ANNEX II

Excel Link Development Limited

Proposed Temporary Open Storage of Construction Materials, Construction Machineries, Auto Parts and Vehicles with Ancillary Facilities for a Period of 3 Years and Associated Filling of Land and Pond in "Agriculture" Zone, Various Lots in D.D. 106 and Adjoining Government Land, Shek Kong, Yuen Long, New Territories

Drainage Impact Assessment

Document No. V1053/01
Issue 1

August 2024

MANNINGS
(Asia) Consultants Limited

V1053/01
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Proposed Temporary Open Storage of Construction Materials Construction Machineries, Auto Parts and Vehicles with Ancillary Facilities for a Period of 3years and Associated Filling of Land and Pond in "Agriculture" Zone, Various Lots in D.D. 106 and Adjoining Government Land, Shek Kong, Yuen Long, New Territories

Drainage Impact Assessment

Approved for Issue by:

Bryan LEUNG

Position: Project Manager

Date: 13 August 2024

Excel Link Development Limited
205A Sik Kong Tsuen
Ha Tsuen, Yuen Long N. T

Mannings (Asia) Consultants Ltd
5/F, Winning Commercial Building,
46-48 Hillwood Road,
Tsim Sha Tsui,
Kowloon.

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Drainage Impact Assessment

Issue	Prepared by	Reviewed by	Date
1	EM	BLE	13 Aug 2024

Content

1.0 Introduction **1**
2.0 Site Condition **2**
3.0 Design Methodology and Assumptions **3**
4.0 Drainage Assessment **6**
5.0 Conclusion **7**

List of Appendix

Appendix A: Drawing
Appendix B: Design Calculation
Appendix C: Site Photos

List of Tables

Table 4.1: Runoff Coefficient
Table 4.2: Minimum pipeline cover and manhole spacing requirements
Table 4.3: Storm Constant for SDM

1.0 Introduction

1.1 This submission presents the drainage impact assessment of the proposed temporary open storage of construction materials construction machineries, auto parts and vehicles with ancillary facilities for a period of 3years and associated filling of land and pond at various lots in D.D. 106 and adjoining government land Shek Kong, Pat Heung, Yuen Long, New Territories ("Site").

1.2 The Site has an area of about 78,557m^2 and it is currently occupied by open space uses. Six 1- storey structures are proposed at the Site for site offices and washrooms with total GFA of about 1,320 m^2. The general layout plan of the Site is shown in the **Drawing No. V1053/001.**

1.3 Due to the concerns of possible drainage impact arising from the change of uses, Mannings (Asia) Consultants Limited (MACL) was commissioned by Excel Link Development Limited to undertake a Drainage Impact Assessment (DIA) to demonstrate the acceptability of drainage impact upon the surrounding environment.

2.0 Site Condition

2.1 The topography of the Site is generally flat and currently situated with levels ranging from +12.7mPD to +15.10 mPD. In general, the direction of surface runoff flow from east to west. The existing catchment plan refer to the **Drawing No. V1053/009** in **Appendix A**. After completion of the project, the ground level of the Site will be raised to above +15.0mPD to +16.6 mPD. The existing unpaved area will change to paved area for the proposed 6 structures. There is no change of unpaved area for the other areas such as road, parking area and open space. The catchment plan after the development refer to the **Drawing No. V1053/010** in **Appendix A.**

2.2 According to the site survey and site observation, there is a natural stream located at the north of the Site flowing from east to west and finally connected to the Kam Tin River. Some of the runoff from the Site will be discharged into the natural stream.

2.3 In addition, there are existing u channels and pipes located at the south of the Site. These drain discharging part of the site surface runoff into the river at the south.

3.0 Design Methodology and Assumptions

3.1 Design Code

Stormwater Drainage Manual (DSD) - Fifth Edition, January 2018;
Stormwater Drainage Manual (DSD) - Corrigendum No. 1/2022;
Stormwater Drainage Manual (DSD) - Corrigendum No. 1/2024;
Stormwater Drainage Manual (DSD) - Corrigendum No. 2/2024;
BS 5911 Code of practice for precast concrete pipe design
DSD Standard Drawings

3.2 Design Parameters

a) Runoff Coefficient

Table 3-1 Runoff Coefficients

Surface Characteristic	Runoff Coefficient, C
Roof of Structure	1.00
Existing Concrete	0.95
Grassland (heavy soil**) Flat	0.25

Roughness Coefficient for pipe flow k_s= 3

b) Minimum pipeline cover and manhole spacing requirements

Table 3-2 Minimum pipeline cover and manhole spacing requirements

Minimum pipeline cover	
In Roads	0.9 m
In footways and verges	0.45 m
Manhole spacing requirements	
D<675 mm	80 m
675 < D < 1050	100 m
D > 1050	120 m

c) Bedding factors

Granular bedding : 1.9
Plain concrete bedding : 2.6
Reinforced concrete bedding with allowance for minimum steel area : 3.4
Concrete Surround : 4.5

d) Design Flow Velocity

Minimum : 1 m/s

Maximum : 3 m/s (desirable)
: 6 m/s (absolute)

3.3 1 in 10 years return period is used for the drainage design.

3.4 Description of Analysis Method

a) Rational method is used for calculation of the peak runoff. The formula is extracted from Section 7.5.2 (a) of SDM which is to estimate the stormwater runoff as shown below:

$$Q_p = 0.278\ CiA$$

Where Q_p = peak runoff in m3/s
C = runoff coefficient (dimensionless)
i = rainfall intensity in mm/hr
A = catchment area in km2

b) 10% reduction of flow area is allowed taken into account of decomposition of siltation as per DSD's Stormwater Drainage Manual (SDM) 2018.

c) The time of concentration used for determining the duration of the design storm is considered by the time of entry and the time of flow,

$$t_c = t_e + t_f \qquad t_f = L/V$$

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

Where t_f = flow time
L = Length of drain
V = flow velocity

e) The time of entry or time of flow in the hinterland is calculated using the Bransby William's Equation.

$$t_e = \frac{0.14465\,L}{A^{0.1}H^{0.2}}$$

Where t_e = time of concentration (min)
L = catchment length (m)
A = catchment area (m2)
H = average catchment slope (m/100m)

f) The rainfall intensity is extracted from the Section 4.3.2 of SDM which is to estimate the Intensity-Duration –Frequency (IDF) Relationship.

$$i = a /(t_d+b)^c$$

Where I = extreme mean intensity in mm/hr
t_d = duration in minutes (td<240), and
a,b,c = storm constants given in table 3 of SDM as below

Table 3-3 Storm Constant of SDM

Return Period T (years)	10
a	2251.3
b	27.46
c	0.661

g) Colebrook-White Equation is used in hydraulic design for pipe flow.

$$V = -\sqrt{(32gRs)}\log\left(\frac{k_s}{14.8R} + \frac{1.255v}{R\sqrt{(32gRs)}}\right)$$

Where

V = mean velocity (m/s)
g = gravitational acceleration (m/s^2)
R = hydraulic radius (m)
D = pipe diameter (m)
ks = equivalent sand roughness (m)
v = kinematic viscosity of fluid (m^2/s)
s = frictional slope (energy gradient due to frictional loss)

4.0 Drainage Assessment

4.1 The surface characteristics of the on-site catchment area (i.e. Catchment A-D) of the existing condition and proposed condition are summarized in Table 3.1.

Table 3.1 Existing and Proposed Catchment

Catchment	Existing Catchment		Proposed Catchment	
	unpaved	paved	unpaved	paved
A	36027	5,227	30,599	6,107
B	9,023	0	8,906	0
C	50,423	5,110	50,203	5,330
D	32,941	1,173	37,386	1,393

4.2 The surface runoff within the Site area will be collected by the proposed drainage systems and discharged into the existing drains. The drainage layout plans are shown in D**rawing Nos. V1053/003 - 006** in **Appendix A.**

4.3 The estimated runoff from the existing land use and the proposed land use in summarized in Table 3.2.

Table 3.2 Estimated Runoff of the Existing Land Use and Proposed Land Use

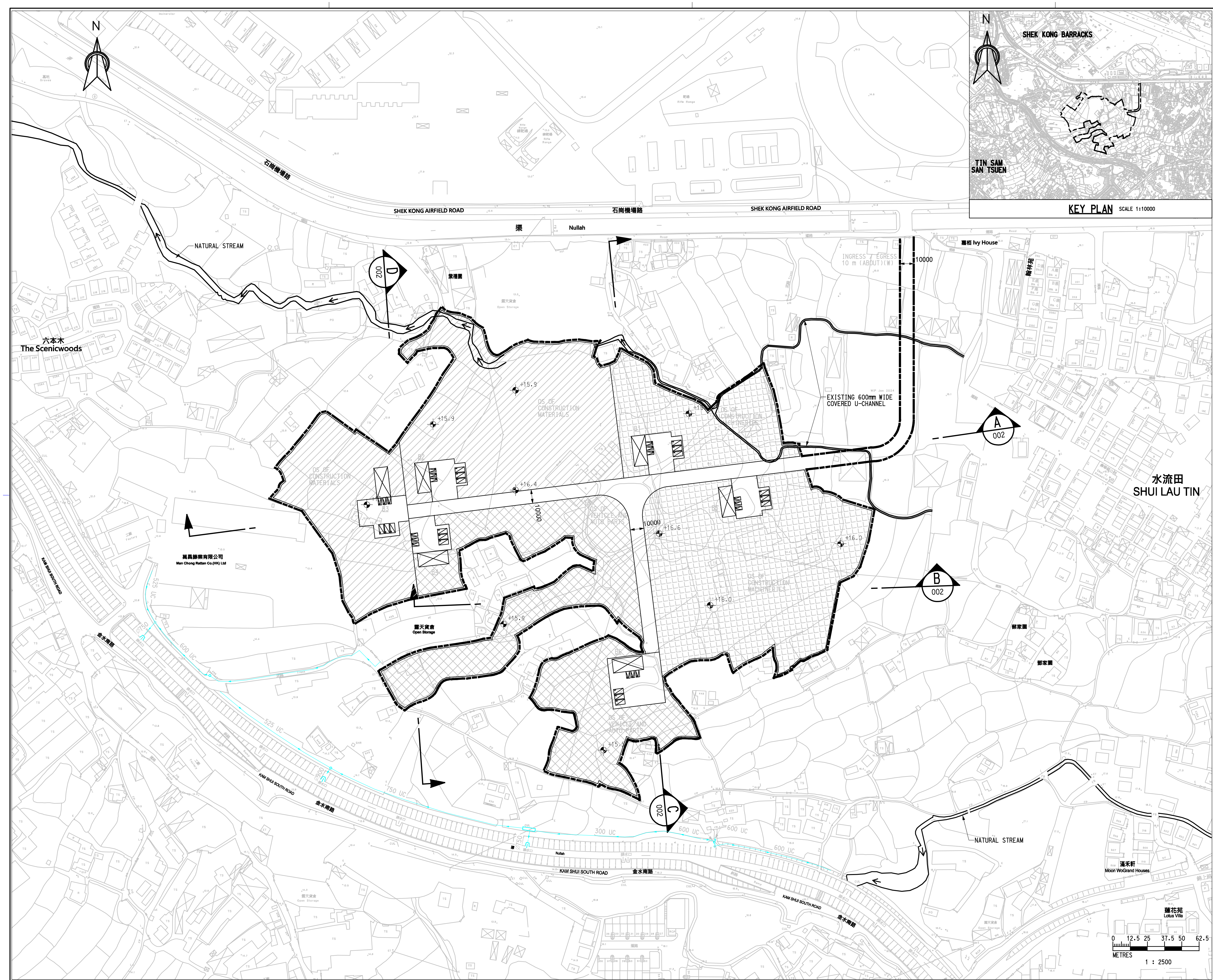
Drainage System	Existing runoff (m3/s)	Future runoff (m^3/s)
A	0.75	0.68
B	0.12	0.12
C	1.01	1.00
D	0.53	0.59

4.4 From the results, there is no increase in surface runoff arising from the land use changes for drainage systems A. B and C. As such, it is anticipated that there is no adverse drainage impact to the existing drainage after implementation of the land use changes. For drainage system D, there is slightly increase in surface runoff arising from the land use changes. The existing 750mm dia. pipe is checked and it provide sufficient capacity to cater for the flow after development.

5.0 Conclusion

5.1 A Drainage Impact Assessment has been conducted for the proposed land use changes in Shek Kong. There is no increase in surface runoff for catchment A, B and C. The existing drainage system is checked for catchment D. Based on the calculation, the existing drainage design has enough adequacies to cater the surface water.

Appendix A
Drawings



NOTES :

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LEGEND :

- APPLICATION SITE
- STRUCTURE
- OPENSTORAGE OF CONSTRUCTION MATERIALS
- OPENSTORAGE CONSTRUCTION MACHINERIES
- OPENSTORAGE OF VEHICLE AND AUTO PARTS
- PARKING SPACE (PRIVATE CAR)
- L/UL SPACE (LIGHT GOODS VEHICLE)
- INGRESS/EGRESS
- EXISTING U-CHANNEL
- EXISTING PIPE
- EXISTING MANHOLE
- +16.6 PROPOSED GROUND SURFACE LEVEL

Rev.	Description of Revision	Date	Ckd.

Client

EXCEL LINK DEVELOPMENT LIMITED

Consultants

MANNINGS (Asia) Consultants Limited

Scale in A3: AS SHOWN	Date: AUG 2024	
Designed: EM	Drawn: KAM	Checked: BLE
Design Team Leader: SC	Date: AUG 2024	
Approved: KTC	Date: AUG 2024	

Project

PROPOSED TEMPORARY OPEN STORAGE OF CONSTRUCTION MATERIALS, CONSTRUCTION MACHINERIES AUTO PARTS AND VEHICLES WITH ANCILLARY FACILITIES FOR A PERIOD OF 3 YEARS AND ASSOCIATED FILLING OF LANDAND POND

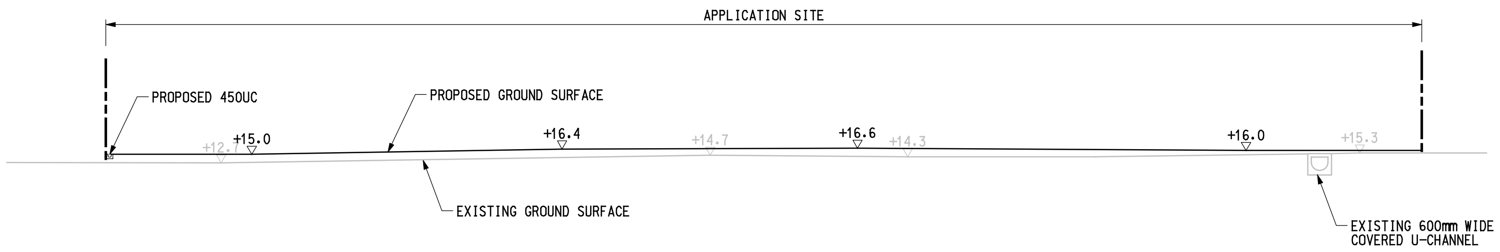
Title

LAYOUT PLAN

Drawing No.	Stage	Rev.
V1053/001	P	-

14/8/2024 $TIME$

K:*V1053 - DIA for Shek Kong Development*Ustation*V1053-001.dgn



SECTION A
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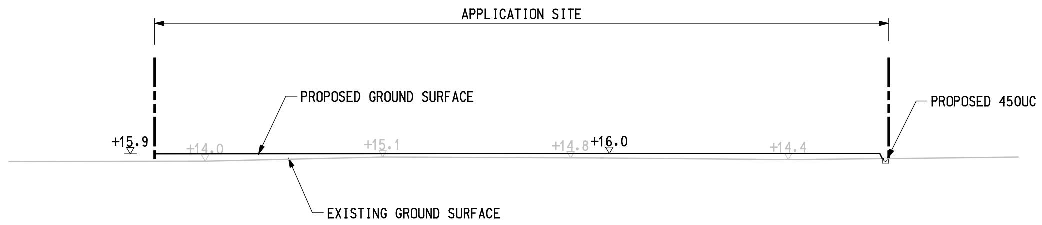

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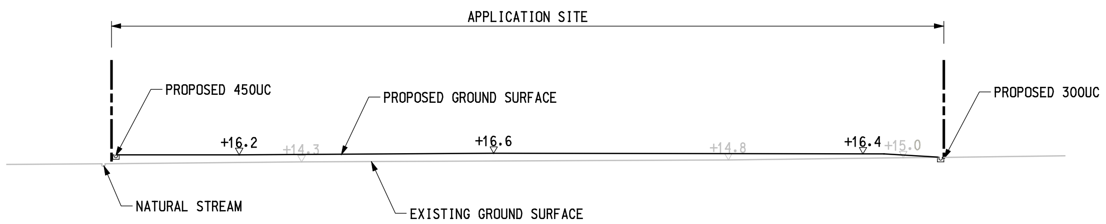

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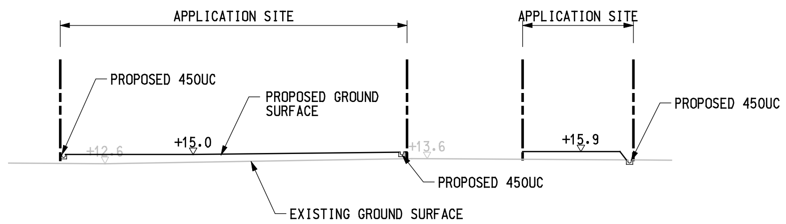

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001

0 10 20 30 40 50
METRES
1 : 2000

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Client
EXCEL LINK DEVELOPMENT LIMITED

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Title
SECTIONS

Drawing No.	Stage	Rev.
V1053/002	P	-

14/8/2024 $TIME$

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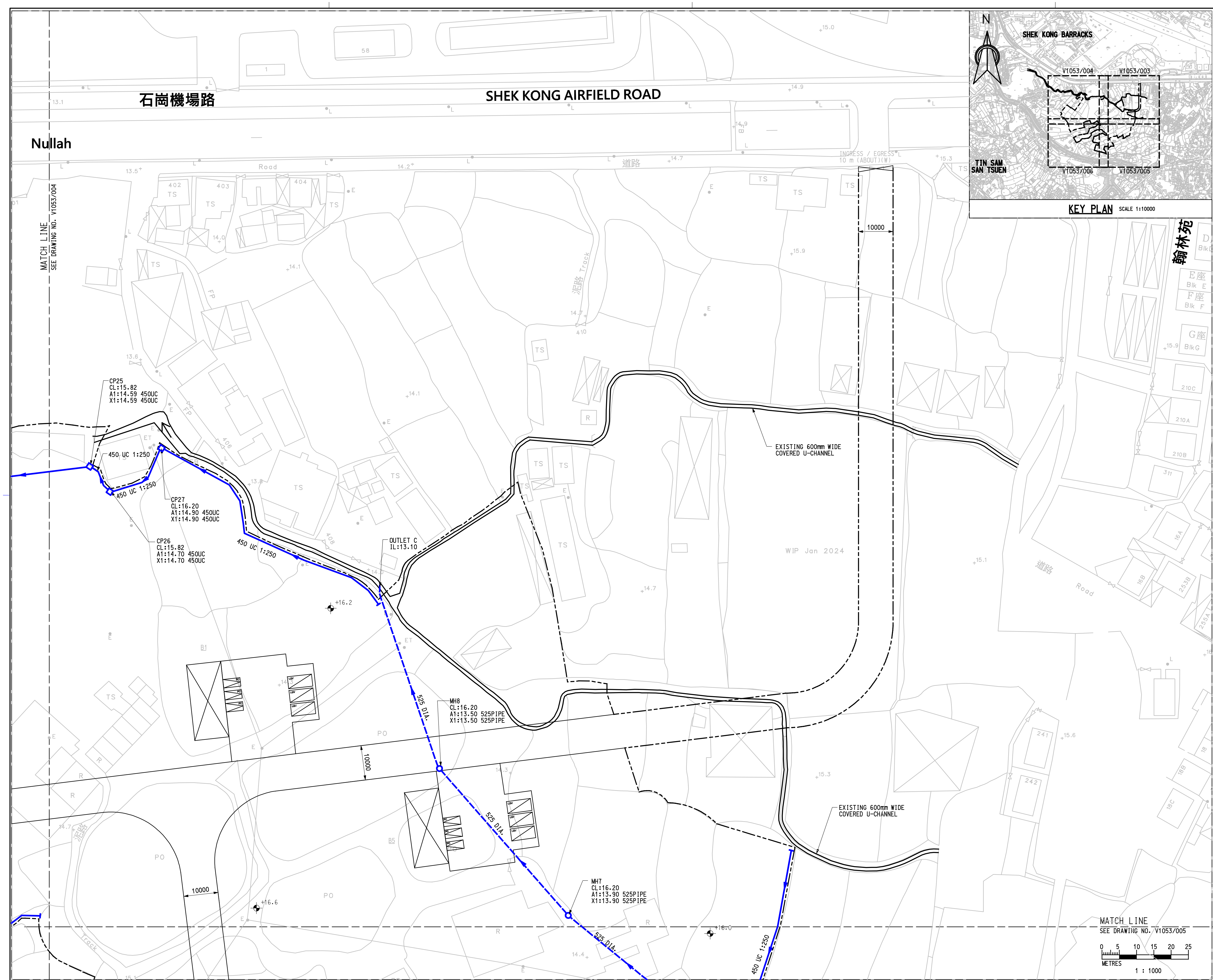

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LEGEND :

- APPLICATION SITE
- STRUCTURE
- PARKING SPACE (PRIVATE CAR)
- L/UL SPACE (LIGHT GOODS VEHICLE)
- INGRESS/EGRESS
- PROPOSED U-CHANNEL
- PROPOSED PIPE
- PROPOSED CATCHPIT
- PROPOSED MANHOLE
- EXISTING U-CHANNEL
- EXISTING PIPE
- EXISTING MANHOLE
- +16.6 PROPOSED GROUND SURFACE LEVEL

Rev.	Description of Revision	Date	Ckd.

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Title

DRAINAGE LAYOUT PLAN

(SHEET 1 OF 4)

Drawing No.	Stage	Rev.
V1053/003	P	-

14/8/2024 $TIME$

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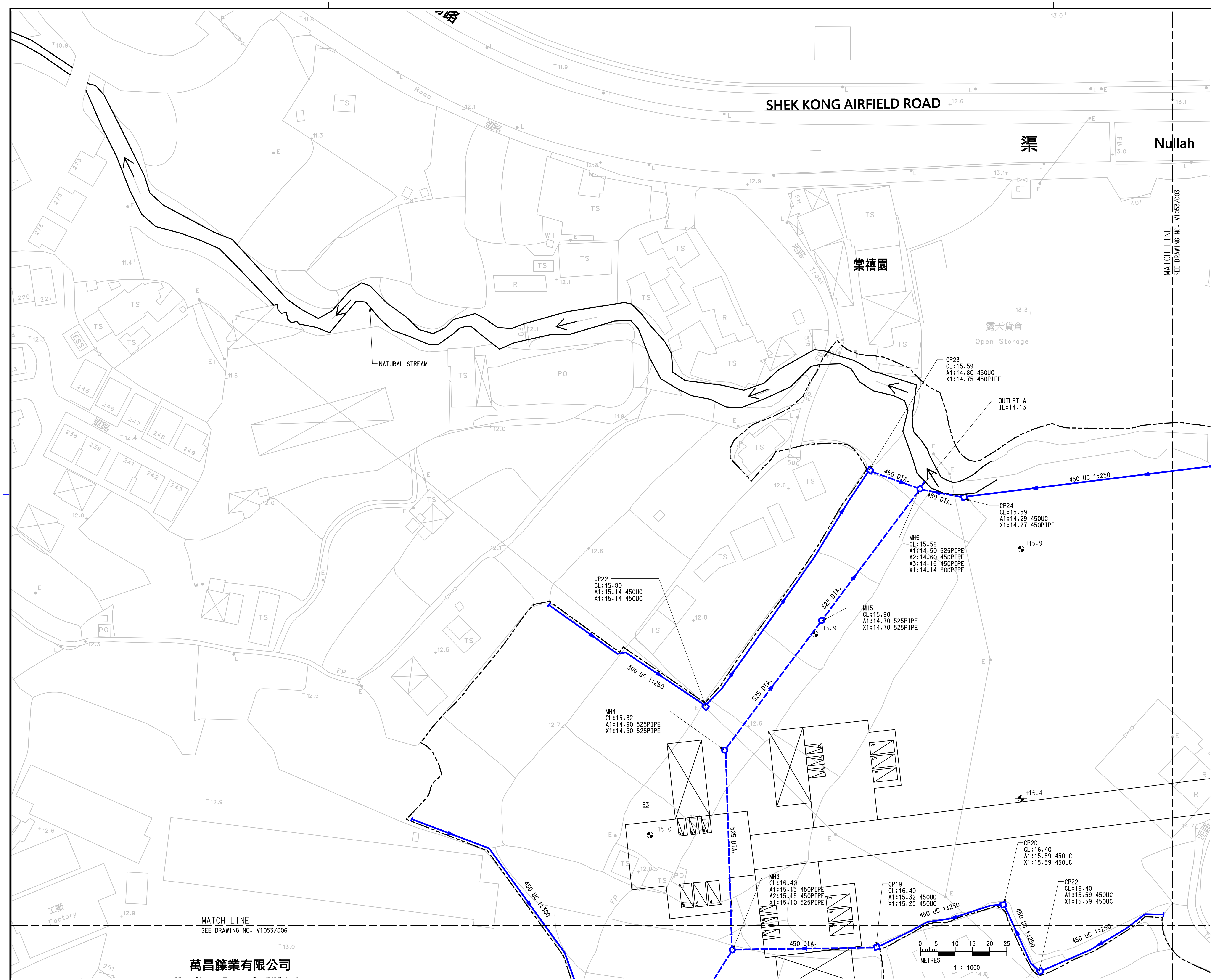

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Rev.	Description of Revision	Date	Ckd.

Client

EXCEL LINK DEVELOPMENT LIMITED

Consultants

MANNINGS (Asia) Consultants Limited

Scale in A3 AS SHOWN	Date AUG 2024	
Designed EM	Drawn KAM	Checked BLE
Design Team Leader SC		Date AUG 2024
Approved KTC		Date AUG 2024

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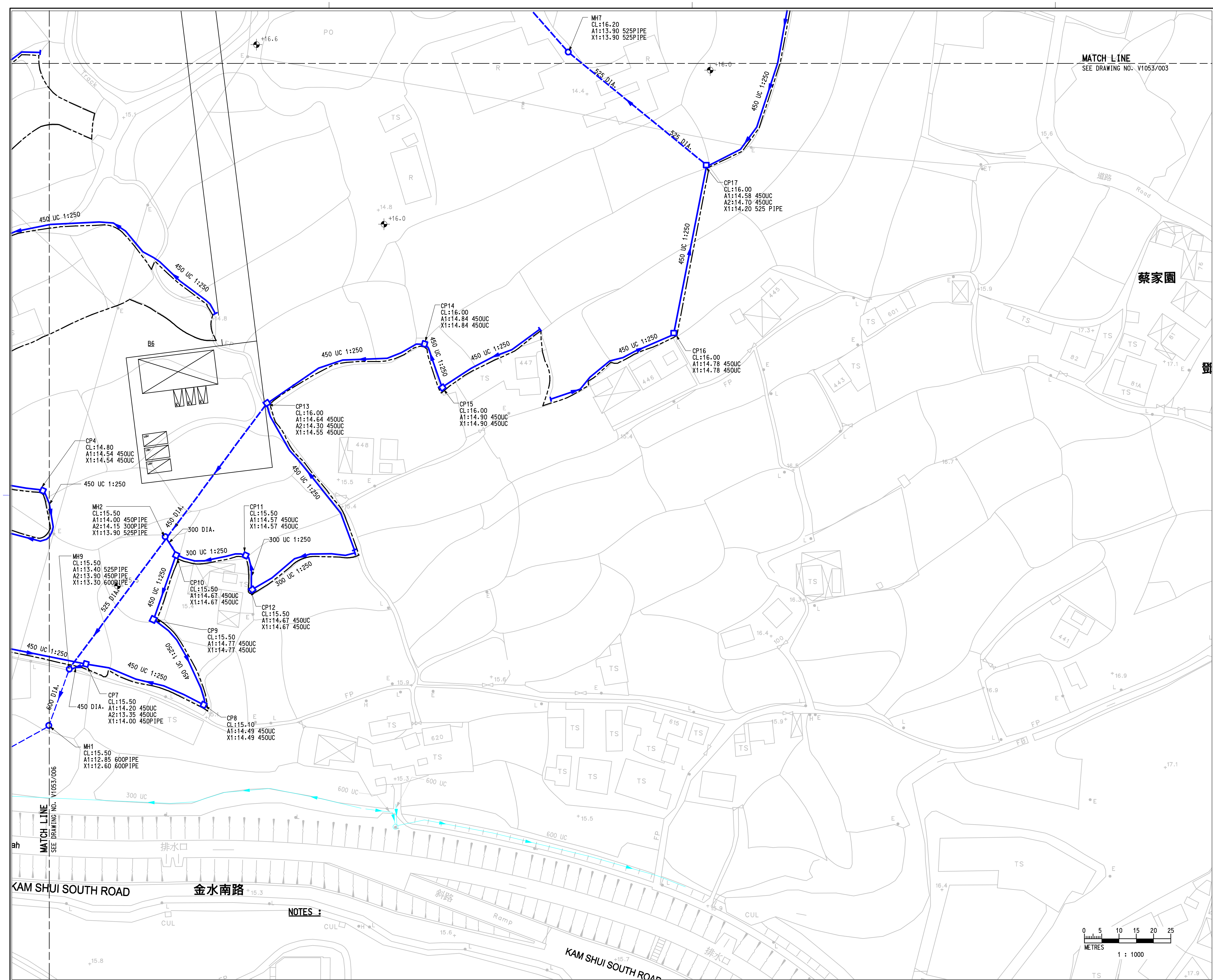
PROPOSED TEMPORARY OPEN STORAGE OF CONSTRUCTION MATERIALS, CONSTRUCTION MACHINERIES AUTO PARTS AND VEHICLES WITH ANCILLARY FACILITIES FOR A PERIOD OF 3 YEARS AND ASSOCIATED FILLING OF LANDAND POND

Title

DRAINAGE LAYOUT PLAN

(SHEET 2 OF 4)

Drawing No.	Stage	Rev.
V1053/004	P	-



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LEGEND :

- APPLICATION SITE
- STRUCTURE
- PARKING SPACE (PRIVATE CAR)
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Client

EXCEL LINK DEVELOPMENT LIMITED

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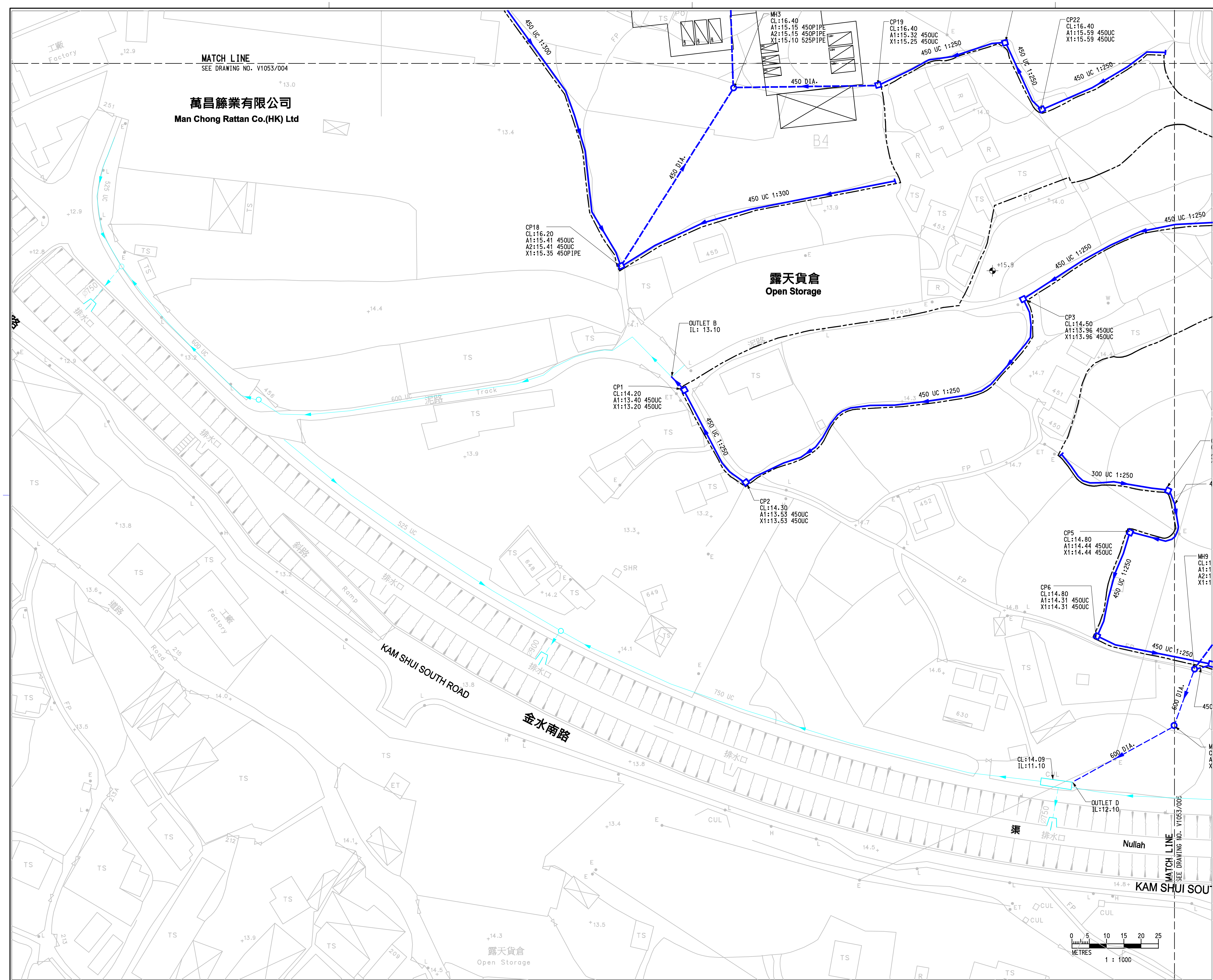
Title

DRAINAGE LAYOUT PLAN

(SHEET 3 OF 4)

Drawing No.	Stage	Rev.
V1053/005	P	-



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Rev.	Description of Revision	Date	Ckd.

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EXCEL LINK DEVELOPMENT LIMITED

Consultants

MANNINGS (Asia) Consultants Limited

Scale in A3	Date	
AS SHOWN	AUG 2024	
Designed: EM	Drawn: KAM	Checked: BLE
Design Team Leader: SC		Date: AUG 2024
Approved: KTC		Date: AUG 2024

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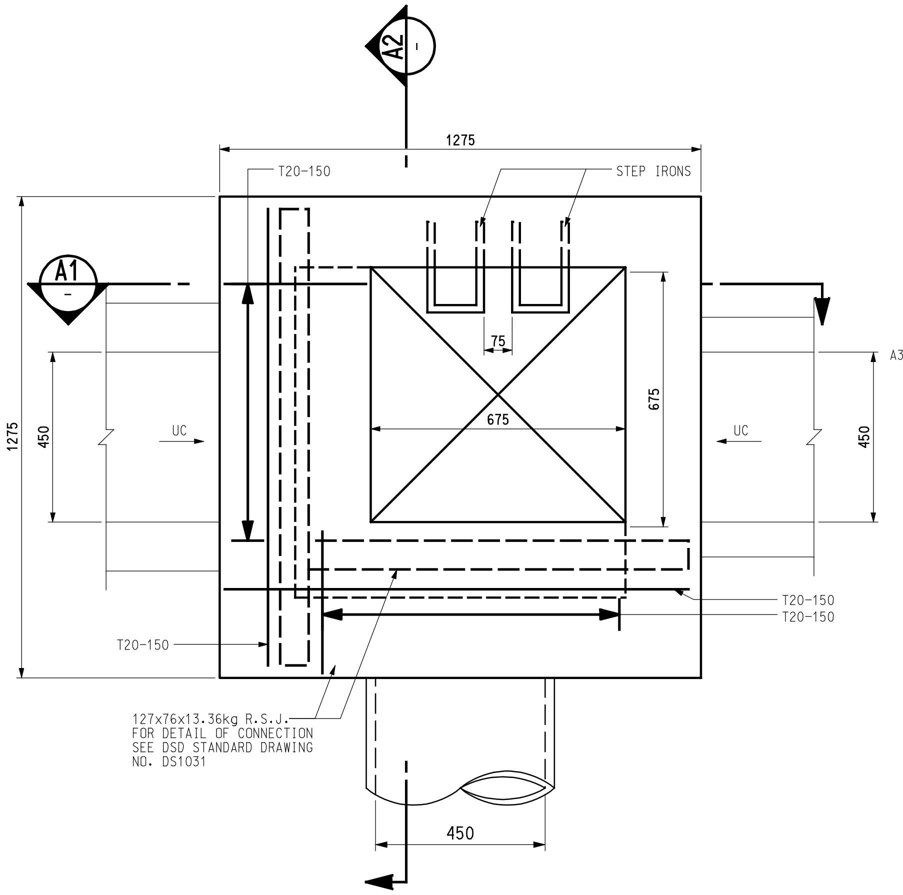
PROPOSED TEMPORARY OPEN STORAGE OF CONSTRUCTION MATERIALS, CONSTRUCTION MACHINERIES AUTO PARTS AND VEHICLES WITH ANCILLARY FACILITIES FOR A PERIOD OF 3 YEARS AND ASSOCIATED FILLING OF LANDAND POND

Title

DRAINAGE LAYOUT PLAN

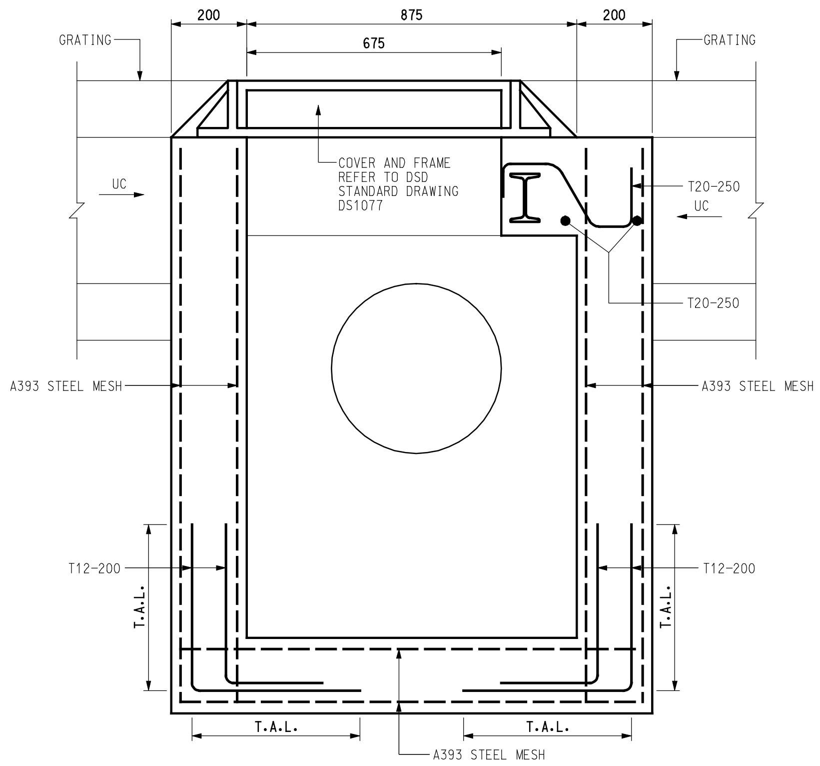
(SHEET 4 OF 4)

Drawing No.	Stage	Rev.
V1053/006	P	-



TYPICAL DETAILS OF CATCHPIT TYPE A

SCALE 1:20



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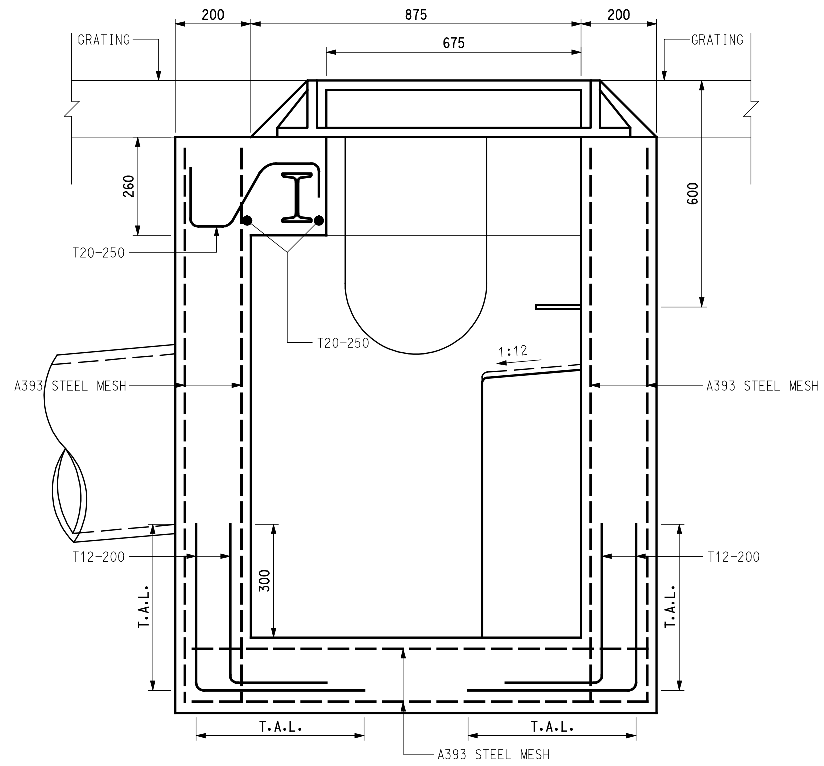

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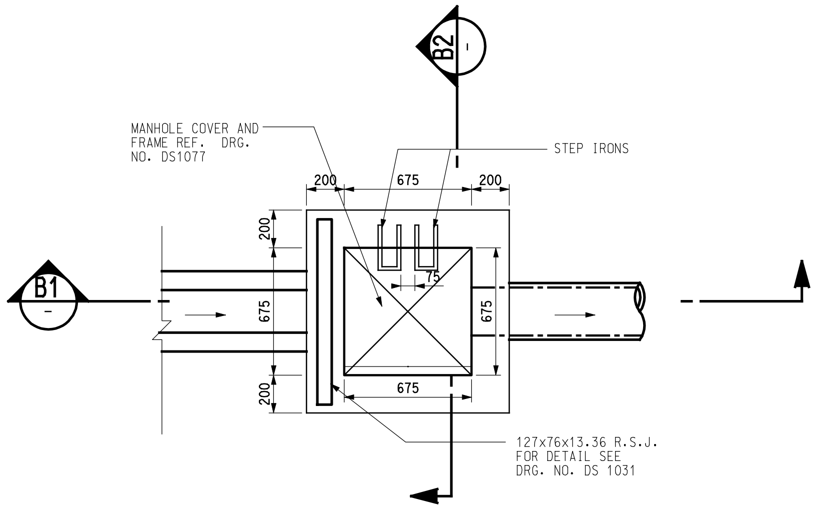

TYPICAL DETAILS OF CATCHPIT TYPE B

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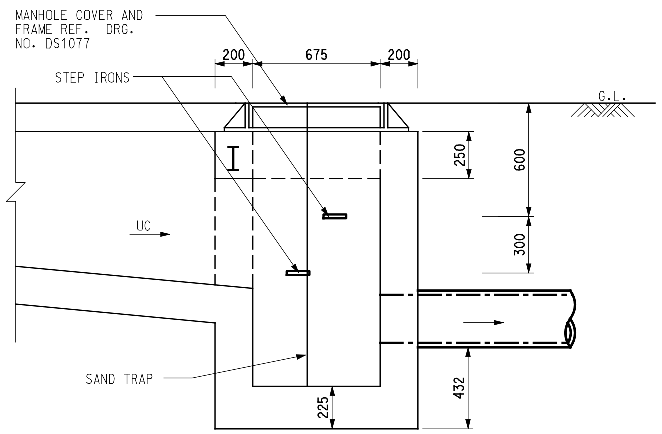

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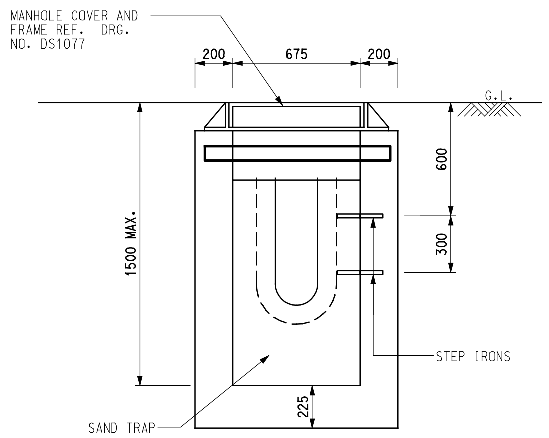

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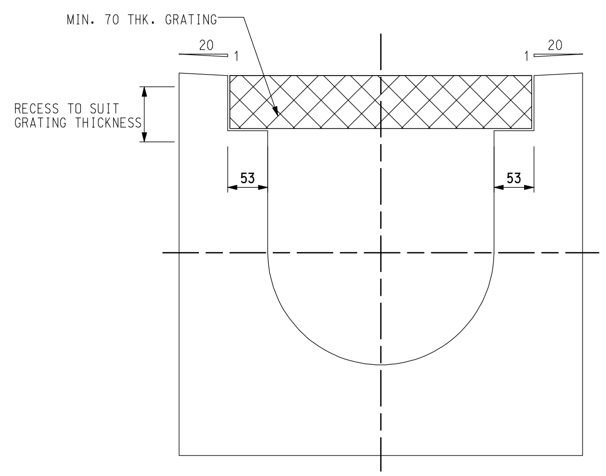
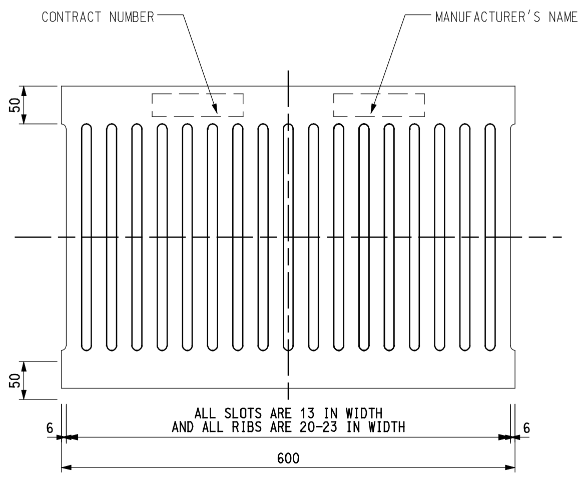


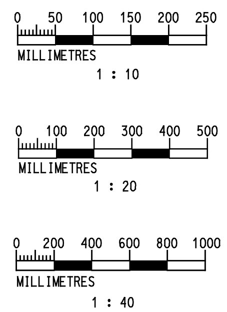
TYPICAL CROSS SECTION OF CHANNEL

SCALE 1:10



TYPICAL GRATING

SCALE 1:10



NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
2. ALL LEVELS ARE IN mPD METRE ABOVE HONG KONG PRINCIPAL DATUM.
3. LETTERING FOR CONTRACT NO. AND MANUFACTURER'S NAME SHALL BE RAISED 2mm ABOVE NORMAL SURFACE.

Rev.	Description of Revision	Date	Ckd.

Client

EXCEL LINK DEVELOPMENT LIMITED

Consultants

MANNINGS (Asia) Consultants Limited

Scale in A3: AS SHOWN		Date: AUG 2024
Designed: EM	Drawn: KAM	Checked: BLE
Design Team Leader: SC		Date: AUG 2024
Approved: KTC		Date: AUG 2024

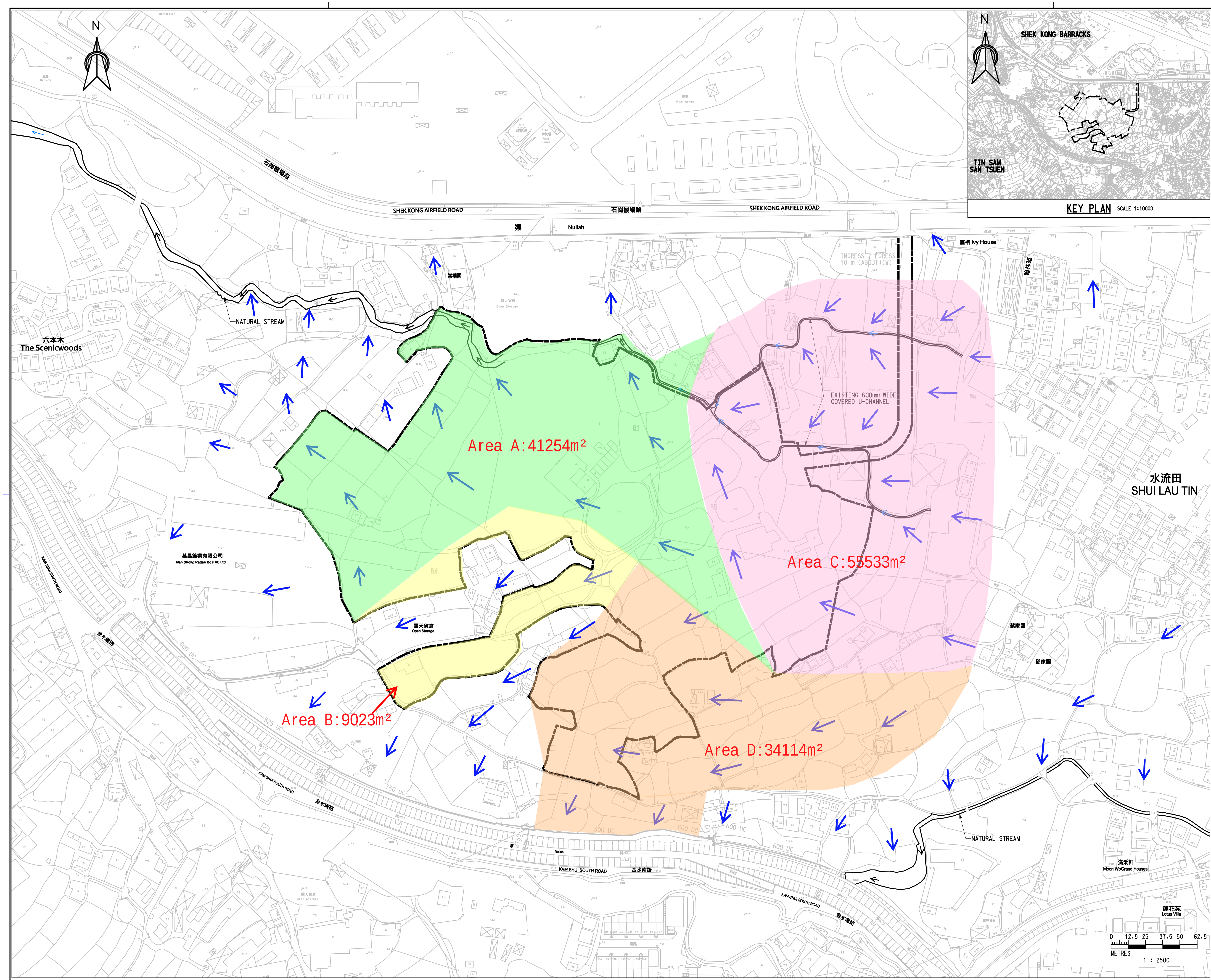
Project

PROPOSED TEMPORARY OPEN STORAGE OF CONSTRUCTION MATERIALS. CONSTRUCTION MACHINERIES AUTO PARTS AND VEHICLES WITH ANCILLARY FACILITIES FOR A PERIOD OF 3 YEARS AND ASSOCIATED FILLING OF LANDAND POND

Title

TYPICAL DETAILS OF DRAINAGE

Drawing No.	Stage	Rev.
V1053/007	P	-



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LEGEND :

- APPLICATION SITE
- CATCHMENT AREA A
- CATCHMENT AREA B
- CATCHMENT AREA C
- CATCHMENT AREA D
- RUNOFF DIRECTION

Rev.	Description of Revision	Date	Ckd.

Client

EXCEL LINK DEVELOPMENT LIMITED

Consultants

MANNINGS (Asia) Consultants Limited

Scale in A3 AS SHOWN		Date AUG 2024
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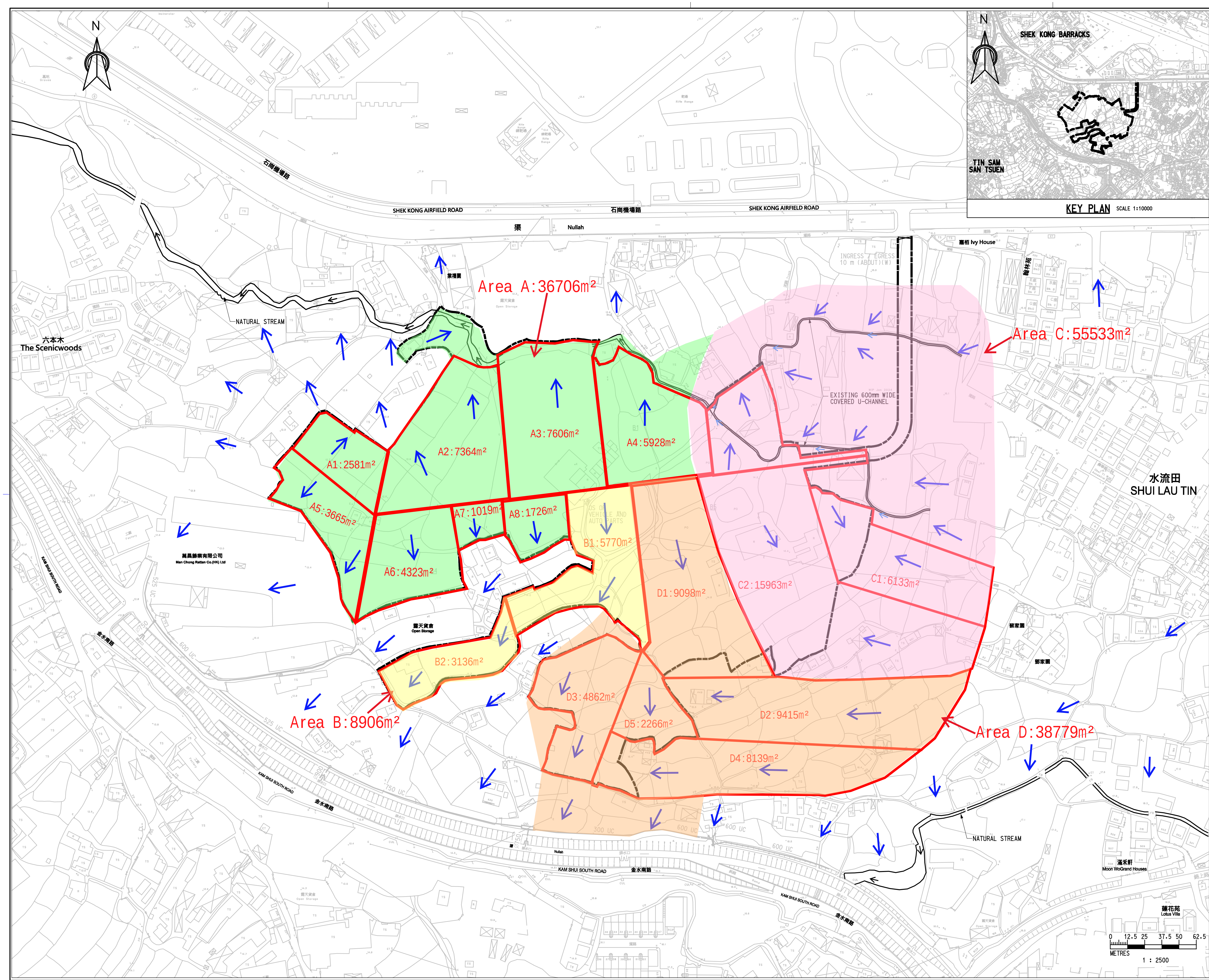
Title

CATCHMENT PLAN - BEFORE DEVELOPMENT

Drawing No.	Stage	Rev.
V1053/009	P	-



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LEGEND :

- APPLICATION SITE
- CATCHMENT AREA A
- CATCHMENT AREA B
- CATCHMENT AREA C
- CATCHMENT AREA D
- SITE CATCHMENT AREA
- RUNOFF DIRECTION

Rev.	Description of Revision	Date	Ckd.

Client

EXCEL LINK DEVELOPMENT LIMITED

Consultants

MANNINGS (Asia) Consultants Limited

Scale in A3: AS SHOWN		Date: AUG 2024
Designed: EM	Drawn: KAM	Checked: BLE
Design Team Leader: SC		Date: AUG 2024
Approved: KTC		Date: AUG 2024

Project

PROPOSED TEMPORARY OPEN STORAGE OF CONSTRUCTION MATERIALS, CONSTRUCTION MACHINERIES AUTO PARTS AND VEHICLES WITH ANCILLARY FACILITIES FOR A PERIOD OF 3 YEARS AND ASSOCIATED FILLING OF LANDAND POND

Title

CATCHMENT PLAN - AFTER DEVELOPMENT

Drawing No.	Stage	Rev.
V1053/010	P	-

14/8/2024 $TIME$

K:*V1053 - DIA for Shek Kong Development*Ustation*V1053-010.dgn

Appendix B
Design Calculations

Rational method is used for calculation of the peak runoff. The formula is extracted from Section 7.5.2 (a) of SDM.
Qp = 0.278 C i A
Where Qp = peak runoff in m3/s
I = rainfall intensity in mm/hr
A = catchment area in km2
The parameters and assumptions refer to section 3.

Before Development

Runoff Estimation at Cacthment A

Natural Catch. (m^2)	Longest flow path (m)	Highest (mPD)	Lowest (mPD)	Gradient (per 100m) = (h_1-h_2)/L x 100	to (min) = 0.14465L/($H^{0.2}A^{0.1}$)	Length of Nullah L (m)	flow vel. (m^3/s)	t_f = L/v (min)	tc = to + t_f (min)	Runoff coeff.	Total Catch. Area (m^2)	10 year Intensity (mm/hr)	10 year design runoff = 0.278CiA	10 year Total runoff (m^3/s)
41254	188	14.55	9.98	2.43	7.87	401	1.218	5	13.4	0.25	36027	193.95	0.49	0.75
										0.95	5227		0.27	

Runoff Estimation at Cacthment B

Natural Catch. (m^2)	Longest flow path (m)	Highest (mPD)	Lowest (mPD)	Gradient (per 100m) = (h_1-h_2)/L x 100	to (min) = 0.14465L/($H^{0.2}A^{0.1}$)	Length of Nullah L (m)	flow vel. (m^3/s)	t_f = L/v (min)	tc = to + t_f (min)	Runoff coeff.	Total Catch. Area (m^2)	10 year Intensity (mm/hr)	10 year design runoff = 0.278CiA	10 year Total runoff (m^3/s)
9023	200	15.1	14.1	0.50	13.37	192	1.343	2	15.7	0.25	9023	186.78	0.12	0.12

Runoff Estimation at Cacthment C

Natural Catch. (m^2)	Longest flow path (m)	Highest (mPD)	Lowest (mPD)	Gradient (per 100m) = (h_1-h_2)/L x 100	to (min) = 0.14465L/($H^{0.2}A^{0.1}$)	Length of Nullah L (m)	flow vel. (m^3/s)	t_f = L/v (min)	tc = to + t_f (min)	Runoff coeff.	Total Catch. Area (m^2)	10 year Intensity (mm/hr)	10 year design runoff = 0.278CiA	10 year Total runoff (m^3/s)
55533	126	14.55	12.87	1.33	5.77	289	1.343	4	9.4	0.25	50423	207.63	0.73	1.01
										0.95	5110		0.28	

Runoff Estimation at Cacthment D

Natural Catch. (m^2)	Longest flow path (m)	Highest (mPD)	Lowest (mPD)	Gradient (per 100m) = (h_1-h_2)/L x 100	to (min) = 0.14465L/($H^{0.2}A^{0.1}$)	Length of Nullah L (m)	flow vel. (m^3/s)	t_f = L/v (min)	tc = to + t_f (min)	Runoff coeff.	Total Catch. Area (m^2)	10 year Intensity (mm/hr)	10 year design runoff = 0.278CiA	10 year Total runoff (m^3/s)
34114	172	16.3	15.1	0.70	9.42	70	1.343	1	10.4	0.25	32941	203.69	0.47	0.53
										0.95	1173		0.06	

Rational method is used for calculation of the peak runoff. The formula is extracted from Section 7.5.2 (a) of SDM.
Qp = 0.278 C i A
Where Qp = peak runoff in m3/s
I = rainfall intensity in mm/hr
A = catchment area in km2
The parameters and assumptions refer to section 3.

After Development

Runoff Estimation at Cacthment A

Natural Catch. (m^2)	Longest flow path (m)	Highest (mPD)	Lowest (mPD)	Gradient (per 100m) = (h_1-h_2)/L x 100	to (min) = 0.14465L/($H^{0.2}A^{0.1}$)	Length of Nullah L (m)	flow vel. (m^3/s)	t_f = L/v (min)	tc = to + t_f (min)	Runoff coeff.	Total Catch. Area (m^2)	10 year Intensity (mm/hr)	10 year design runoff = 0.278CiA	10 year Total runoff (m^3/s)
36706	188	14.55	9.98	2.43	7.96	401	1.218	5	13.4	0.25	30599	193.66	0.41	0.68
										0.95	5227		0.27	
										1.00	880		0.00	

Runoff Estimation at Cacthment B

Natural Catch. (m^2)	Longest flow path (m)	Highest (mPD)	Lowest (mPD)	Gradient (per 100m) = (h_1-h_2)/L x 100	to (min) = 0.14465L/($H^{0.2}A^{0.1}$)	Length of Nullah L (m)	flow vel. (m^3/s)	t_f = L/v (min)	tc = to + t_f (min)	Runoff coeff.	Total Catch. Area (m^2)	10 year Intensity (mm/hr)	10 year design runoff = 0.278CiA	10 year Total runoff (m^3/s)
8906	200	15.1	14.1	0.50	13.38	192	1.343	2	15.8	0.25	8906	186.73	0.12	0.12

Runoff Estimation at Cacthment C

Natural Catch. (m^2)	Longest flow path (m)	Highest (mPD)	Lowest (mPD)	Gradient (per 100m) = (h_1-h_2)/L x 100	to (min) = 0.14465L/($H^{0.2}A^{0.1}$)	Length of Nullah L (m)	flow vel. (m^3/s)	t_f = L/v (min)	tc = to + t_f (min)	Runoff coeff.	Total Catch. Area (m^2)	10 year Intensity (mm/hr)	10 year design runoff = 0.278CiA	10 year Total runoff (m^3/s)
55533	126	14.55	12.87	1.33	5.77	289	1.343	4	9.4	0.25	50203	207.63	0.72	1.00
										0.95	5110		0.28	
										1.00	220		0.00	

Runoff Estimation at Cacthment D

Natural Catch. (m^2)	Longest flow path (m)	Highest (mPD)	Lowest (mPD)	Gradient (per 100m) = (h_1-h_2)/L x 100	to (min) = 0.14465L/($H^{0.2}A^{0.1}$)	Length of Nullah L (m)	flow vel. (m^3/s)	t_f = L/v (min)	tc = to + t_f (min)	Runoff coeff.	Total Catch. Area (m^2)	10 year Intensity (mm/hr)	10 year design runoff = 0.278CiA	10 year Total runoff (m^3/s)
38779	172	16.3	15.1	0.70	9.30	70	1.343	1	10.3	0.25	37386	204.12	0.53	0.59
										0.95	1173		0.06	
										1.00	220		0.00	

Mannings (Asia) Consultants Ltd.	Job No.		Sheet No.	Rev.
Calculation Sheet	Member / Location			
Job Tilte: Proposed Temporary Open Storage of Construction Materials, Construction Machineries, Auto Parts and Vehicles with Ancillary Facilities for a Period of 3 Years and Associated Filling of Land and Pond in "Agriculture" Zone, Various Lots in D.D. 106 and Adjoining Government Land, Shek Kong, Yuen Long, New Territories	Drg. Ref.			
	Made By NHL		Date	Chd.

The drainage design is referring to DSD's SDM 2018 & Corrigendum No. 1/2022 and Corrigendum No. 1/2024
1 in 10 year design return period is taken.

Rational method is used for calculation of the peak runoff. The formula is extracted from Section 7.5.2 (a) of SDM.
Qp = 0.278 C i A
Where Qp = peak runoff in m^3/s
I = rainfall intensity in mm/hr
A = catchment area in km^2

Runoff Estimation

Location	**Natural Catch. (m^2)**	**Longest flow path (m)**	**Gradient (m per 100m)**	**to (min) = 0.14465L/ ($H^{0.2}A^{0.1}$)**	**t_f = L/v (min)**	**tc = to + t_f (min)**	**Total Catch. Area (m^2)**	**10 year Intensity (mm/hr)**	**10 year design runoff = 0.278CiA (m^3/s)**
A1	2581	30	0.010	4.97	0.90	5.87	2581	221.74	0.04
A2	9945	98	0.010	14.13	0.06	14.19	9945	191.37	0.13
A3	13534	93	0.010	13.14	0.81	13.95	13534	192.10	0.18
A4	5928	94	0.006	15.67	0.34	16.02	5928	186.02	0.08
A5	3665	37	0.005	6.69	0.70	7.39	3665	215.29	0.05
A6	4323	72	0.003	14.63	0.06	14.70	4323	189.84	0.06
A7	2745	30	0.030	3.96	0.70	4.66	2745	227.21	0.04
A8	1726	41	0.024	5.92	1.63	7.55	1726	214.65	0.03
B1	5770	98	0.009	15.23	1.11	16.34	5770	185.10	0.07
B2	8745	98	0.006	15.85	3.78	19.63	8745	176.46	0.11
C1	6133	105	0.009	16.45	0.10	16.55	6133	184.52	0.08
C2	15963	134	0.007	20.03	1.08	21.11	15963	172.88	0.19
D1	9098	138	0.007	21.95	0.74	22.69	9098	169.27	0.11
D2	9415	212	0.007	33.52	0.06	33.58	9415	148.64	0.10
D3	4862	100	0.007	16.70	0.19	16.89	4862	183.59	0.06
D4	8139	193	0.005	32.50	0.74	33.24	8139	149.19	0.08
D5	2266	61	0.016	9.27	0.13	9.41	2266	207.44	0.03

Stormwater Drainage Design

Manhole		Catchment Area		Length (m)	Nominal Diameter (mm)	Gradient, S_f		Roughness Coefficient (m)	Velocity (m/s)	Time of Flow (min)	Time of Conc. (min)	Rainfall Duration (min)	10 year Intensity (mm/hr)	10 year Runoff (m^3/s)	Inflow (m^3/s)	Total Flow (m^3/s)	Capacity (m^3/s)	Adjusted Capacity > Total Flow ?	Cover Level		Invert Level	
From	To	Increment (m^2)	Accu. (m^2)			(%)	1 in												From (mPD)	To (mPD)	From (mPD)	To (mPD)
CP17	MH7	22096	22096	49	525	0.8	122.5	3.0	1.547	21.11	21.11	21.11	172.88	0.265	0.000	0.265	0.301	Yes	16.00	16.20	14.30	13.90
MH7	MH8	22096	22096	58	525	0.7	145.0	3.0	1.422	21.11	21.11	21.11	172.88	0.265	0.000	0.265	0.277	Yes	16.20	16.20	13.90	13.50
MH8	Existing Stream	22096	22096	52	525	0.8	130.0	3.0	1.502	21.11	21.11	21.11	172.88	0.265	0.000	0.265	0.293	Yes	16.20	16.20	13.50	13.10
CP13	MH2	18513	18513	41	525	1.3	74.5	3.0	1.984	33.58	33.58	33.58	148.64	0.191	0.000	0.191	0.386	Yes	16.00	15.50	13.95	13.40
CP7	MH9	13000	13000	4	450	2.5	40.0	3.0	2.447	16.89	16.89	16.89	183.59	0.166	0.000	0.166	0.350	Yes	15.50	15.50	14.00	13.90
CP10	MH2	2266	2266	5	300	2.0	50.0	3.0	1.670	9.41	9.41	9.41	207.44	0.033	0.000	0.033	0.106	Yes	15.50	15.50	14.25	14.15
MH9	MH1	33780	33780	20	600	2.3	44.4	3.0	2.805	13.95	13.95	13.95	192.10	0.451	0.000	0.451	0.714	Yes	15.50	15.90	13.30	12.85
MH1	Existing Stream	33780	33780	36	600	1.4	72.0	3.0	2.203	16.02	16.02	16.02	186.02	0.437	0.000	0.437	0.561	Yes	15.50	15.50	12.60	12.10
CP18	MH3	7988	7988	58	450	0.3	290.0	3.0	0.907	14.70	14.70	14.70	189.84	0.105	0.000	0.105	0.130	Yes	16.20	16.40	15.35	15.15
CP19	MH3	2745	2745	43	450	0.2	430.0	3.0	0.745	14.70	14.70	14.70	189.84	0.036	0.000	0.036	0.107	Yes	16.40	16.40	15.25	15.15
MH3	MH4	10734	10734	58	525	0.3	290.0	3.0	1.004	14.70	14.70	14.70	189.84	0.142	0.000	0.142	0.196	Yes	16.40	16.00	15.10	14.90
MH4	MH5	10734	10734	45	525	0.4	225.0	3.0	1.141	14.70	14.70	14.70	189.84	0.142	0.000	0.142	0.222	Yes	16.00	15.90	14.90	14.70
MH5	MH6	10734	10734	47	525	0.4	235.0	3.0	1.116	16.34	16.34	16.34	185.10	0.138	0.000	0.138	0.217	Yes	15.90	15.59	14.70	14.50
MH6	Existing Stream	10734	10734	47	525	0.4	235.0	3.0	1.116	16.34	16.34	16.34	185.10	0.138	0.000	0.138	0.217	Yes	15.90	15.80	14.70	14.50
CP23	MH6	9945	9945	18	450	0.8	120.0	3.0	1.412	14.19	14.19	14.19	191.37	0.132	0.000	0.132	0.202	Yes	15.59	15.90	14.75	14.60
CP24	MH6	13534	13534	13	450	0.9	108.3	3.0	1.486	16.02	16.02	16.02	186.02	0.175	0.000	0.175	0.213	Yes	15.59	15.90	14.27	14.15
MH6	Existing Stream	34213	34213	1	600	1.0	100.0	3.0	1.869	33.58	33.58	33.58	148.64	0.353	0.000	0.353	0.476	Yes	15.59	15.90	14.14	14.13
Check Existing Pipe																						
Existing Catchment Area D		34114	34114	10	750	1.0	100.0	3.0	2.162	3.08	3.08	3.08	234.94	0.557	0.000	0.557	0.859	Yes	14.09	12.17	11.10	11.00
Proposed Catchment Area D		38779	38779	10	750	1.0	100.0	3.0	2.162	3.08	3.08	3.08	234.94	0.633	0.000	0.633	0.859	Yes	14.09	12.17	11.10	11.00

Mean Velocity is calculated by Colebrook- White equation

Where:

$$\overline{V} = -\sqrt{32gRS_f}\,\log\left[\frac{k_s}{14.8R}+\frac{1.255\nu}{R\sqrt{32gRS_f}}\right]$$

$\overline{V}$ =Mean Velocity (m/s)
R =Hydraulic Diameter (m)
Ks =Surface Roughness (m)
V =Kinematic viscosity (kg/ms)
Sf =Slope of Hydraulic Gradient
g =Gravity (m/s2)

The Roughness Coefficient Ks is assumed to be 3 for concrete.
Peak Runoff is estimated using rational method according to SDM.

Mannings (Asia) Consultants Ltd.	Job No.	Sheet No.	Rev.
Calculation Sheet	Member / Location		
Job Tilte: Proposed Temporary Open Storage of Construction Materials, Construction Machineries, Auto Parts and Vehicles with Ancillary Facilities for a Period of 3 Years and Associated Filling of Land and Pond in “Agriculture” Zone, Various Lots in D.D. 106 and Adjoining Government Land, Shek Kong, Yuen Long, New Territories	Drg. Ref.		
	Made By NHL	Date	Chd.

Checking of Capacity (300UC)

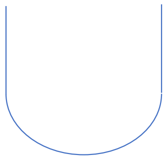
Input Data

Width of UC = 0.3 m

Height of UC = 0.3 m

Design Runoff = 0.04 m^3/s

($Q_{discharge}$)



Flow capacity, Q

$$Q = \frac{A \times r^{2/3} \times s^{1/2}}{n}$$

where A = cross sectional area of flow (m^2) = 0.080343 m^2

r = hydraulic radius (m)

s = slope of the water surface or the linear hydraulic head loss (m/m)

n = Manning coefficient of roughness

Hydraulic radius

$$r = \frac{A}{P}$$

p = wetted perimeter (m) = 0.77 m

r = 0.10 *m*

Slope

s = 0.004 m/m

Manning coefficient of roughness

n = 0.014

Therefore,

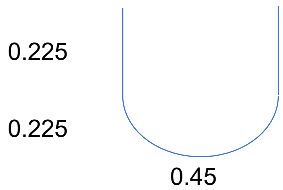
Q = 0.08 m^3/s **> Design runoff, OK!**

V = Q/A = 1.00 m/s

Mannings (Asia) Consultants Ltd. Calculation Sheet	Job No.	Sheet No.	Rev.
Job Tilte: Proposed Temporary Open Storage of Construction Materials, Construction Machineries, Auto Parts and Vehicles with Ancillary Facilities for a Period of 3 Years and Associated Filling of Land and Pond in “Agriculture” Zone, Various Lots in D.D. 106 and Adjoining Government Land, Shek Kong, Yuen Long, New Territories	Member / Location Drg. Ref. Made By NHL	Date	Chd.

<u>Checking of Capacity (450UC)</u>

Input Data



Width of UC	=	0.45	m
Height of UC	=	0.45	m
Design Runoff	=	0.19 ($Q_{after,uncov.}$)	m^3/s

Flow capacity, Q

$$Q = \frac{A \times r^{2/3} \times s^{1/2}}{n}$$

where A = cross sectional area of flow (m^2) = 0.180772 m^2

r = hydraulic radius (m)

s = slope of the water surface or the linear hydraulic head loss (m/m)

n = Manning coefficient of roughness

Hydraulic radius

$$r = \frac{A}{P}$$

p = wetted perimeter (m) = 1.16 m

r = 0.16 *m*

Slope

s = 0.004 m/m

Manning coefficient of roughness

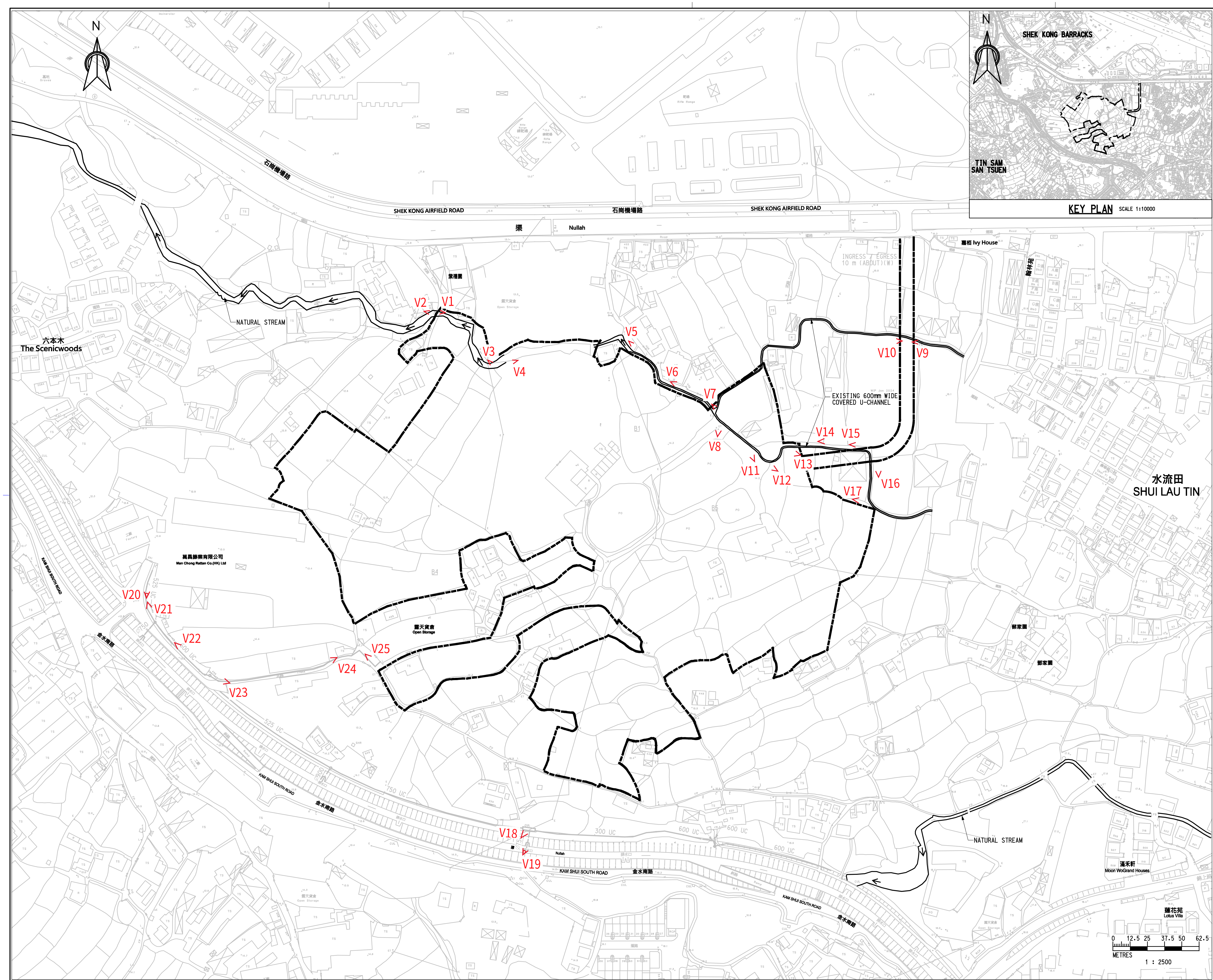
n = 0.014

Therefore,

Q = 0.24 m^3/s **> Design runoff, OK!**

V = Q/A = 1.31 m/s

Appendix C
Site Photos



NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
2. ALL LEVELS ARE IN mPD METRE ABOVE HONG KONG PRINCIPAL DATUM.

LEGEND :

- - - - APPLICATION SITE

Rev.	Description of Revision	Date	Ckd.

Client

EXCEL LINK DEVELOPMENT LIMITED

Consultants

MANNINGS (Asia) Consultants Limited

Scale in A3: AS SHOWN	Date: AUG 2024	
Designed: EM	Drawn: KAM	Checked: BLE
Design Team Leader: SC		Date: AUG 2024
Approved: KTC		Date: AUG 2024

Project

PROPOSED TEMPORARY OPEN STORAGE OF CONSTRUCTION MATERIALS, CONSTRUCTION MACHINERIES AUTO PARTS AND VEHICLES WITH ANCILLARY FACILITIES FOR A PERIOD OF 3 YEARS AND ASSOCIATED FILLING OF LANDAND POND

Title

SITE PHOTO PLAN

Drawing No.	Stage	Rev.
V1053/008	P	-

14/8/2024 $TIME$

K:\V1053 - DIA for Shek Kong Development\station\V1053-009.dgn

Photo V1

Photo V2

Photo V3

Photo V4

Photo V5

Photo V6

Photo V7

Photo V8

Photo V9

Photo V10

Photo V11

Photo V12

Photo V13

Photo V14

Photo V15

Photo V16

Photo V17

Photo V18

Photo V19

Photo V20

Photo V21

Photo V22

Photo V23

Photo V24

Photo V25