0001, 0:09:11
Observation : General Photograph

Photo Ref. : 014 **Video Tape :** 0001, 0:09:36
Observation : General Photograph

- Structural Defects
- Service Defects
- **Structural Defects with Grade 4 or 5**
- **Service Defects with Grade 4 or 5**
- Constructional Features
- Miscellaneous Features

CCTV Photographs

Road	FAN KIM ROAD DD111	Start MH	S1	Size	1800 mm	ID	001
Location	FANLING	Finish Pt.	S2	Shape	Circular	PLR	S1X
				Material	Concrete		

Photo Ref. : 015 **Video Tape :** 0001, 0:10:06
Observation : General Photograph

Photo Ref. : 016 **Video Tape :** 0001, 0:10:58
Observation : Manhole
Remark : S2

- Structural Defects
- Service Defects
- **Structural Defects with Grade 4 or 5**
- **Service Defects with Grade 4 or 5**
- Constructional Features
- Miscellaneous Features

SUMMARY OF CODES IN ENGLISH & CHINESE

Codes for Service Condition Grade (SCG)

Type	Code	Description	註解	Grade
Service	DE G	Deposits Attached Grease	依附物- 油脂	#1
	DE S	Deposits Settled Debris / silt	依附物- 垃圾碎 / 淤泥	#1
	DE	Deposits Settled Others	依附物- 硬物 及 其他	#1
	E L (J)	Encrustation Light (<5%) (at joint)	輕微凝結物 (<5%)	2
	E M (J)	Encrustation Medium (5% - 20%) (at joint)	中度凝結物 (5% - 20%)	4
	E H (J)	Encrustation Heavy (>20%) (at joint)	嚴重凝結物 (>20%)	5
	I S (J)	Infiltration Seeping (at joint)	滲漏	2
	I D (J)	Infiltration Dripping (at joint)	滴漏	2
	I R (J)	Infiltration Running (at joint)	湧漏	4
	I G (J)	Infiltration Gushing (at joint)	噴漏	5
	CU	Loss of Vision Camera Under Water	失去影像	0
	OB	Obstacles	阻塞	5
	R F (J)	Roots Fine (at joint)	根鬚	2
	R T (J)	Roots Tap (>10mm) (at joint)	根枝 (>10mm)	3
	R M (J)	Roots Mass (at joint)	根堆	#2

#1 The grade for the these defects follows the % cross section loss:
≦ 5%: Grade 1 >5% and <25%: Grade 2 ≧ 25% and ≦ 50%: Grade 3
>50% and ≦ 75%: Grade 4 >75% and ≦ 100%: Grade 5

#2 The grade for Roots Mass follows the % of cross section loss:
≦ 5%: Grade 3 >5% and <25%: Grade 4 ≧ 25% and ≦ 100%: Grade 5

Codes for Internal (Structural) Condition Grade (ICG)

Type	Code	Description	註解	Grade
Structure	B	Broken Pipework	管道破裂	4
	C L	Crack Longitudinal	直裂紋	1
	C C	Crack Circumferential	環形裂紋	1
	C M	Crack Multiple	複合裂紋	2
	D V	Deformation Vertical (more than 25% as Collapse)	管道變形垂直 (多於 25%給予 Collapse)	#3
	D H	Deformation Horizontal (more than 25% as Collapse)	管道變形水平 (多於 25%給予 Collapse)	#3
	D B	Displaced Bricks	磚塊移位	3
	D I	Dropped Invert	行水沉降	3
	F L	Fracture Longitudinal	直裂縫	3
	F C	Fracture Circumferential	環形裂縫	3
	F M	Fracture Multiple	複合裂縫	4
	H	Hole	管道穿孔	4
	JD (M)	Joint Displaced Medium (1-1.5 pipe	接口移位中型 (1-1.5t)	2
	JD (L)	Joint Displaced Large (>1.5 Pipe thickness)	接口移位大型 (>1.5t)	3
	M S	Mortar missing Surface	表面沙漿丟失輕度	1
	M M	Mortar missing Medium	表面沙漿丟失中度	2
	M T	Mortar missing Total	表面沙漿丟失深度	3
	OJ (M)	Open Joint Medium (1-1.5 Pipe thickness)	接口離位中型 (1-1.5t)	1
	OJ (L)	Open Joint Large (>1.5 Pipe thickness)	接口離位大型 (>1.5t)	2
	SS S	Surface Spalling Slight	表面剝落輕度	1
	SS M	Surface Spalling Medium	表面剝落中度	2
	SS L	Surface Spalling Large	表面剝落深度	3
	SW S	Surface Wear Slight	表面磨損輕度	1
	SW M	Surface Wear Medium	表面磨損中度	2
	SW L	Surface Wear Large	表面磨損深度	3
	X	Collapse Pipe	管道倒塌	5

#3 The grade for DV and DH follows the % deformation:
≦ 5%: Grade 3 >5% and <25%: Grade 4

Codes for Internal (Structural) Condition Grade (ICG)				
Type	Code	Description	註解	Grade
Junction & Connection	CN	Connection	分支連接 (後加)	0
	CX	Collection Defective	分支連接	3
	CX I	Collection Defective Pipe Intruding	分支連接插入	4
	JN	Junction	分支連駁 (預製)	0
	JX	Junction Defective	分支連駁損壞	4
Repair DF	LN	Lining Defect	管道內套缺損	4

Others Codes				
Type	Code	Description	註解	Grade
Nodes	MH	Manhole	沙井	0
	BR	Major Branch (Without Cover)	主要分支 (暗井)	0
	GY	Gully	集水沟	0
	CP	Catchpit	截留井	0
	OS	Oil Separator	隔油井	0
Miscellaneous	SC	Shape Change	形狀改變	0
	DC	Dimension Change	尺寸改變	0
	MC	Material Change	物料改變	0
	PC	Pipe Unit Length Change	管道基本長度改變	0
	FH	Finish Survey	完成查勘	0
	GP	General Photograph	一般影相位	0
	L L	Line Deviates Left	管道轉向左	0
	L R	Line Deviates Right	管道轉向右	0
	L U	Line Deviates Up	管道轉向上	0
	L D	Line Deviates Down	管道轉向下	0
	WL	Water Level	水位	0
	V	Vermin	害蟲	0
	ST	Start Survey / Inspection	開始查勘	0
	SA	Survey Abandoned	放棄查勘	0
	UTS	Unable To Survey	沙井滿水/滿料/渠道已經作廢	0
	UTR	Unable To Raise Manhole Cover	沙井蓋不能提起	0
	UTL	Unable To Locate Manhole	找不到沙井	0

Defect Grade Description

Structural & Service Grade for pipeline		
Grade	Appropriate response in normal circumstances	Mean Score
0	No defect was found	0
1	Normal condition	<5
2	Acceptable condition	5 to 19.9
3	Need to consider the area surrounding the sewer and the probability of environmental impact if no action taken	20 to 39.9
4	Fairly urgent, look at the sewer briefly, engineering and environmental improvement are needed	40 to 82
5	Urgent, look at the sewer, and add engineering and environmental improvements immediately	>82

DEVELOP

This is to certify that

Lam Wai Keung

attended the course

Pipe Sewer Condition Classification
and successfully passed the examination
to MSCC5

at

Hong Kong

on

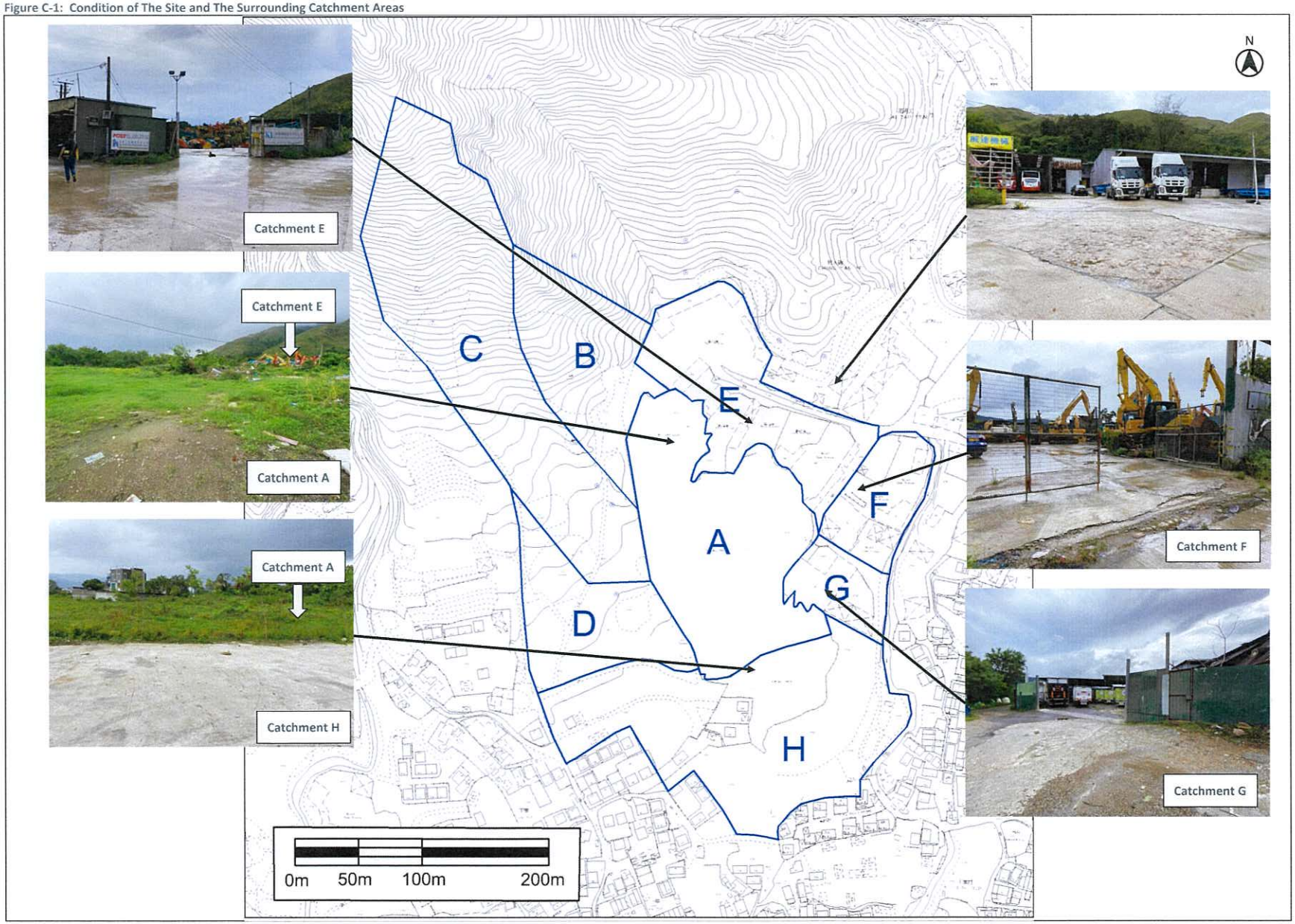
8th to 12th April 2019

Certificate No. 2740/19

00058278

Appendix C CONDITION OF THE SITE AND THE SURROUNDING CATCHMENTS

Figure C-1: Condition of The Site and The Surrounding Catchment Areas



Appendix D RUNOFF CALCULATION

Calculation of Runoff for Return Period of 2 Years

Catchment ID	Catchment Area (A), km^2	Average slope (H), m/100m	Flow path length (L), m	Inlet time (t_0), min	Duration (t_d), min	Storm Constants			Runoff intensity (i) mm/hr	Runoff coefficient (C)	C x A	Peak runoff (Q_p), m^3/s
						a	b	c				
Before the Proposed Development												
Catchment A (Site)	0.0216	4.77	234.9	9.16	9.16	499.8	4.26	0.494	138.56	0.15	0.0032	0.139
Catchment B	0.0118	36.14	175.0	4.84	4.84	499.8	4.26	0.494	167.93	0.20	0.0024	0.122
Catchment C	0.0313	28.94	427.0	11.19	11.19	499.8	4.26	0.494	129.25	0.20	0.0063	0.250
Catchment D	0.0103	7.66	206.6	7.89	7.89	499.8	4.26	0.494	145.54	0.15	0.0016	0.070
Catchment E	0.0148	5.40	183.4	7.25	7.25	499.8	4.26	0.494	149.51	0.95	0.0141	0.649
Catchment F	0.0058	6.51	61.5	2.57	2.57	499.8	4.26	0.494	193.45	0.95	0.0055	0.328
Catchment G	0.0042	7.82	80.6	3.35	3.35	499.8	4.26	0.494	183.35	0.95	0.0040	0.225
Catchment H	0.0272	4.61	216.7	8.32	8.32	499.8	4.26	0.494	143.09	0.39	0.0106	0.468
											Total (General Scenario)	**2.251**

After the Proposed Development												
Catchment A (Site)	0.0216	-	-	5.00	5.00	499.8	4.26	0.494	166.45	0.91	0.0196	1.010
Catchment B	0.0118	36.14	175.0	4.84	4.84	499.8	4.26	0.494	167.93	0.20	0.0024	0.122
Catchment C	0.0313	28.94	427.0	11.19	11.19	499.8	4.26	0.494	129.25	0.20	0.0063	0.250
Catchment D	0.0103	7.66	206.6	7.89	7.89	499.8	4.26	0.494	145.54	0.15	0.0016	0.070
Catchment E	0.0148	5.40	183.4	7.25	7.25	499.8	4.26	0.494	149.51	0.95	0.0141	0.649
Catchment F	0.0058	6.51	61.5	2.57	2.57	499.8	4.26	0.494	193.45	0.95	0.0055	0.328
Catchment G	0.0042	7.82	80.6	3.35	3.35	499.8	4.26	0.494	183.35	0.95	0.0040	0.225
Catchment H	0.0272	4.61	216.7	8.32	8.32	499.8	4.26	0.494	143.09	0.39	0.0106	0.468
											Total (General Scenario)	**3.122**

Note:

1) Runoff is calculated in accordance with DSD *Stormwater Drainage Manual Planning, Design and Management Fifth Edition, January 2018* and *Stormwater Drainage Manual Corrigendum No.1/2022*
2) The inlet time of Catchment A after the proposed development is arbitratily taken as 5 minutes in reference to rainfall intensity estimation approach in Highway Department *Guidance Notes on Road Pavement Drainage Design* .

Calculation of Runoff for Return Period of 10 Years

Catchment ID	Catchment Area (A), km^2	Average slope (H), m/100m	Flow path length (L), m	Inlet time (t_o), min	Duration (t_d), min	Storm Constants			Runoff intensity (i) mm/hr	Runoff coefficient (C)	C x A	Peak runoff (Q_p), m^3/s
						a	b	c				
Before the Proposed Development												
Catchment A (Site)	0.0216	4.77	234.9	9.16	9.16	471.9	3.02	0.397	174.90	0.15	0.0032	0.175
Catchment B	0.0118	36.14	175.0	4.84	4.84	471.9	3.02	0.397	208.19	0.20	0.0024	0.152
Catchment C	0.0313	28.94	427.0	11.19	11.19	471.9	3.02	0.397	164.53	0.20	0.0063	0.318
Catchment D	0.0103	7.66	206.6	7.89	7.89	471.9	3.02	0.397	182.72	0.15	0.0016	0.087
Catchment E	0.0148	5.40	183.4	7.25	7.25	471.9	3.02	0.397	187.20	0.95	0.0141	0.813
Catchment F	0.0058	6.51	61.5	2.57	2.57	471.9	3.02	0.397	238.29	0.95	0.0055	0.404
Catchment G	0.0042	7.82	80.6	3.35	3.35	471.9	3.02	0.397	226.20	0.95	0.0040	0.278
Catchment H	0.0272	4.61	216.7	8.32	8.32	471.9	3.02	0.397	179.98	0.39	0.0106	0.589
											Total (General Scenario)	**2.816**

After the Proposed Development												
Catchment A (Site)	0.0216	-	-	5.00	5.00	471.9	3.02	0.397	206.49	0.91	0.0196	1.253
Catchment B	0.0118	36.14	175.0	4.84	4.84	471.9	3.02	0.397	208.19	0.20	0.0024	0.152
Catchment C	0.0313	28.94	427.0	11.19	11.19	471.9	3.02	0.397	164.53	0.20	0.0063	0.318
Catchment D	0.0103	7.66	206.6	7.89	7.89	471.9	3.02	0.397	182.72	0.15	0.0016	0.087
Catchment E	0.0148	5.40	183.4	7.25	7.25	471.9	3.02	0.397	187.20	0.95	0.0141	0.813
Catchment F	0.0058	6.51	61.5	2.57	2.57	471.9	3.02	0.397	238.29	0.95	0.0055	0.404
Catchment G	0.0042	7.82	80.6	3.35	3.35	471.9	3.02	0.397	226.20	0.95	0.0040	0.278
Catchment H	0.0272	4.61	216.7	8.32	8.32	471.9	3.02	0.397	179.98	0.39	0.0106	0.589
											Total (General Scenario)	**3.894**

Note:

1) Runoff is calculated in accordance with DSD *Stormwater Drainage Manual Planning, Design and Management Fifth Edition, January 2018* and *Stormwater Drainage Manual Corrigendum No.1/2022*
2) The inlet time of Catchment A after the proposed development is arbitratily taken as 5 minutes in reference to rainfall intensity estimation approach in Highway Department *Guidance Notes on Road Pavement Drainage Design* .

Calculation of Runoff for Return Period of 50 Years

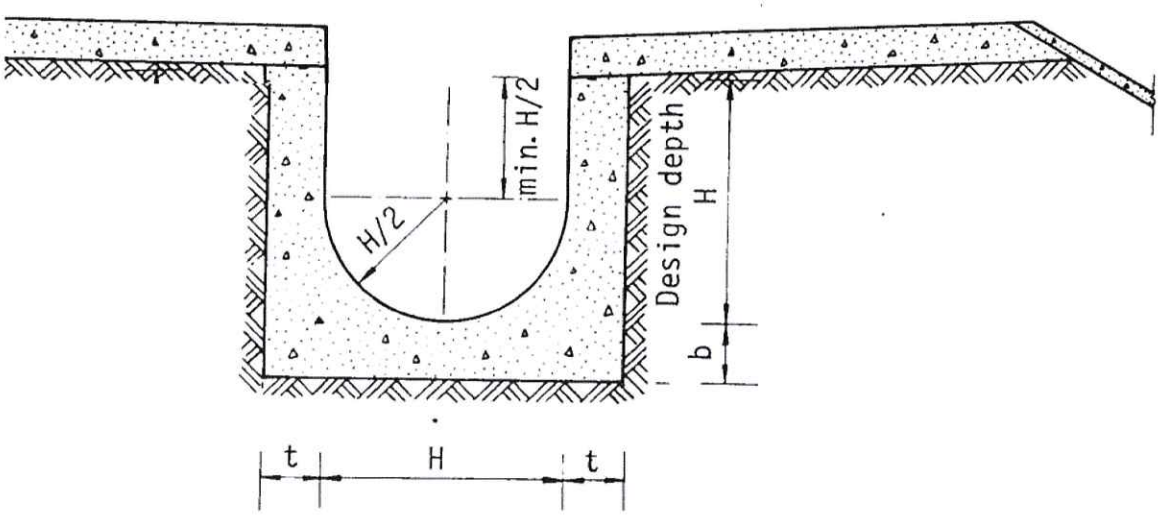
Catchment ID	Catchment Area (A), km^2	Average slope (H), m/100m	Flow path length (L), m	Inlet time (t_0), min	Duration (t_d), min	Storm Constants			Runoff intensity (i) mm/hr	Runoff coefficient (C)	C x A	Peak runoff (Q_p), m^3/s
						a	b	c				
Before the Proposed Development												
Catchment A (Site)	0.0216	4.77	234.9	9.16	9.16	451.3	2.46	0.337	197.44	0.15	0.0032	0.197
Catchment B	0.0118	36.14	175.0	4.84	4.84	451.3	2.46	0.337	231.00	0.20	0.0024	0.168
Catchment C	0.0313	28.94	427.0	11.19	11.19	451.3	2.46	0.337	187.02	0.20	0.0063	0.361
Catchment D	0.0103	7.66	206.6	7.89	7.89	451.3	2.46	0.337	205.30	0.15	0.0016	0.098
Catchment E	0.0148	5.40	183.4	7.25	7.25	451.3	2.46	0.337	209.80	0.95	0.0141	0.911
Catchment F	0.0058	6.51	61.5	2.57	2.57	451.3	2.46	0.337	261.83	0.95	0.0055	0.444
Catchment G	0.0042	7.82	80.6	3.35	3.35	451.3	2.46	0.337	249.36	0.95	0.0040	0.307
Catchment H	0.0272	4.61	216.7	8.32	8.32	451.3	2.46	0.337	202.54	0.39	0.0106	0.662
											Total (General Scenario)	**3.148**

After the Proposed Development												
Catchment A (Site)	0.0216	-	-	5.00	5.00	451.3	2.46	0.337	229.27	0.91	0.0196	1.391
Catchment B	0.0118	36.14	175.0	4.84	4.84	451.3	2.46	0.337	231.00	0.20	0.0024	0.168
Catchment C	0.0313	28.94	427.0	11.19	11.19	451.3	2.46	0.337	187.02	0.20	0.0063	0.361
Catchment D	0.0103	7.66	206.6	7.89	7.89	451.3	2.46	0.337	205.30	0.15	0.0016	0.098
Catchment E	0.0148	5.40	183.4	7.25	7.25	451.3	2.46	0.337	209.80	0.95	0.0141	0.911
Catchment F	0.0058	6.51	61.5	2.57	2.57	451.3	2.46	0.337	261.83	0.95	0.0055	0.444
Catchment G	0.0042	7.82	80.6	3.35	3.35	451.3	2.46	0.337	249.36	0.95	0.0040	0.307
Catchment H	0.0272	4.61	216.7	8.32	8.32	451.3	2.46	0.337	202.54	0.39	0.0106	0.662
											Total (General Scenario)	**4.342**

Note:

1) Runoff is calculated in accordance with DSD *Stormwater Drainage Manual Planning, Design and Management Fifth Edition, January 2018* and *Stormwater Drainage Manual Corrigendum No.1/2022*
2) The inlet time of Catchment A after the proposed development is arbitratily taken as 5 minutes in reference to rainfall intensity estimation approach in Highway Department *Guidance Notes on Road Pavement Drainage Design* .

Appendix E DRAWING OF TYPICAL DETAILS OF U-CHANNEL


min. H/2
H/2
Design depth
H
b
t
H
t

Appendix F CALCULATION OF PROPSED DRAINAGE SYSTEM CAPACITY

Calculation of Proposed Channel Capacity for Return Period of 50 Years

Drainage Capacity of Internal Drainage System (U-channel)

Channel	Channel Section	Upstream Catchpit	Downstream Catchpit	Shape	Depth (m)	Diameter (m)	gradient (1 over)	Length (m)	s	A_w	P_w	R	n	V	Q_c	Involved Catchment	Qn (m^3/s)	% of capacity	Remark
Northern Channel	Channel 01	Catchpit 09	Catchpit 08	U-Shape	0.1125	0.225	40	35.37	0.0250	0.0452	0.5784	0.0781	0.016	1.806	0.073	80%B	0.134	61%	OK
	Channel 02	Catchpit 08	Catchpit 07	U-Shape	0.1125	0.225	40	28.26	0.0250	0.0452	0.5784	0.0781	0.016	1.806	0.073	80%B	0.134	61%	OK
	Channel 03	Catchpit 07	Catchpit 06	U-Shape	0.1125	0.225	30	25.81	0.0333	0.0452	0.5784	0.0781	0.016	2.085	0.085	80%B	0.134	53%	OK
	Channel 04	Catchpit 06	Catchpit 05	U-Shape	0.15	0.3	30	37.08	0.0333	0.0803	0.7712	0.1042	0.016	2.526	0.183	80%A1 + 80%B	0.350	64%	OK
	Channel 05	Catchpit 05	Catchpit 04	U-Shape	0.15	0.3	30	28.90	0.0333	0.0803	0.7712	0.1042	0.016	2.526	0.183	80%A1 + 80%B	0.350	64%	OK
	Channel 06	Catchpit 04	Catchpit 03	U-Shape	0.1875	0.375	30	33.66	0.0333	0.1255	0.9640	0.1302	0.016	2.932	0.331	80%A1 + 50%A2 + 80%B	0.602	61%	OK
	Channel 07	Catchpit 03	Catchpit 02	U-Shape	0.1875	0.375	25	33.07	0.0400	0.1255	0.9640	0.1302	0.016	3.211	0.363	80%A1 + 50%A2 + 80%B	0.602	55%	OK
	Channel 08	Catchpit 02	Catchpit 01	U-Shape	0.1875	0.375	25	45.66	0.0400	0.1255	0.9640	0.1302	0.016	3.211	0.363	80%A1 + 50%A2 + 80%B	0.602	55%	OK
Southern Channel	Channel 09	Catchpit 09	Catchpit 10	U-Shape	0.1875	0.375	30	111.78	0.0333	0.1255	0.9640	0.1302	0.016	2.932	0.331	20%A1 + 20%B + 100%C	0.449	45%	OK
	Channel 10	Catchpit10	Point 1	U-Shape	0.1875	0.375	30	74.55	0.0333	0.1255	0.9640	0.1302	0.016	2.932	0.331	20%A1 + 20%B + 100%C + 100%D	0.547	55%	OK
	Channel 11	Point 1	Catchpit 11	U-Shape	0.1875	0.375	21	7.20	0.0476	0.1255	0.9640	0.1302	0.016	3.504	0.396	20%A1 + 20%B + 100%C + 100%D	0.547	46%	OK
	Channel 12	Catchpit 11	Point 2	U-Shape	0.225	0.45	21	38.12	0.0476	0.1808	1.1569	0.1563	0.016	3.957	0.644	20%A1 + 100%A4 + 20%B + 100%C + 100%D	0.744	39%	OK
	Channel 13	Point 2	Catchpit 12	U-Shape	0.2625	0.525	200	72.49	0.0050	0.2461	1.3497	0.1823	0.016	1.421	0.315	20%A1 + 100%A4 + 20%B + 100%C + 100%D	0.744	79%	OK
	Channel 14	Catchpit 12	Catchpit 13	U-Shape	0.2625	0.525	200	15.95	0.0050	0.2461	1.3497	0.1823	0.016	1.421	0.315	20%A1 + 100%A4 + 20%B + 100%C + 100%D	0.744	79%	OK
	Channel 15	Catchpit 13	Catchpit 14	U-Shape	0.2625	0.525	200	32.63	0.0050	0.2461	1.3497	0.1823	0.016	1.421	0.315	20%A1 + 100%A4 + 20%B + 100%C + 100%D	0.744	79%	OK
	Channel 16	Catchpit 14	Catchpit 15	U-Shape	0.2625	0.525	150	20.91	0.0067	0.2461	1.3497	0.1823	0.016	1.641	0.363	20%A1 + 25%A3 + 100%A4 + 20%B + 100%C + 100%D	0.849	78%	OK
	Channel 17	Catchpit 15	Catchpit 16	U-Shape	0.2625	0.525	150	73.86	0.0067	0.2461	1.3497	0.1823	0.016	1.641	0.363	20%A1 + 25%A3 + 100%A4 + 20%B + 100%C + 100%D	0.849	78%	OK
Central Channel	Channel 18	Catchpit 19	Point 3	U-Shape	0.225	0.45	100	53.35	0.0100	0.1808	1.1569	0.1563	0.016	1.813	0.295	50%A2 + 75%A3	0.567	64%	OK
	Channel 19	Point 3	Catchpit 18	U-Shape	0.225	0.45	37	21.63	0.0270	0.1808	1.1569	0.1563	0.016	2.981	0.485	50%A2 + 75%A3	0.567	39%	OK
	Channel 20	Catchpit 18	Catchpit 17	U-Shape	0.225	0.45	40	21.02	0.0250	0.1808	1.1569	0.1563	0.016	2.867	0.466	50%A2 + 75%A3	0.567	41%	OK
	Channel 21	Catchpit 17	Catchpit 16	U-Shape	0.225	0.45	40	6.64	0.0250	0.1808	1.1569	0.1563	0.016	2.867	0.466	50%A2 + 75%A3	0.567	41%	OK

Remark: In reference to *Stormwater Drainage Manual* Table 13, the manning's roughness coefficient is taken as concrete line surface under fair condition, the effect of sedimentation is considered through deducting flow capacity by 10%.

Legend

D = diameter, m
A_w = Cross Section Area of Flow, m^2
P_w = Wetted Perimeter, m
R = Hydraulic Radius = A_w/P_w, m
s = Hydraulic Gradient
n = Manning's roughness coefficient
V = Mean Velocity, m/s
Q_c = Flow Capacity, m^3/s
Q_p = Estimated Peak Flow, m^3/s

Calculation of Proposed Pipe Capacity for Return Period of 50 Years

Drainage Capacity of Proposed External Drainage System

From	To	Description	Length	d	r	A_w	P_w	R	s	k_s	V	Q_c	Q_p	% of capacity	Remark
			m	m	m	m^2	m	m	-	mm	m/s	m^3/s	m^3/s	%	
Catchpit 01	Terminal Manhole	Internal drainage 01	9.04	0.75	0.375	0.442	2.356	0.188	0.005	0.15	2.267	0.902	0.6019	67%	OK
Catchpit 16	Terminal Manhole	Internal drainage 02	3.46	1.05	0.525	0.866	3.299	0.263	0.005	0.15	2.784	2.17	1.4161	65%	OK
Terminal Manhole	RMH-X1	external drainage 01	1.36	1.5	0.75	1.767	4.712	0.375	0.005	0.15	3.455	5.494	2.929	53%	OK
RMH-X1	RMH-X2	external drainage 02	24.82	1.5	0.75	1.767	4.712	0.375	0.005	0.15	3.455	5.494	2.929	53%	OK
RMH-X2	RMH-X3	external drainage 03	34.09	1.5	0.75	1.767	4.712	0.375	0.005	0.15	3.455	5.494	2.929	53%	OK
RMH-X3	RMH-X4	external drainage 04	47.65	1.5	0.75	1.767	4.712	0.375	0.005	0.15	3.455	5.494	2.929	53%	OK
RMH-X4	Discharge Point	external drainage 05	6.41	1.5	0.75	1.767	4.712	0.375	0.005	0.15	3.455	5.494	2.929	53%	OK

Remark: In reference to *Stormwater Drainage Manual* Table 14, the surface roughness value is taken as precast concrete pipe with 'O' ring joints under poor condition, the effect of sedimentation is considered by deducting flow capacity by 10%.

Legend

d = pipe diameter, m

r = pipe radius (m) = 0.5d

A_w = wetted area (m^2) = πr^2

P_w = wetted perimeter (m) = $2\pi r$

R = Hydraulic radius (m) = A_w/P_w

s = Slope of the total energy line

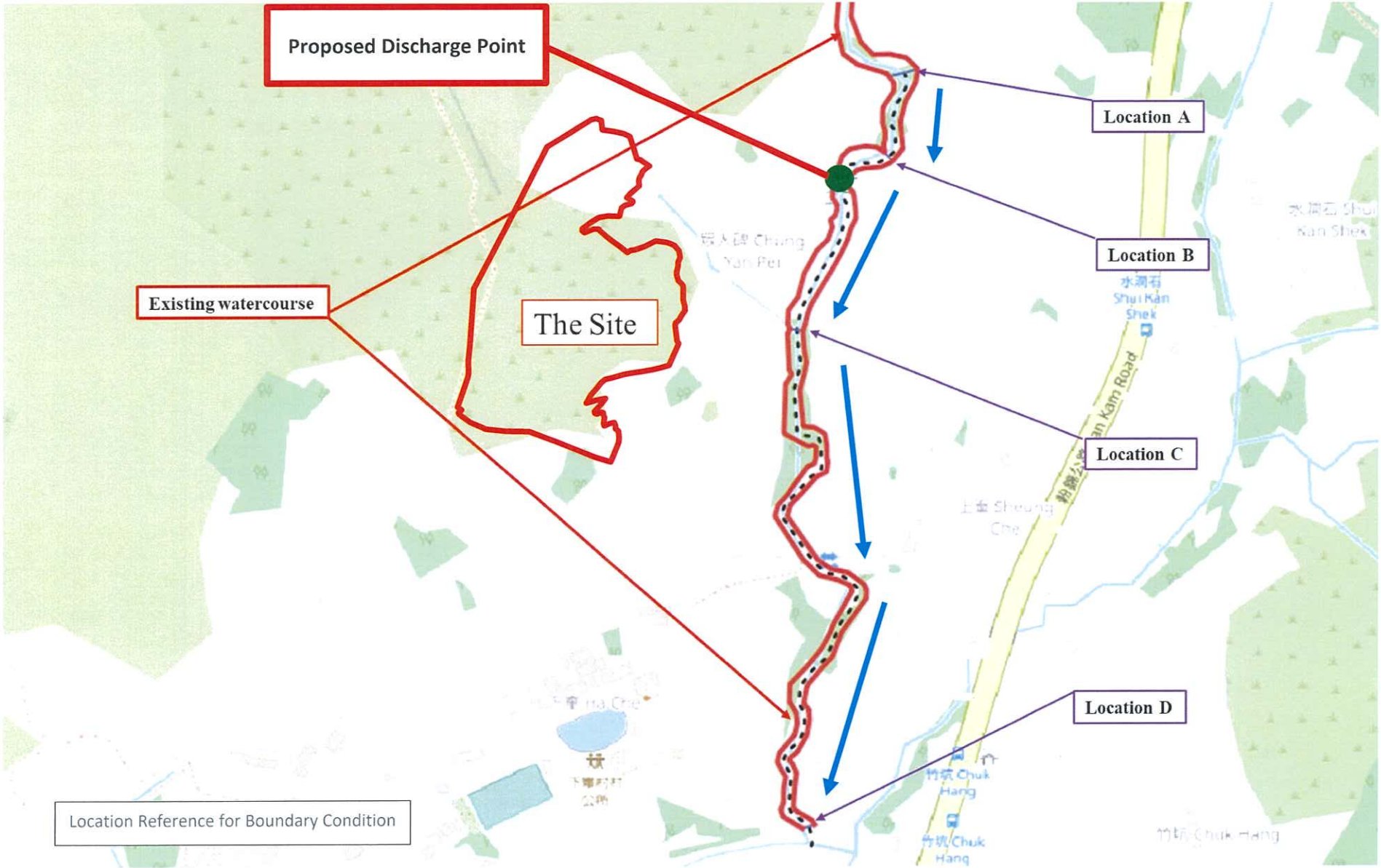
k_s = equivalent sand roughness, mm

V = Velocity of flow calculated based on Colebrook White Equation, m/s

Q_c = Flow Capacity (10% sedimentation incorporated), m^3/s

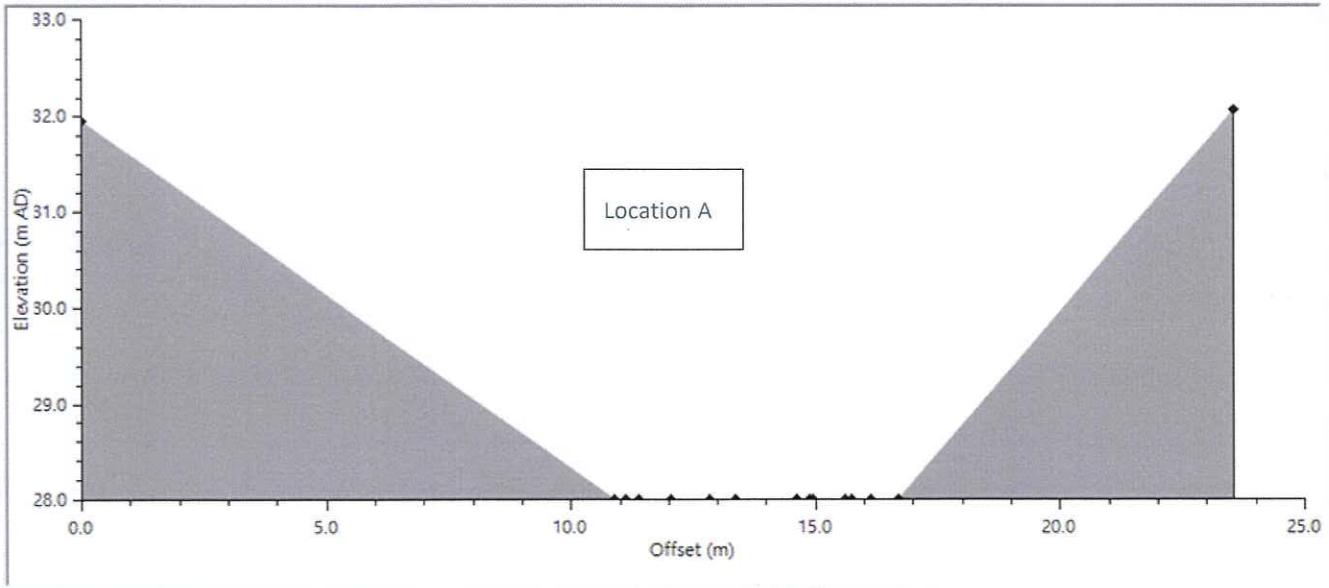
Q_p = Estimated total peak flow from the pipe

Appendix G INFORMATION OF EXISTING WATERCOURSE


Proposed Discharge Point
Existing watercourse
The Site
Location A
Location B
Location C
Location D
Location Reference for Boundary Condition
Shui Kan Shek
Chuk Hang
Kan Road

Cross section line : P01_P_LAI TAU_160000_a-P01_P_LAI TAU_02! : Section data

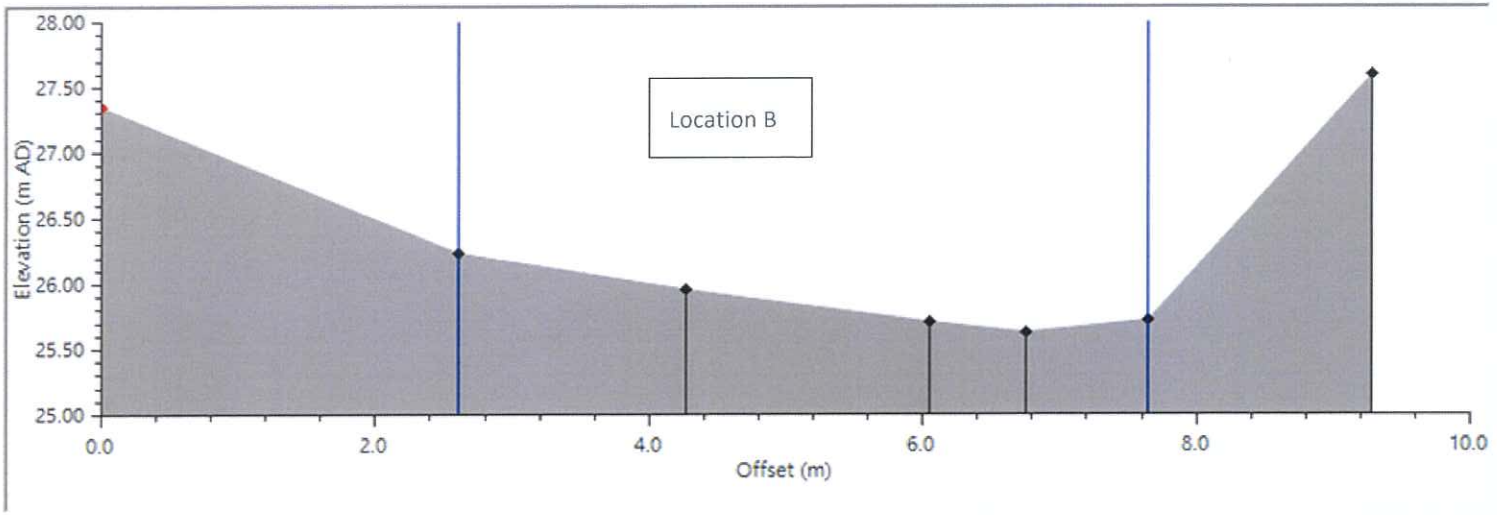
	Offset (m)	X coordinate (m)	Y coordinate (m)	Bed level (m AD)	Roughness Manning's n	New panel
1	0.000	827996.759	834897.266	31.955	0.0160	☐
2	10.896	827986.382	834893.946	28.000	0.0160	☐
3	11.130	827986.152	834893.900	28.000	0.0160	☐
4	11.391	827985.897	834893.850	28.000	0.0160	☐
5	12.042	827985.259	834893.721	28.000	0.0160	☐
6	12.822	827984.493	834893.567	28.000	0.0160	☐
7	13.347	827983.978	834893.466	28.000	0.0160	☐
8	14.606	827982.743	834893.226	28.000	0.0160	☐
9	14.878	827982.475	834893.174	28.000	0.0160	☐
10	14.924	827982.430	834893.166	28.000	0.0160	☐
11	15.614	827981.753	834893.034	28.000	0.0160	☐
12	15.734	827981.635	834893.014	28.000	0.0160	☐
13	16.137	827981.238	834892.946	28.000	0.0160	☐



OK Cancel

Cross section line : P01_P_LAI TAU_160530_a : Section data

	Offset (m)	X coordinate (m)	Y coordinate (m)	Bed level (m AD)	Roughness Manning's n	New panel
1	0.000	827976.997	834823.522	27.350	0.0160	☐
2	2.600	827975.173	834825.375	26.240	0.0160	☒
3	4.270	827974.002	834826.565	25.960	0.0160	☐
4	6.050	827972.753	834827.834	25.710	0.0160	☐
5	6.750	827972.262	834828.333	25.620	0.0160	☐
6	7.640	827971.638	834828.967	25.720	0.0160	☒
7	9.280	827970.488	834830.136	27.600	0.0160	☐



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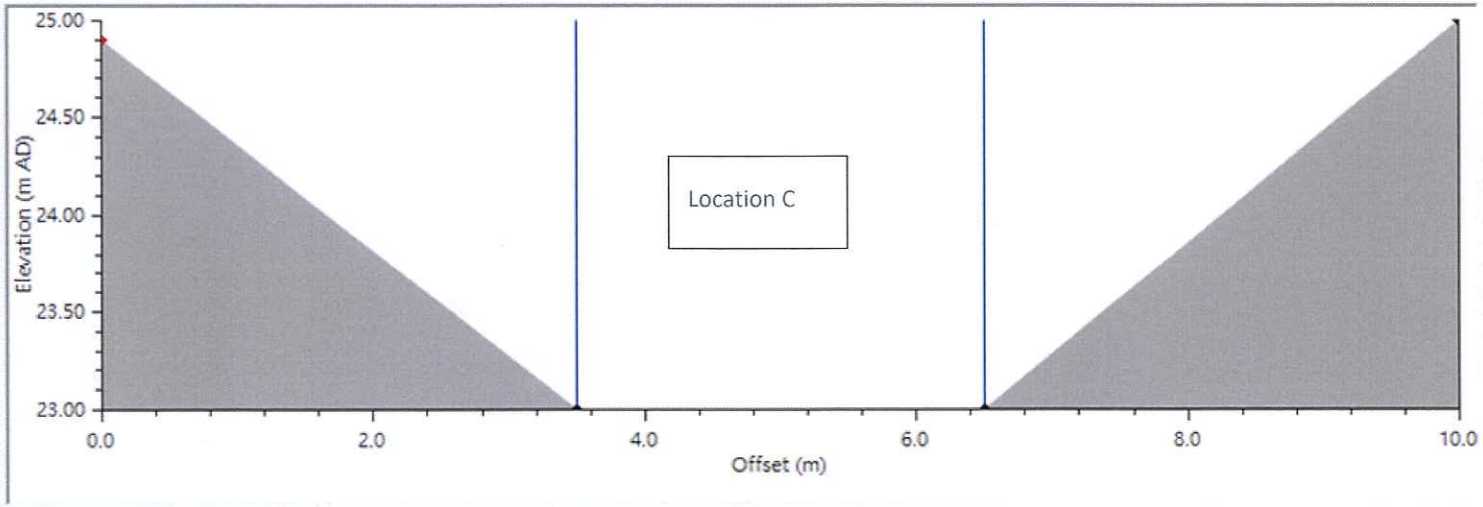
Cross section line : P01_P_LAI TAU_160900 : Section data

	Offset (m)	X coordinate (m)	Y coordinate (m)	Bed level (m AD)	Roughness Manning's n	New panel
1	0.000	827906.112	834687.532	24.900	0.0160	☐
2	3.500	827902.649	834688.040	23.000	0.0160	☒
3	6.500	827899.681	834688.475	23.000	0.0160	☒
4	10.000	827896.218	834688.982	25.000	0.0160	☐



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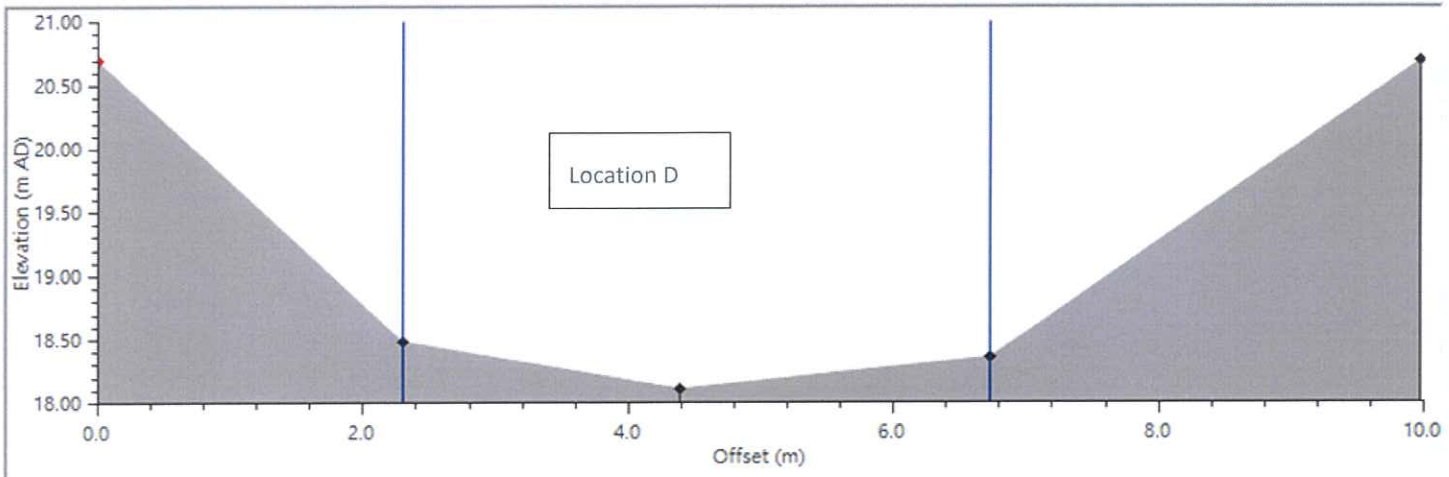
Cross section line : P01_P_LAI TAU_161180_a : Section data

	Offset (m)	X coordinate (m)	Y coordinate (m)	Bed level (m AD)	Roughness Manning's n	New panel
1	0.000	827915.891	834292.642	20.700	0.0160	☐
2	2.305	827913.697	834291.934	18.480	0.0160	☒
3	4.386	827911.702	834291.343	18.110	0.0160	☐
4	6.733	827909.453	834290.669	18.360	0.0160	☒
5	9.972	827906.380	834289.645	20.700	0.0160	☐



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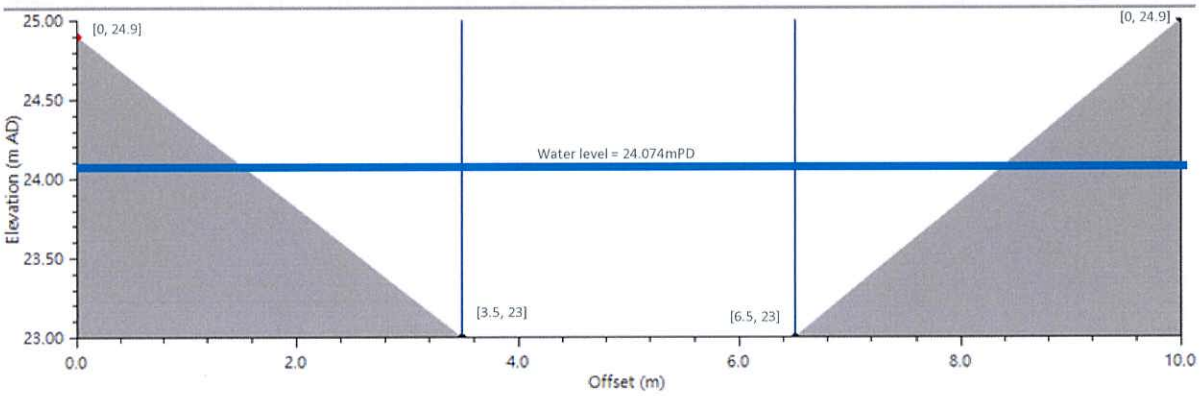
Boundary Condition at Each Section of Watercourse

Location	Section ID	Return Period															
		2AB			10A			10B			50A			50B			
		Peak Water Level (mPD)	Peak Flow (m3/s)	Peak Velocity (m/s)	Peak Water Level (mPD)	Peak Flow (m3/s)	Peak Velocity (m/s)	Peak Water Level (mPD)	Peak Flow (m3/s)	Peak Velocity (m/s)	Peak Water Level (mPD)	Peak Flow (m3/s)	Peak Velocity (m/s)	Peak Water Level (mPD)	Peak Flow (m3/s)	Peak Velocity (m/s)
A	P01_P_LAI TAU_160000_a-P01_P_LAI TAU_02!	28.41300	14.80727	5.25000	28.53400	22.90300	6.06600	28.41300	14.80724	5.25000	28.59600	28.07553	6.54000	28.53400	22.90267	6.06600
B	P01_P_LAI TAU_160530_a	26.41500	14.80655	4.86400	26.57800	21.15100	5.68200	26.41500	14.80648	4.86400	26.67300	28.82516	6.12100	26.57800	23.15104	5.68200
C	P01_P_LAI TAU_160900	23.75600	14.80303	4.42800	23.95900	23.14600	5.05500	23.75600	14.80309	4.42800	24.07400	28.84762	5.39900	23.95900	23.14692	5.05500
D	P01_P_LAI TAU_161180_a	19.53400	14.84949	2.11800	19.96600	23.21900	2.39500	19.53400	14.85032	2.11800	20.23200	28.98928	2.54300	19.96600	23.21988	2.39500

Appendix H CALCULATION OF WATERCOURSE CAPACITY

Calculation of Flow Capacity of Watercourse at Location C

Referring to the information provided by DSD, the peak water level at Location C has reached 24.074mPD under the scenario of a 10-year sea level in conjunction with a 50-year rainfall. The flow area as well as the hydraulic radius at the peak water level can be calculated from the geometry of the cross section of the watercourse at Location C:



As shown, the geometry of the watercourse cross-section at Location C can be portrayed by its bed level and the corresponding offset from shore line. Listed in the format as [offset, bed level], the 4 points used for describing cross-section geometry are:

[0, 24.9]; [3.5, 23]; [6.5, 23]; [10, 25].

Therefore,

$$flow\ area = (\frac{24.074 - 23.0}{24.9 - 23.0})^2 \times (24.9 - 23.0) \times (3.5 - 0) \times 0.5 + (24.074 - 23.0) \times (6.5 - 3.5) + \left(\frac{24.074 - 23.0}{25.0 - 23.0}\right)^2 \times (25.0 - 23.0) \times (10.0 - 6.5) \times 0.5 = 5.29370(m^2)$$

$$wet\ perimeter = \frac{24.074 - 23.0}{24.9 - 23.0} \times \sqrt[2]{(24.9 - 23.0)^2 + (3.5 - 0)^2} + (6.5 - 3.5) + \frac{24.074 - 23.0}{25.0 - 23.0} \times \sqrt[2]{(25.0 - 23.0)^2 + (10.0 - 6.5)^2} = 7.41585\ (m)$$

$$hydraulic\ radius = \frac{flow\ area}{wet\ perimeter} = \frac{5.29370}{7.41585} = 0.71384\ (m)$$

Under assumption of uniform flow condition, the flow velocity of an open channel will subject to its roughness, channel gradient, and hydraulic radius as express as Manning's equation:

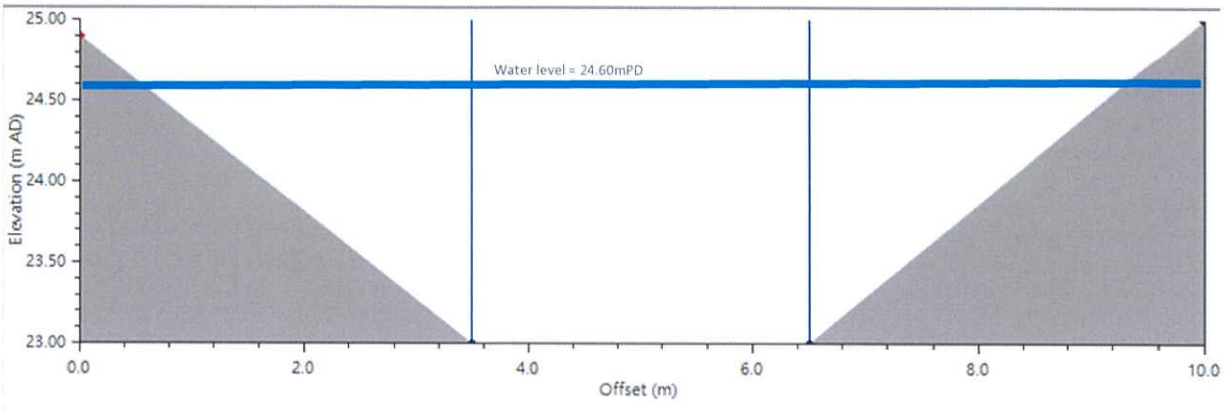
$$flow\ velocity = \frac{channel\ gradient^{\frac{1}{2}}}{Manning\ coefficient} \times hydraulic\ radius^{\frac{2}{3}}$$

The peak velocity of watercourse at Location C corresponding to the water level of 24.074m has been given by DSD as 5.399m/s. The hydraulic property of watercourse at Location C can be back calculated as a constant.

$$5.399 = \frac{channel\ gradient^{\frac{1}{2}}}{Manning\ coefficient} \times 0.71384^{\frac{2}{3}}$$

$$\frac{channel\ gradient^{\frac{1}{2}}}{Manning\ coefficient} = \frac{5.399}{0.71384^{\frac{2}{3}}} = 6.75947\ (m^{\frac{1}{3}}/s)$$

When a 300mm freeboard is reserved, the water level at Location C will reach 24.6mPD.



The corresponding flow area and hydraulic radius can be calculated.

$$flow\ area = \left(\frac{24.60 - 23.0}{24.9 - 23.0}\right)^2 \times (24.9 - 23.0) \times (3.5 - 0) \times 0.5 + (24.60 - 23.0) \times (6.5 - 3.5) + \left(\frac{24.60 - 23.0}{25.0 - 23.0}\right)^2 \times (25.0 - 23.0) \times (10.0 - 6.5) \times 0.5 = 9.39790\ (m^2)$$

$$wet\ perimeter = \frac{24.60 - 23.0}{24.9 - 23.0} \times \sqrt[2]{(24.9 - 23.0)^2 + (3.5 - 0)^2} + (6.5 - 3.5) + \frac{24.60 - 23.0}{25.0 - 23.0} \times \sqrt[2]{(25.0 - 23.0)^2 + (10.0 - 6.5)^2} = 9.57855\ (m)$$

$$hydraulic\ radius = \frac{flow\ area}{wet\ perimeter} = \frac{9.39790}{9.57855} = 0.98114\ (m)$$

With the hydraulic radius and flow area known, the capacity of watercourse at Location C when a 300mm freeboard is reserved can be estimated as below:

$$flow\ velocity = \frac{channel\ gradient^{\frac{1}{2}}}{Manning\ coefficient} \times hydraulic\ radius^{\frac{2}{3}} = 6.75947 \times 0.98114^{\frac{2}{3}} = 6.67421\ (m/s)$$

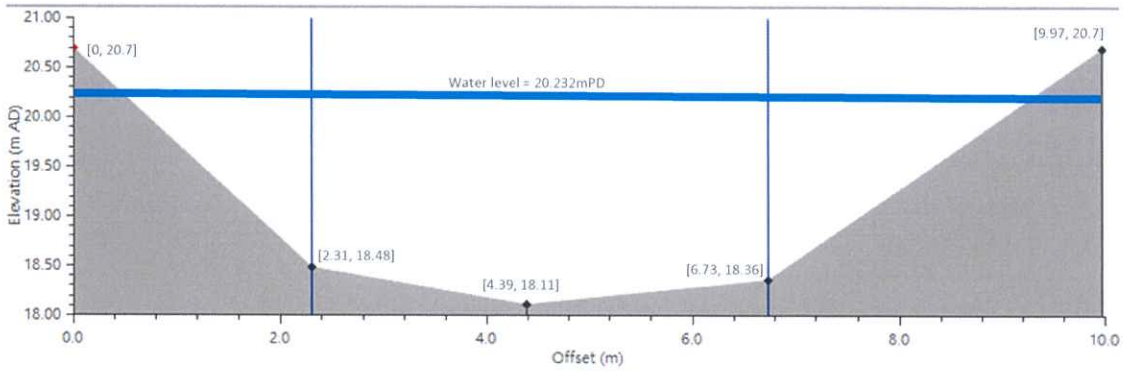
$$flow\ capacity = flow\ area \times flow\ velocity = 9.39790 \times 6.67421 = 62.72357\ (m^3/s)$$

Comparing the peak flow under current boundary condition, 28.84762m³/s, and the flow capacity under 300mm freeboard, the available capacity of watercourse at Location C can be estimated:

$$available\ capacity = 62.72357 - 28.84762 = 33.87595\ (m^3/s)$$

Calculation of Watercourse Capacity at Location D

Referring to the information provided by DSD, the peak water level at Location D has reached 20.232mPD under the scenario of a 10-year sea level in conjunction with a 50-year rainfall. The flow area as well as the hydraulic radius at the peak water level can be calculated from the geometry of the cross section of the watercourse at Location D:



As shown, the geometry of the watercourse cross-section at Location D can be portrayed by its bed level and the corresponding offset from shore line. Listed in the format as [offset, bed level], the 5 points used for describing cross-section geometry are:

[0, 20.7]; [2.31, 18.48]; [4.39, 18.11]; [6.73, 18.36]; [9.97, 20.7].

Therefore,

$$flow\ area = (\frac{20.232 - 18.48}{20.70 - 18.48})^2 \times (20.70 - 18.48) \times (2.31 - 0) \times 0.5 + (20.232 - 18.48) \times (4.39 - 2.31) + (18.48 - 18.11) \times (4.39 - 2.31) \times 0.5 + (20.232 - 18.36) \times (6.73 - 4.39) \times 0.5 + (18.36 - 18.11) \times (6.73 - 4.39) \times 0.5 + \left(\frac{20.232 - 18.36}{20.70 - 18.36}\right)^2 \times (20.70 - 18.36) \times (9.97 - 6.73) \times 0.5 = 12.73673(m^2)$$

$$wet\ perimeter = \frac{20.232 - 18.48}{20.70 - 18.48} \times \sqrt[2]{(20.70 - 18.48)^2 + (2.31 - 0)^2} + \sqrt[2]{(18.48 - 18.11)^2 + (4.39 - 2.31)^2} + \sqrt[2]{(18.36 - 18.11)^2 + (6.73 - 4.39)^2} + \frac{20.232 - 18.36}{20.70 - 18.36} \times \sqrt[2]{(20.70 - 18.36)^2 + (9.97 - 6.73)^2} = 10.19617\ (m)$$

$$hydraulic\ radius = \frac{flow\ area}{wet\ perimeter} = \frac{12.73673}{10.19617} = 1.24917\ (m)$$

Under assumption of uniform flow condition, the flow velocity of an open channel will subject to its roughness, channel gradient, and hydraulic radius as express as Manning's equation:

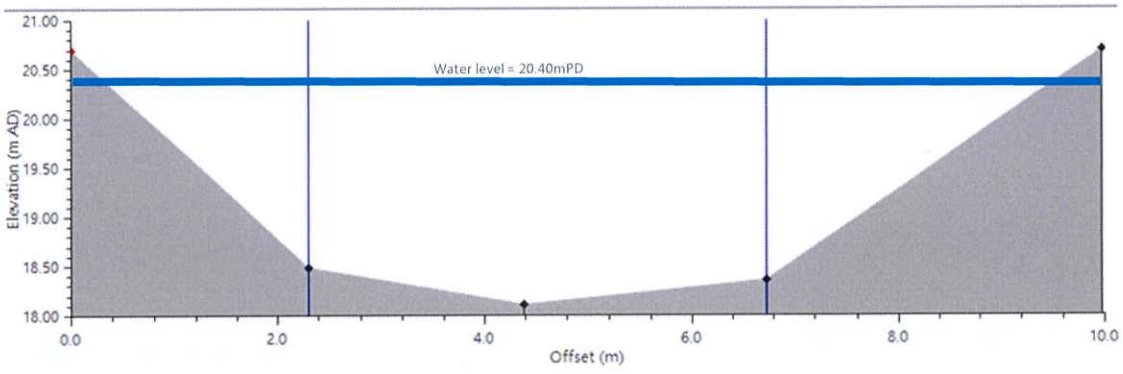
$$flow\ velocity = \frac{channel\ gradient^{\frac{1}{2}}}{Manning\ coefficient} \times hydraulic\ radius^{\frac{2}{3}}$$

The peak velocity of watercourse at Location D corresponding to the water level of 20.232m has been given by DSD as 2.543m/s. The hydraulic property of watercourse at Location D can be back calculated as a constant.

$$2.543 = \frac{channel\ gradient^{\frac{1}{2}}}{Manning\ coefficient} \times 1.24917^{\frac{2}{3}}$$

$$\frac{channel\ gradient^{\frac{1}{2}}}{surface\ roughness} = \frac{2.543}{1.24917^{\frac{2}{3}}} = 2.19246\ (m^{\frac{1}{3}}/s)$$

When a 300mm freeboard is reserved, the water level at Location D will reach 20.40mPD.



The corresponding flow area and hydraulic radius can be calculated.

$$flow\ area = (\frac{20.40 - 18.48}{20.70 - 18.48})^2 \times (20.70 - 18.48) \times (2.31 - 0) \times 0.5 + (20.40 - 18.48) \times (4.39 - 2.31) + (18.48 - 18.11) \times (4.39 - 2.31) \times 0.5 + (20.40 - 18.36) \times (6.73 - 4.39) \times 0.5 + (18.36 - 18.11) \times (6.73 - 4.39) \times 0.5 + \left(\frac{20.40 - 18.36}{20.70 - 18.36}\right)^2 \times (20.70 - 18.36) \times (9.97 - 6.73) \times 0.5 = 14.25575\ (m^2)$$

$$wet\ perimeter = \frac{20.40 - 18.48}{20.70 - 18.48} \times \sqrt[2]{(20.40 - 18.48)^2 + (2.31 - 0)^2} + \sqrt[2]{(18.48 - 18.11)^2 + (4.39 - 2.31)^2} + \sqrt[2]{(18.36 - 18.11)^2 + (6.73 - 4.39)^2} + \frac{20.40 - 18.36}{20.70 - 18.36} \times \sqrt[2]{(20.70 - 18.36)^2 + (9.97 - 6.73)^2} = 10.72523\ (m)$$

$$hydraulic\ radius = \frac{flow\ area}{wet\ perimeter} = \frac{14.25575}{10.72523} = 1.32918\ (m)$$

With the hydraulic radius and flow area known, the capacity of watercourse at Location D when a 300mm freeboard is reserved can be estimated as below:

$$flow\ velocity = \frac{channel\ gradient^{\frac{1}{2}}}{Manning\ coefficient} \times hydraulic\ radius^{\frac{2}{3}} = 2.19246 \times 1.32918^{\frac{2}{3}} = 2.65046\ (m/s)$$

$$flow\ capacity = flow\ area \times flow\ velocity = 14.25575 \times 2.65046 = 37.78431\ (m^3/s)$$

In summary, the flow capacity of watercourse at Location D with 300mm freeboard is estimated to be 37.78m^3/s.

Comparing the peak flow under current boundary condition, 28.98928m^3/s, and the flow capacity under 300mm freeboard, the available capacity of watercourse at Location D can be estimated:

$$available\ capacity = 37.78431 - 28.98928 = 8.79503\ (m^3/s)$$

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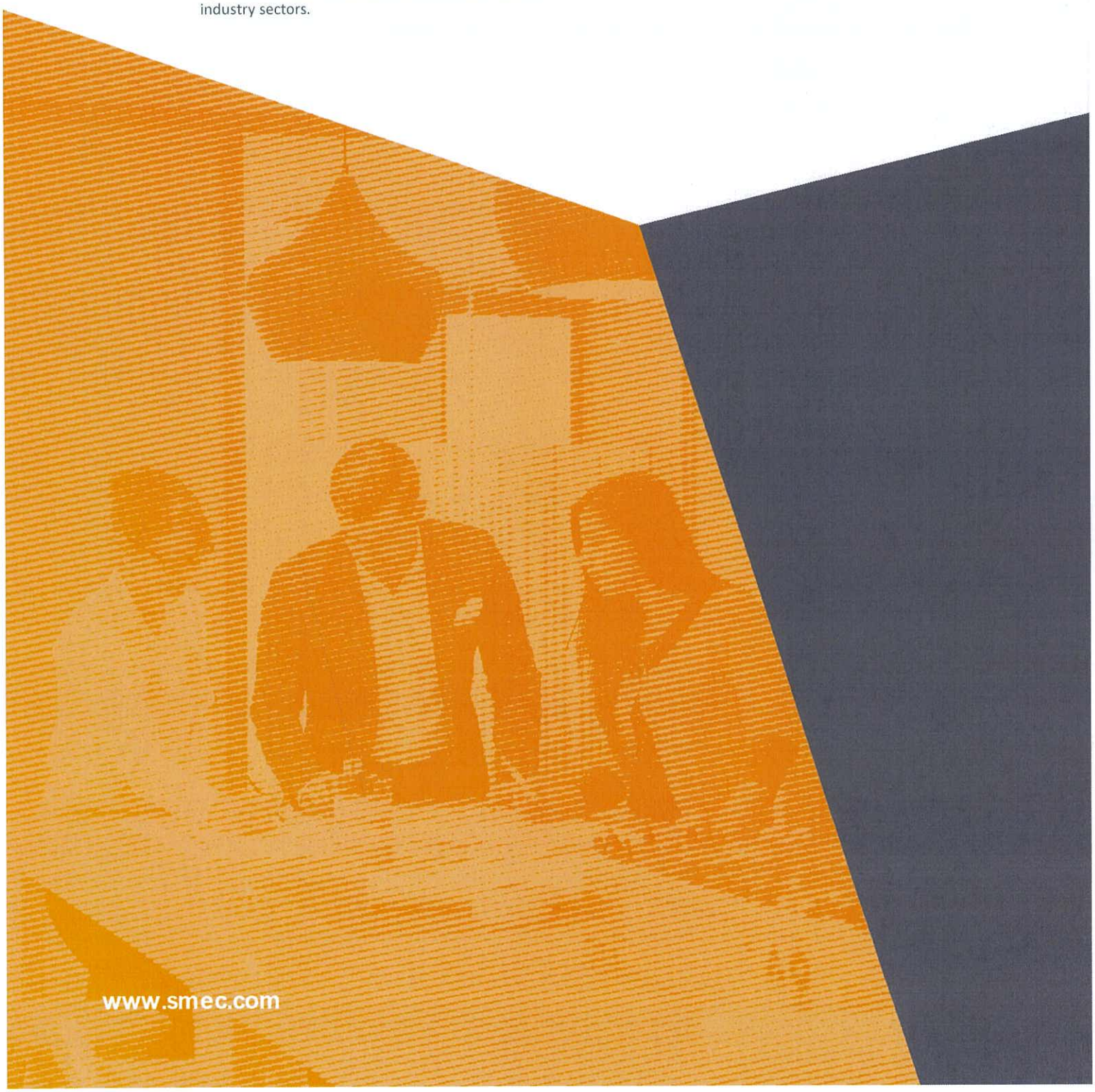

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