Appendix 7

Sewerage Impact Assessment

URBAN GREEN

Proposed Development of Hong Kong Sheng Kung Hui St. Christopher's Complex at the Remaining Portion of Taxlord Lot No. T77 In D.D.34. Tai Po

Sewerage Impact Assessment Report

Reference: P060/01 Issue 3
Date: November 2024
Confidential

Proposed Development of Hong Kong Sheng Kung Hui St. Christopher's Complex at the Remaining Portion of Taxlord Lot No. T77 In D.D.34. Tai Po

Sewerage Impact Assessment Report

Reference: P060/01 Issue 3

Date: November 2024

Issue	Status	Prepared By	Date	Checked by	Date	Approved By	Date
1	Final	AIC	26-May-22	EMT	26-May-22	JOC	26-May-22
2	Draft	AIC	7-Feb-24	EMT	7-Feb-24	JOC	7-Feb-24
3	Final	Various	9-Jul-24	EMT	9-Jul-24	JOC	9-Jul-24

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1 Introduction

1.1 Background

1.1.1 The Applicant intends to develop a community service complex (hereafter as "the proposed development") for providing child care and elderly care services at the remaining portion of Taxlord Lot No. T77 in D.D.34, Tai Po (hereafter as "the Site").

1.1.2 According to the Draft Tai Po Outline Zoning Plan (OZP) (OZP No.: S/TP/29) published by Town Planning Board in September 2021, the Site is in the "Government, Institution or Community" Zone.

1.1.3 Urban Green Consultants Limited (UGC) was commissioned by the Applicant to conduct a Sewerage Impact Assessment (SIA) to assess the potential sewerage impacts arising from the change of sewerage generation due to the Proposed Development.

1.2 Objective of the SIA

1.2.1 The objectives of this SIA are to assess the potential sewerage impacts arising from the proposed development and recommend the mitigation measures, if necessary, to alleviate the impacts.

1.3 Report Structure

1.3.1 The remaining chapters of this report are shown below:

Chapter 2 – Site Context

Chapter 3 – Evaluation of Sewerage Impact

Chapter 4 – Environmental Considerations

2 Site Context

2.1 Site Location and Its Environs

2.1.1 The Site is bounded by Tai Po Road – Tai Po Kau to its South. The Japanese International School is located at the West of the Site, while Po Leung Kuk Tin Ka Ping Millennium Primary School is at the Northeast of the Site. The site area is approximately 2,210.2m^2.

2.1.2 Figure 2.1 shows the Site location and its environs.

2.2 Proposed Development Scheme

2.2.1 The proposed development is a 10-storey building which consists of seven department units, i.e. Special Child Care Centre (SCCC), Care and Attention Home Providing Continuum of Care (CoC Home), Small Group Home (SGH), Foster Care Service and Agency-based Enhancement of Professional Staff Support Services (FCS), Staff Training Unit (STU), and Child Care Centre (CCC). There will also be residential places for the elderly, a basement carpark, and a localized sewerage treatment plant on B2/F. The anticipated commissioning year of the proposed development is 2030.

2.2.2 The development plans are shown in Appendix A.

2.3 Existing Sewerage Condition

2.3.1 Based on the review of drainage plans (reference no.: 7-NE-11C-4, 7-NE-11D-3, 7-NE-16A-2 and 7-NE-16B-1) from Drainage Services Department (DSD) in November 2015, it has revealed that the Site is not served by any form of DSD's sewerage facility currently.

3 Evaluation of Sewerage Impact

3.1 Assumptions and Methodology

3.1.1 For the sewerage flow estimation from the proposed development, the ceiling unit flow rates as recommended in the "Guidelines for Estimating Sewerage Flows for Sewerage Infrastructure Planning" (hereafter as "GESF") published by the Environmental Protection Department (EPD) in 2005 have been adopted in the assessment.

3.1.2 The sewerage generation from the proposed development includes the flow contribution from the staffs, visitors and residents in the proposed development. The population for the proposed development is summarised in Table 3.1.

3.1.3 The estimation of pollution loadings from the Proposed Development is based on the basic design parameters of Biochemical Oxygen Demand (BOD) and Suspended Solid (SS) loads for commercial populations as stipulated in "Guidelines for the Design of Small Sewerage Treatment Plants".

3.1.4 In the calculation of sewerage generation from non-overnight staff, the unit flow factor of 0.28m^3/person/day was adopted. The unit flow factor of 0.28m^3/person/day was adopted for overnight staff. And the unit flow factor of 0.19m^3/person/day was adopted for overnight staff and residents. As for visitors, the unit flow factor adopted is 0.015m^3/person/day.

Table 3.1 Estimated Population of the Proposed Development

Type of People	No. of persons	Unit Flow Factor (m^3/person/day)	Category
Staff (non-overnight)	240	0.28	Commercial Employee + Commercial activities – J11 Community, Social & Personal Services in Table T-2 of GESF [1]
Staff (overnight)	20	0.28	"Services" in Appendix 2 of GDSSTP [2]
Residents	414	0.19	Domestic – Institutional and special class in Table T-1 of GESF [1]
Visitors	190	0.015	"Visitor" of Table 3-4 of "Wastewater Engineering Treatment and Reuse" published by Metcalf & Eddy

Notes:

[1] Environmental Protection Department, HKSARG [EPD] (2005). Guidelines for estimating sewerage flows for sewerage infrastructure planning (EPD/TP 1/05).

[2] Environmental Protection Department, HKSARG [EPD] (2006). Guidelines for the Design of Small Sewage Treatment Plants

3.1.5 The estimated daily flow and hourly flow from the proposed development will be 154.31m^3/day and 38.58m^3/hr, respectively. The calculations have been provided in Appendix B for reference.

3.2 Proposed Sewerage Treatment Plant

3.2.1 As the Site is not served by public sewer, it is required to provide their own sewerage treatment or disposal facilities to ensure sewerage can be discharged in a proper manner and hence to achieve the best protection to the public and the environment. The use of small Sewerage Treatment Plant (STP) with tertiary wastewater treatment technology is recommended to ensure the sewerage generated from the proposed development will be treated to acceptable level before discharge. The location of the proposed underground sewerage treatment plant is shown in Figure 3.1.

3.2.2 The "Guidelines for the Design of Small Sewerage Treatment Plants" published by the EPD for the design, construction, operation, and maintenance of STP should be followed. The effluent quality should comply with the "Standards for effluents discharged into Group D inland waters" and the "Standards for effluents discharged into the coastal waters of Tolo and Port Shelter Water Control Zones" as specified in the "Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS)". The discharge standards of the proposed STP shall adopt the higher standards of the above standards. The key parameters are summarised in Table 3.2.

Table 3.2 Key Parameters of Discharge Standards

Key Parameters	Standards for effluents discharged into Group D inland waters (for flow ≤200 m^3/d)	Standards for effluents discharged into coastal waters of Tolo ad Port Shelter Water Control Zones (for flow >10 and ≤200 m^3/d)	Discharge Standard for the Proposed Development
Biochemical Oxygen Demand BOD (mg/L)	≤20	≤20	≤20
Suspended Solids TSS (mg/L)	≤30	≤30	≤30
Ammonia Nitrogen NH_3-N (mg/L)	≤20	-	≤20
E.coli (count/100mL)	≤1000	≤1000	≤1000
Total Phosphorus TP (mg/L)	≤10	≤8	≤8

3.2.3 In order to fulfil the required discharge standards, the proposed STP will provide secondary treatment and nitrogen removal treatment in order to comply with eh requirement of sewage treatment level. The proposed STP will be equipped with biological treatment by Contact Aeration Process, Ultra Filtration System and Ultra Violet (UV) Sterilization. Furthermore, the treated sewerage from the Site will be discharged in accordance with the Water Pollution Control (General) Regulation.

Therefore, no adverse water quality impact due to sewerage generation from the proposed development will be anticipated.

3.2.4 The treated sewerage and the drainage discharge from the site boundary will be discharged into the existing drainage system through DSD catchpit SCH1003542. Peak runoff is estimated to be 0.113m^3/s, which exceeds the capacity of the drainage pipes, as shown in Appendix E. Upgrading works of the drainage system will be required to cater the treated sewerage and drainage discharge.

3.3 Emergency Measures

3.3.1 Submersible pump, air blower, chemical dosing pump and submersible ejector will be provided with standby unit. An emergency generator will be provided in case electric power supply for whole system is failure. As such, suspension of whole STP operation is rarely under normal operation.

3.3.2 Regular preventive maintenance service will be provided to check operation condition of equipment and plan the repairing and replacement scheme for equipment and material of treatment system. An operation and maintenance manual will be prepared by the contractor and then the future operator should appoint competent technician(s) to operate the STP. The operator should be fully conversant with the recommended operating procedures as stipulated in the operation and maintenance manual.

3.3.3 In case of STP failure, raw sewerage will be temporarily stored in the equalization tank with volume to 2.40 hours retention time on peak flow, a 30.80m^3 effective tank volume of equalization tank will be provided. The detailed design calculation as shown in Appendix C. Real-time monitor will be provided to monitoring the sewerage flow. In the event of any emergency overflow, on-call crews will follow the overflow emergency response plan and proceed with the best response to correct the problem at once. For example, the alarm system will be activated once overflow occurs. The on-call crews will provide instant response by acknowledging the alarm, to investigate the cause of overflow and correct the problem. The alarm system will be repeated until it is acknowledged. In addition, the on-call crews will ensure the standby pump is switched on and contains the overflow sewage using temporary weirs or vacuum trucks, where applicable. Furthermore, tanker away service will be arranged immediately to draw away the sewerage from equalization tank to avoid flooding from treatment system.

3.4 Recommendation

3.4.1 Upon detailed design stage of the Project, the project proponent will appoint authorized Persons and consultant to design the STP. Detailed information of the proposed STP will be prepared and submitted to EPD and DSD during the detailed design stage.

4 Environmental Considerations

4.1.1 The proposed on-site STP will be fully enclosed and integrated with ventilation system equipped. Odour treatment facilities shall be installed with the ventilation system to remove any odour from the STP.

4.1.2 To be prudent, the STP should also implement good housekeeping practices to ensure that the continuous operation of the on-site STP will not generate any unacceptable odour impact on the surrounding environment. These should include the regular inspection of treatment components where odour could be produced, regular cleaning and flushing of screens and other sewerage handling equipment to remove odorous sources, proper handling, and disposal of collected grit and sludge, regular inspections and maintenance of the deodorisation and ventilation systems.

4.1.3 As the proposed on-site STP will be fully enclosed by the building structure of the proposed development, the potential breakout noise from the STP upon the surroundings should be minimal.

4.1.4 After the implementation of the above measures, the potential odour and noise impact due to the operation of the on-site STP would be minimal or negligible.

5 Conclusion

5.1.1 A Sewerage Impact Assessment (SIA) has been conducted to evaluate the potential impacts due to the sewerage generation from the proposed development.

5.1.2 The proposed development will serve approximately 864 people and the estimated sewerage generation from the proposed development will be approximately 152m^3/day.

5.1.3 As there is no existing public sewerage in the vicinity of the Site and, to fulfil the required discharge standards, an underground Sewerage Treatment Plant (STP) will be provided by the Applicant.

5.1.4 The proposed STP will be designed, constructed, operated and maintained in accordance with the “Guidelines for the Design of Small Sewerage Treatment Plants” published by the EPD to ensure the sewerage generated from the proposed development will be treated to acceptable standards before discharge to the receiving water. Effluent discharge location from the proposed underground STP will be discharged into the existing drainage system to the west of the Site. No adverse water quality impact due to sewerage generation from the proposed development is anticipated.

5.1.5 With the implementation of mitigation measures including the emergency generator, spare pumps, emergency storage and control system etc, no emergency sewage discharge during the operation of STP is anticipated.

5.1.6 The flow of the sewerage generated and stormwater runoff from the Site will, however, exceed the capacity of the existing drainage system. Upgrading works of the drainage pipes will be required to cater the treated sewerage and drainage discharge.

5.1.7 With the proposed upgrading works, it is concluded that there shall be no sewerage impact arising from the proposed development.

Figures

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Proposed Development of Hong Kong Sheng Kung Hui St. Christopher's Complex at the Remaining Portion of Taxlord Lot No. T77 In D.D.34. Tai Po

The Site and Its Environs

Figure 2.1

Rev. 0

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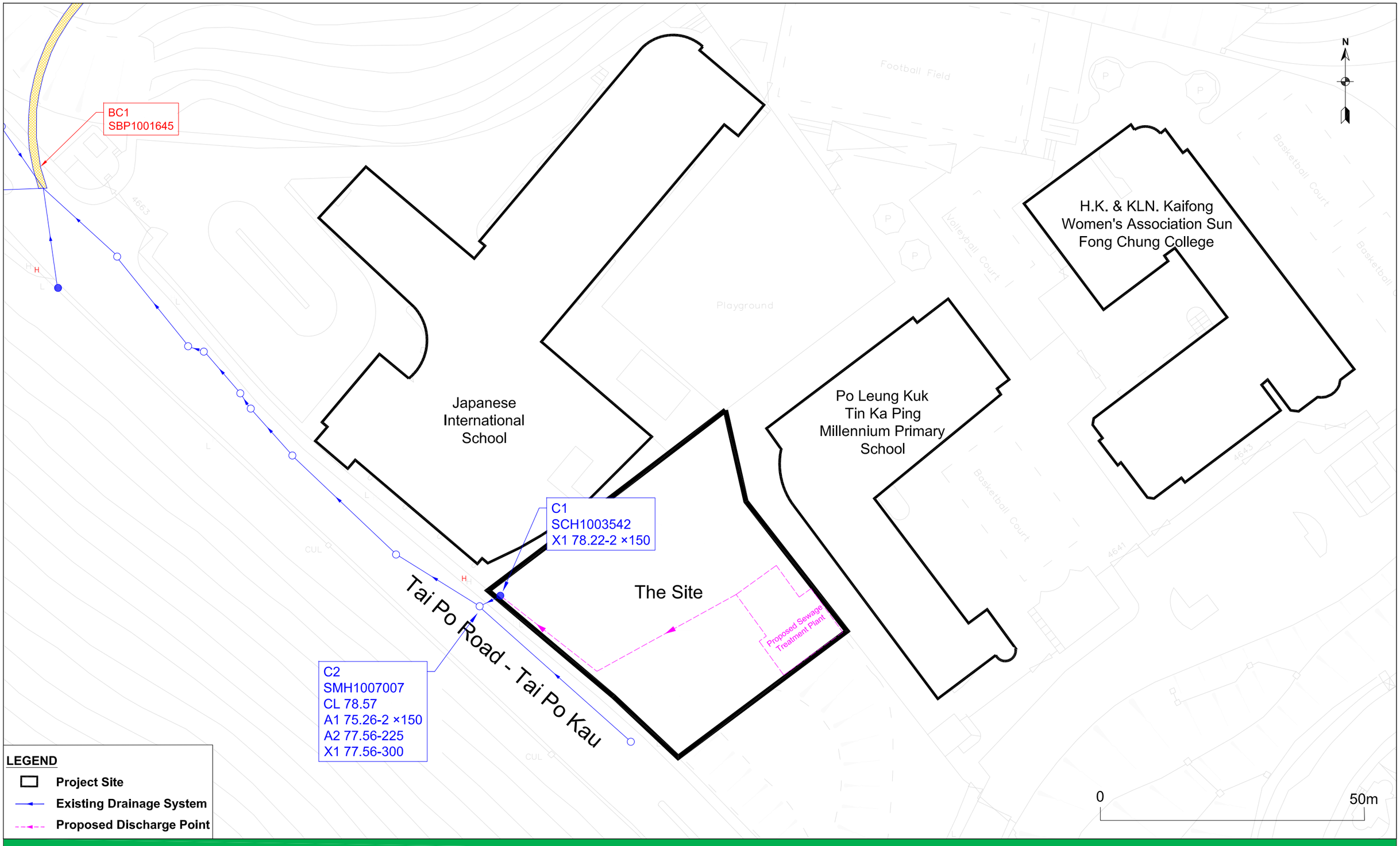
Proposed Development of Hong Kong Sheng Kung Hui St. Christopher's Complex at the Remaining Portion of Taxlord Lot No. T77 In D.D.34. Tai Po

Location of the Proposed Sewage Treatment Plant

Figure 3.1

Rev. 1



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Proposed Development of Hong Kong Sheng Kung Hui St. Christopher's Complex at the Remaining Portion of Taxlord Lot No. T77 In D.D.34. Tai Po

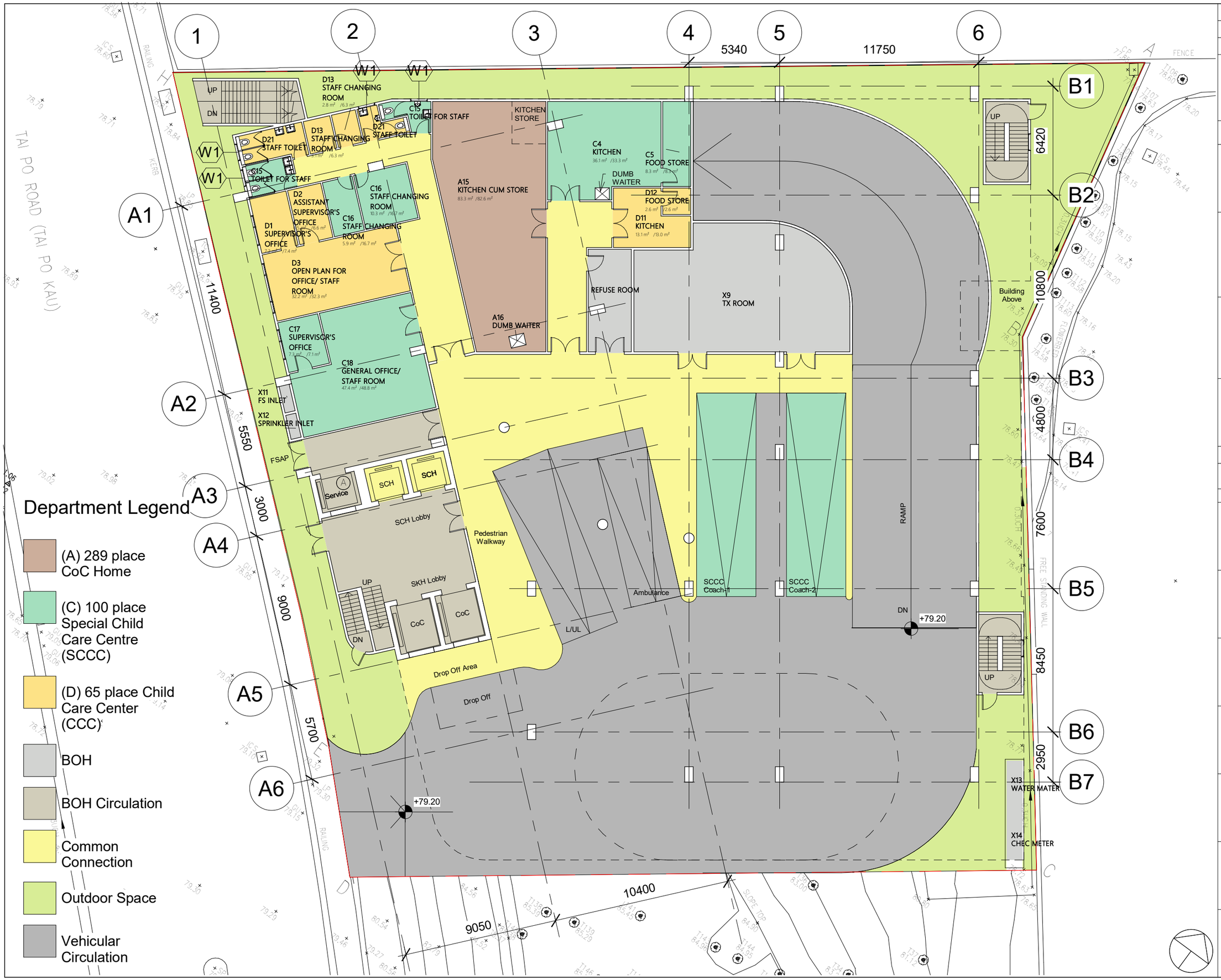
Proposed Discharge Location

Figure 3.2

Rev. 1

Appendix A

Development Plan



Department Legend

- (A) 289 place CoC Home
- (C) 100 place Special Child Care Centre (SCCC)
- (D) 65 place Child Care Center (CCC)
- BOH
- BOH Circulation
- Common Connection
- Outdoor Space
- Vehicular Circulation

BD REF -

BIM REF -

FSD REF -

Rev.	Date	Amendment	Purpose

PROJECT NO.: HKA-P-01757

CLIENT

Hong Kong Sheng Kung Hui Welfare Council Limited

PROJECT

TFS for The Proposed Hong Kong Sheng Kung Hui St. Christopher's Complex

DRAWING TITLE

GF Plan

SCALE 1 : 200 @A3

DRAWING NO. A001

ISSUE DATE 07/03/24

LEAD CONSULTANT & ARCHITECT

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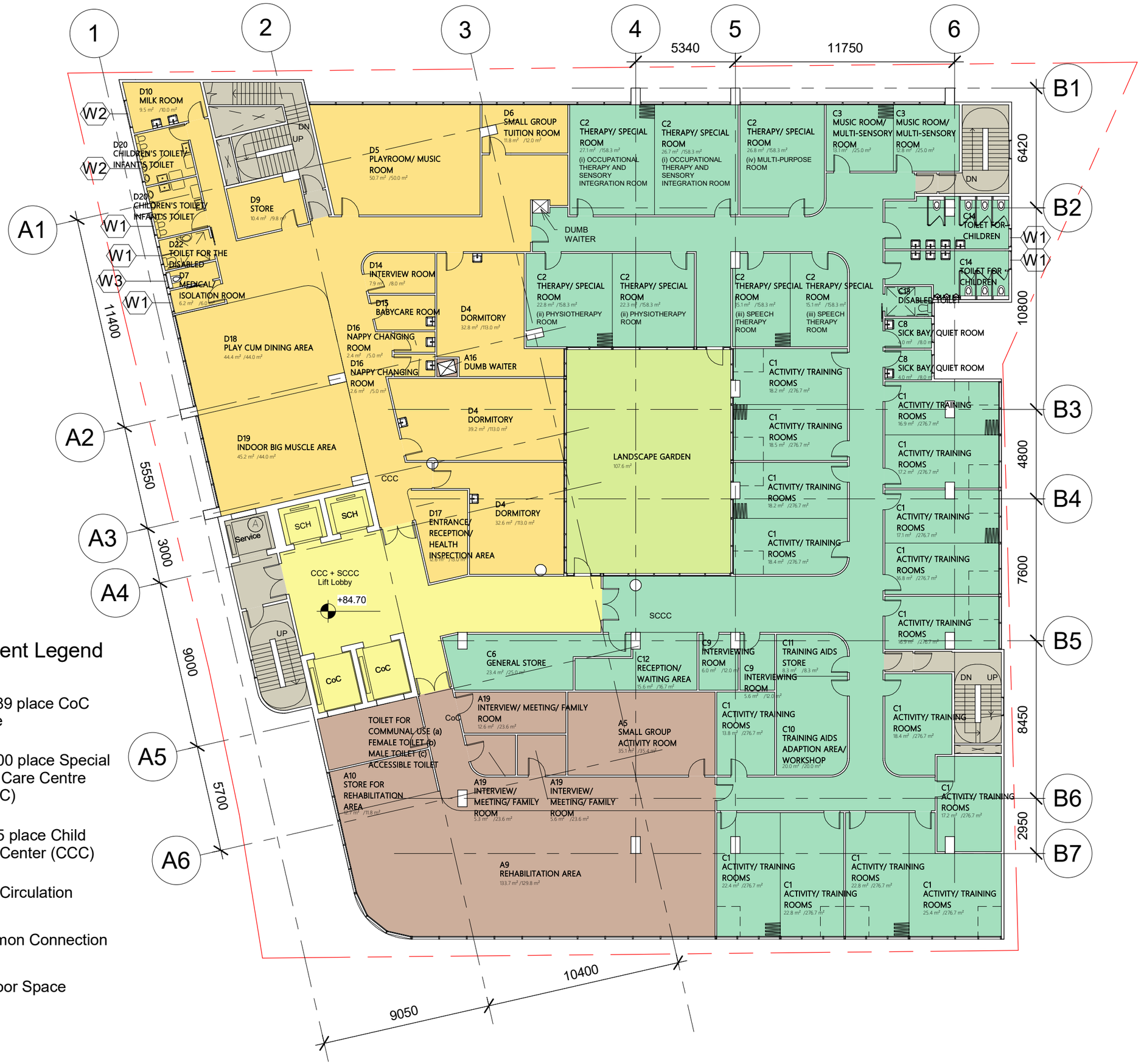

Department Legend

- (A) 289 place CoC Home
- (C) 100 place Special Child Care Centre (SCCC)
- (D) 65 place Child Care Center (CCC)
- BOH Circulation
- Common Connection
- Outdoor Space

BD REF -

BIM REF -

FSD REF -

Rev.	Date	Amendment	Purpose

PROJECT NO.: HKA-P-01757

CLIENT
Hong Kong Sheng Kung Hui Welfare Council Limited

PROJECT
TFS for The Proposed Hong Kong Sheng Kung Hui St. Christopher's Complex

DRAWING TITLE
1F Plan

SCALE 1 : 200 @A3

DRAWING NO. A002

ISSUE DATE 16/02/24

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Department Legend

- (A) 289 place CoC Home
- BOH Circulation
- Common Connection
- Outdoor Space

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BIM REF -

FSD REF -

Rev.	Date	Amendment	Purpose

PROJECT NO.: HKA-P-01757

CLIENT
Hong Kong Sheng Kung Hui Welfare Council Limited

PROJECT
TFS for The Proposed Hong Kong Sheng Kung Hui St. Christopher's Complex

DRAWING TITLE
2F Plan

SCALE 1 : 200 @A3

DRAWING NO. A003

ISSUE DATE 15/01/24

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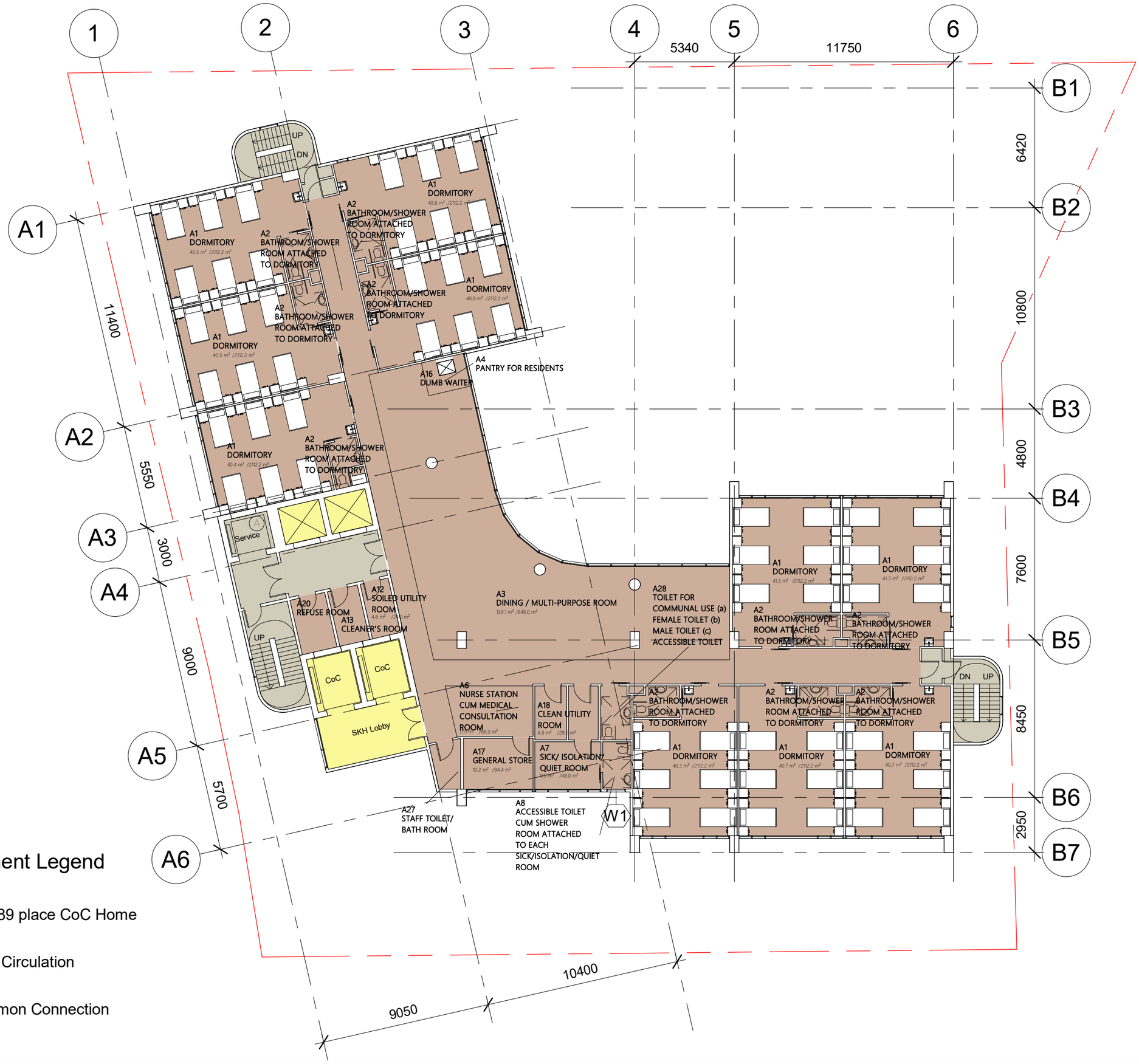

Department Legend

- (A) 289 place CoC Home
- BOH Circulation
- Common Connection

BD REF -

BIM REF -

FSD REF -

Rev.	Date	Amendment	Purpose

PROJECT NO.: HKA-P-01757

CLIENT

Hong Kong Sheng Kung Hui Welfare Council Limited

PROJECT

TFS for The Proposed Hong Kong Sheng Kung Hui St. Christopher's Complex

DRAWING TITLE

3F Plan

SCALE 1 : 200 @A3

DRAWING NO. A004

ISSUE DATE 28/02/24

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LANDSCAPE ARCHITECT
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Department Legend

- (A) 289 place CoC Home
- (F) Foster Care Services and Agency based Enhancement of Professional Staff Support Services (FSC & APBSS)
- (G) Staff Training Unit (STU)
- BOH Circulation
- Common Connection
- Outdoor Space

BD REF -

BIM REF -

FSD REF -

Rev.	Date	Amendment	Purpose

PROJECT NO.: HKA-P-01757

CLIENT
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PROJECT
TFS for The Proposed Hong Kong Sheng Kung Hui St. Christopher's Complex

1 E005

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7F Plan

SCALE 1 : 200 @A3

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1 E001

Department Legend

- (Ea) Three 8-place SGH
- (Eb) One 6-place SGH
- BOH
- BOH Circulation
- Common Connection
- Outdoor Space

BD REF -

BIM REF -

FSD REF -

Rev.	Date	Amendment	Purpose

PROJECT NO.: HKA-P-01757

CLIENT

Hong Kong Sheng Kung Hui Welfare Council Limited

PROJECT

TFS for The Proposed Hong Kong Sheng Kung Hui St. Christopher's Complex

DRAWING TITLE

8F Plan

SCALE 1 : 200 @A3

DRAWING NO. A006

ISSUE DATE 15/01/24

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Department Legend

- (Ec) Three 8-place SGH
- (Ed) Three 8-place SGH
- BOH
- BOH Circulation
- Common Connection
- Outdoor Space

BD REF -

BIM REF -

FSD REF -

Rev.	Date	Amendment	Purpose

PROJECT NO.: HKA-P-01757

CLIENT

Hong Kong Sheng Kung Hui Welfare Council Limited

PROJECT

TFS for The Proposed Hong Kong Sheng Kung Hui St. Christopher's Complex

DRAWING TITLE

9F Plan

SCALE 1 : 200 @A3

DRAWING NO. A007

ISSUE DATE 15/01/24

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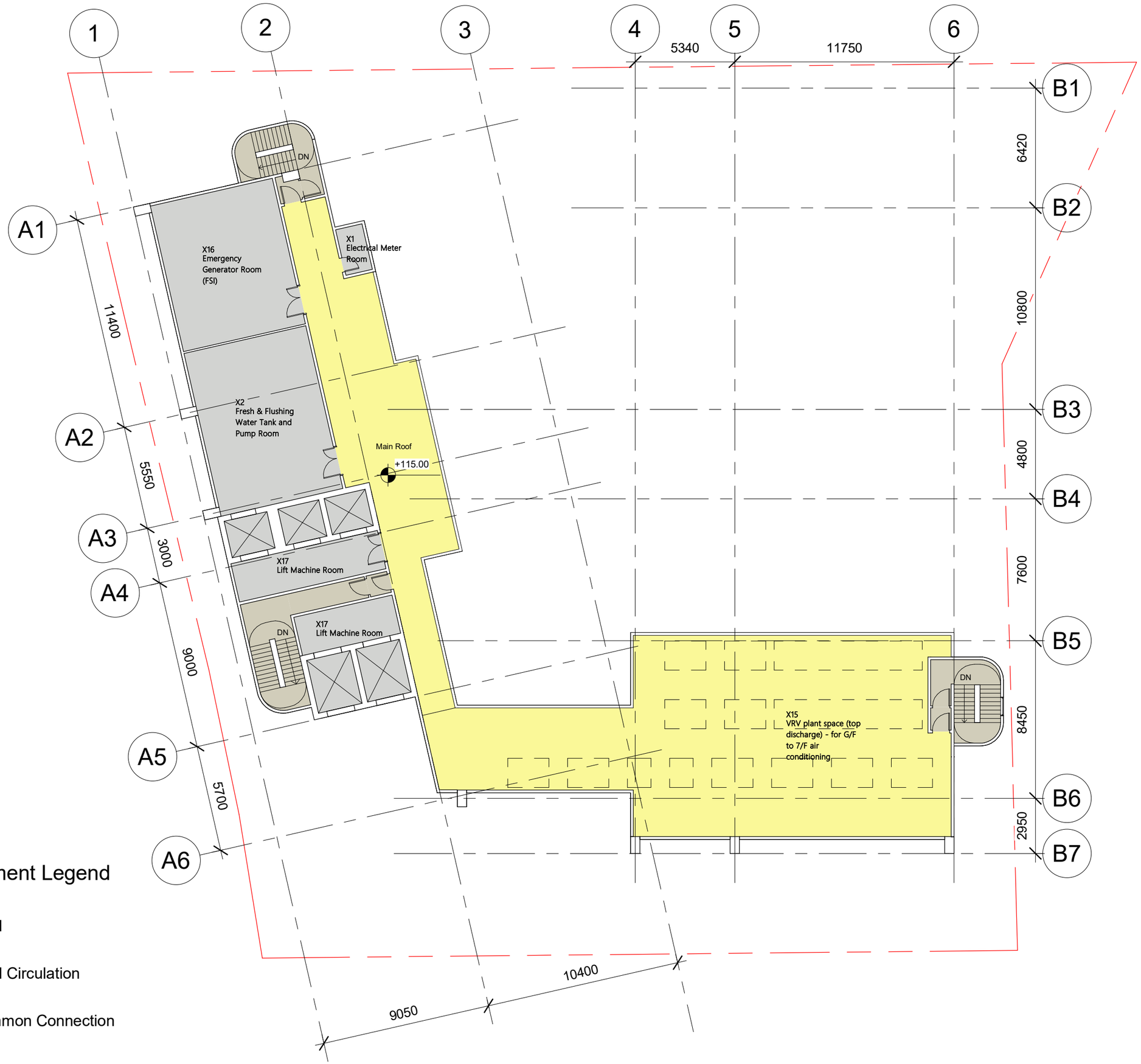

Department Legend

- BOH
- BOH Circulation
- Common Connection

BD REF -

BIM REF -

FSD REF -

Rev.	Date	Amendment	Purpose

PROJECT NO.: HKA-P-01757

CLIENT
Hong Kong Sheng Kung Hui Welfare Council Limited

PROJECT
TFS for The Proposed Hong Kong Sheng Kung Hui St. Christopher's Complex

DRAWING TITLE
RF Plan

SCALE 1 : 200 @A3

DRAWING NO. A008

ISSUE DATE 15/01/24

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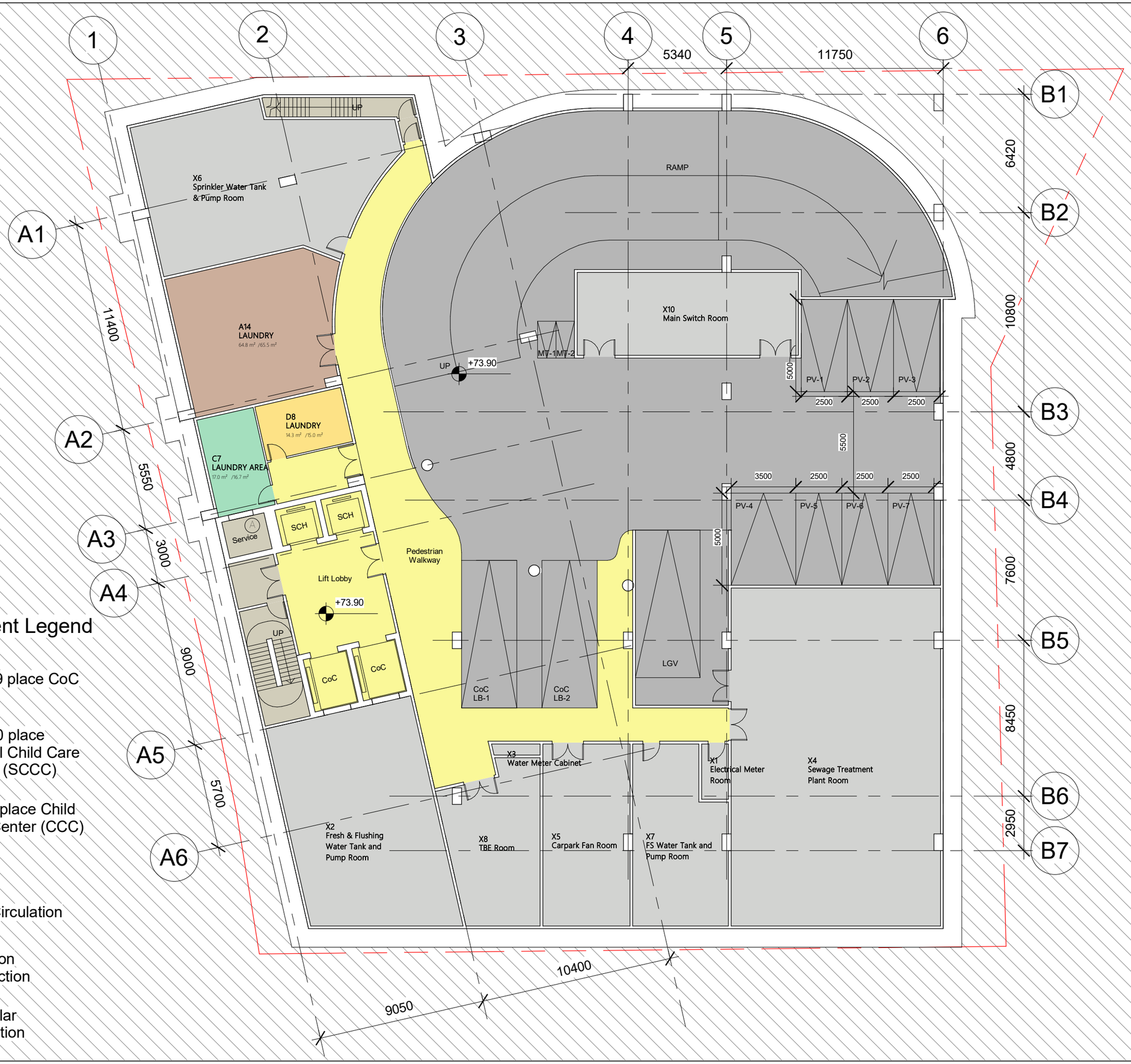

Department Legend

- (A) 289 place CoC Home
- (C) 100 place Special Child Care Centre (SCCC)
- (D) 65 place Child Care Center (CCC)
- BOH
- BOH Circulation
- Common Connection
- Vehicular Circulation

BD REF -

BIM REF -

FSD REF -

Rev.	Date	Amendment	Purpose

PROJECT NO.: HKA-P-01757

CLIENT

Hong Kong Sheng Kung Hui Welfare Council Limited

PROJECT

TFS for The Proposed Hong Kong Sheng Kung Hui St. Christopher's Complex

DRAWING TITLE

B1F Plan

SCALE 1 : 200 @A3

DRAWING NO. A009

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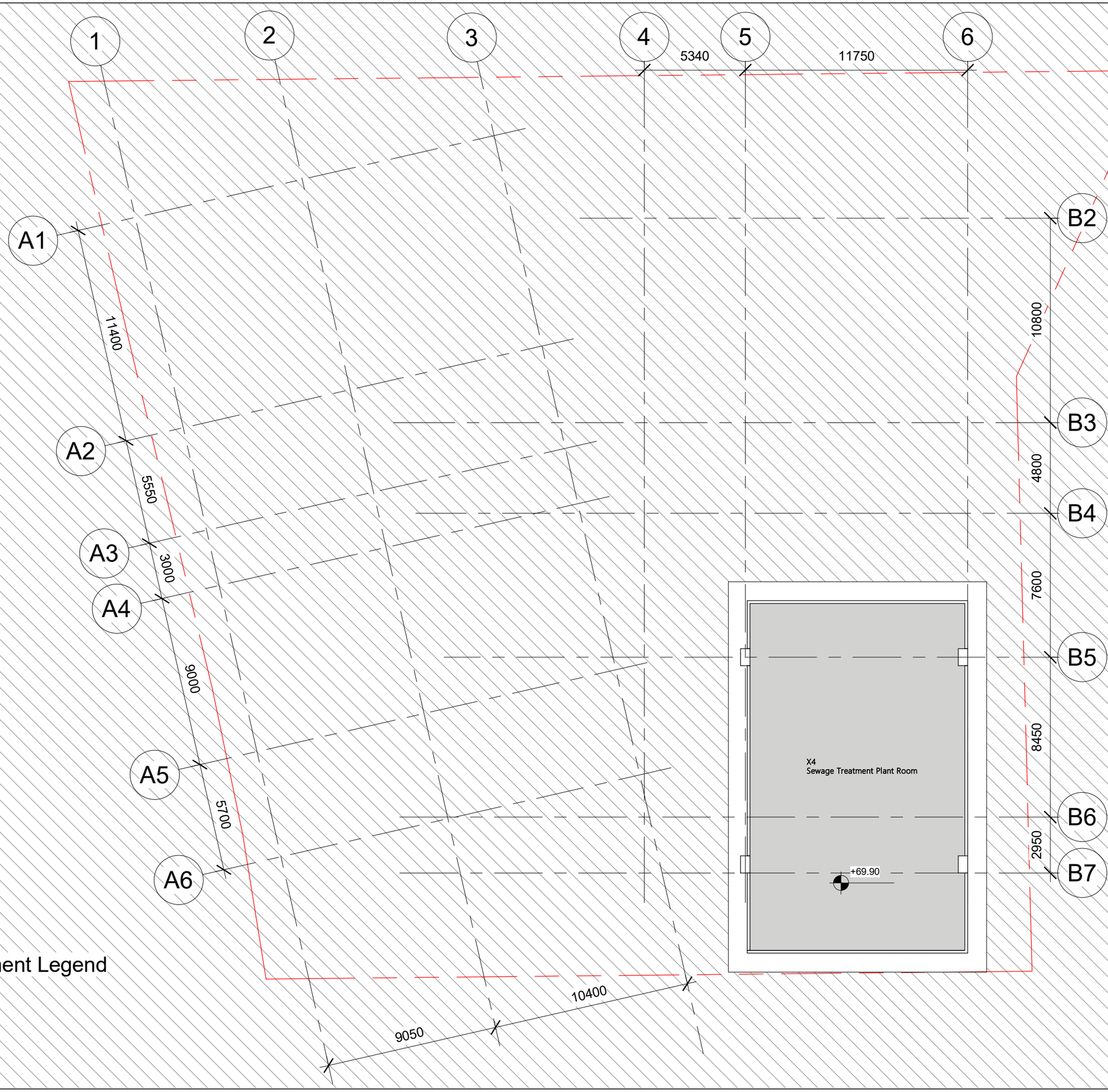

Department Legend

BOH

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BIM REF -

FSD REF -

Rev.	Date	Amendment	Purpose

PROJECT NO.: HKA-P-01757

CLIENT

Hong Kong Sheng Kung Hui Welfare Council Limited

PROJECT

TFS for The Proposed Hong Kong Sheng Kung Hui St. Christopher's Complex

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B2F Plan

SCALE 1 : 200 @A3

DRAWING NO. A010

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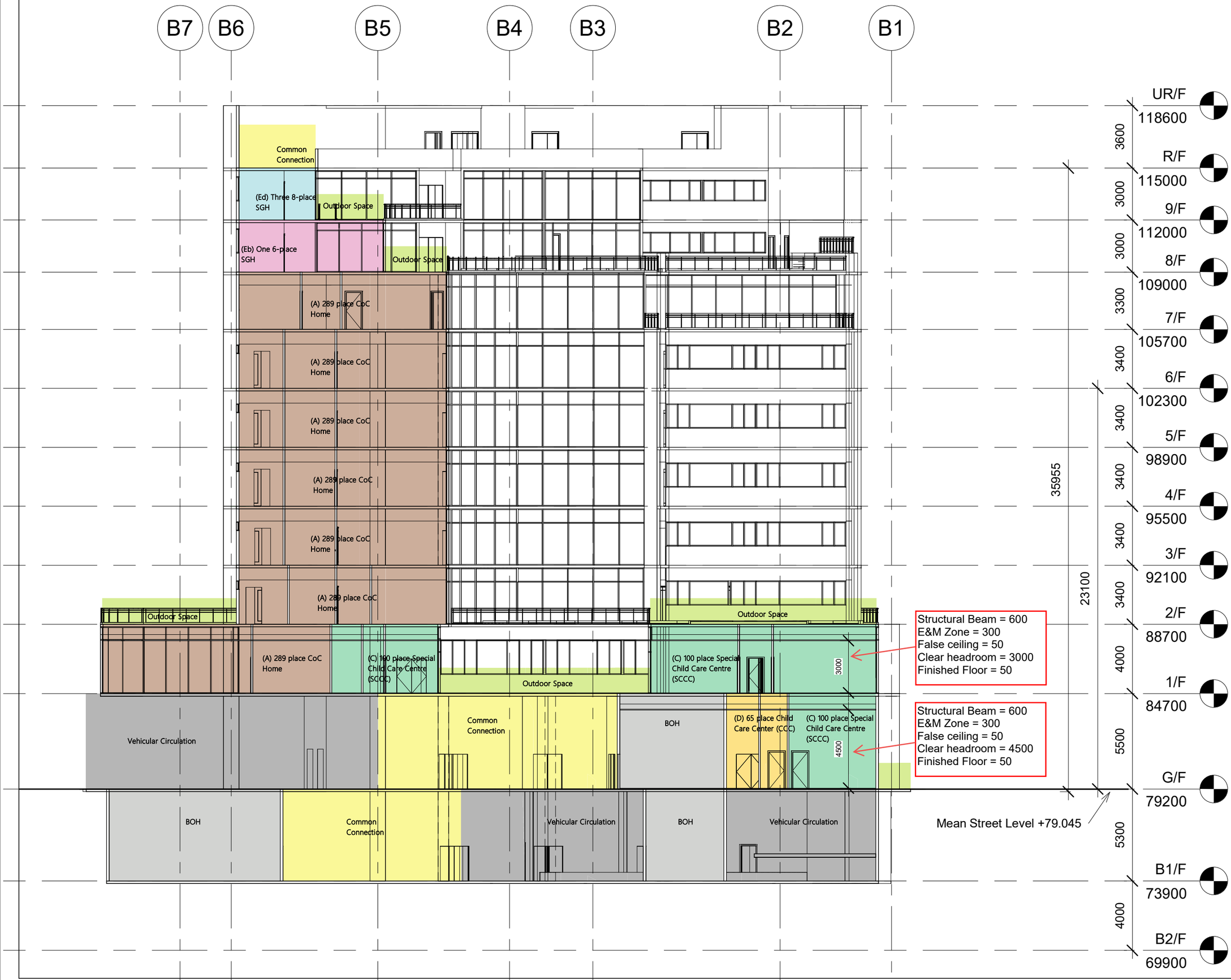

BD REF -

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FSD REF -

Rev.	Date	Amendment	Purpose

PROJECT NO.: HKA-P-01757

CLIENT
Hong Kong Sheng Kung Hui Welfare Council Limited

PROJECT
TFS for The Proposed Hong Kong Sheng Kung Hui St. Christopher's Complex

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Section

SCALE 1 : 200 @A3

DRAWING NO. S001

ISSUE DATE 03/07/24

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Appendix B

Calculation of Peak Flow

Sewage Impact Assessment
Proposed Development of Hong Kong Sheng Kung Hui St. Christopher's Complex at the Remaining Portion of Taxlord Lot No. T77 In D.D.34. Tai Po

				Remark
A	**Estimation of Daily Flow from the Proposed Development**			
	Daily Flow			
1	**Generation from Staff**			
	Number of staff (non-overnight)	240	persons	Provided by client.
	Unit flow	0.280	m^3/person/day	Referred to the planning unit flow for Commercial Employee + Commercial activities - J11 Community, Social & Personal Services in Table T-2 of GESF[(a)].
	Number of staff (overnight)	20	persons	Provided by client.
	Unit flow	0.280	m^3/person/day	Referred to the planning unit flow for" Services" in Appendix 2 of GDSSTP[(b)].
	Estimated daily flow	72.80	m^3/day	
2	**Generation from Dormitory**			
	Number of residents	414	persons	Provided by client.
	Unit flow	0.190	m^3/person/day	Referred to the planning unit flow for Domestic - Institutional and special class in Table T-1 of GESF[(a)].
	Estimated daily flow	78.66	m^3/day	
3	**Generation from Visitors**			
	Number of persons	190	persons	Provided by client.
	Unit flow	0.015	m^3/person/day	Referred to the unit flow factor for "Visitor" of Table 3-4 of "Wastewater EngineeringTreatment and Reuse" published by Metcalf & Eddy.
	Estimated peak daily flow	2.85	m^3/day	
	Total estimated daily flow	**154.31**	m^3/day	

Notes:
(a) GESF - "Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning" published by Environmental Protection Department (EPD) in 2005.
(b) GDSSTP - "Guidelines for the Design of Small Sewage Treatment Plants" published by Environmental Protection Department (EPD) in 2006.

Appendix C

Sewerage Treatment Plant Design Calculation (Tentative)

Proposed Development of Hong Kong Sheng Kung Hui St. Christopher's Complex at the Remaining Portion of Taxlord Lot No. T77 In D.D.34. Tai Po
Sewage Treatment Plant Design Calculation

						Remark
A	**Estimation of Peak Flow from Proposed Development**					
	1 **Generation from Staff**					
	Number of staff (non-overnight)	240	persons			Provided by client.
	Unit flow	0.280	m^3/person/day			Referred to the planning unit flow for Commercial Employee + Commercial activities - J11 Community, Social & Personal Services in Table T-2 of GESF[(a)].
	Number of staff (overnight)	20	persons			Provided by client.
	Unit flow	0.280	m^3/person/day			Referred to the planning unit flow for" Services" in Appendix 2 of GDSSTP[(b)].
	Estimated daily flow	72.80	m^3/day			
	2 **Generation from Dormitory**					
	Number of bed spaces	414	beds	20		Provided by client.
	Unit flow	0.190	m^3/person/day			Referred to the planning unit flow for Domestic - Institutional and special class in Table T-1 of GESF[(a)].
	Estimated peak daily flow	78.66	m^3/day			
	3 **Generation from Visitors**					
	Number of persons	190	persons			Provided by client.
	Unit flow	0.015	m^3/person/day			Referred to the unit flow factor for "Visitor" of Table 3-4 of "Wastewater EngineeringTreatment and Reuse" published by Metcalf & Eddy.
	Estimated daily flow	2.85	m^3/day			
	Total estimated daily flow	154.31	m^3/day			
	Average hourly flow (DWF)	6.43	m^3/hour			Dry Weather Flow
	Total estimated peak hourly flow	38.58	m^3/hour	190		6 DWF
B	**BOD loading**					
	Generation from Proposed Development					
	Total Number of population	864	persons			
	Unit flow	0.055	kg/h/day			Referred to Guidelines for the Design of Small Sewage Treatment Plants by EPD.
	Total BOD loading	47.52	kg/day			
C	**Design Flow for STP**					
	Design Flow	25.72	m^3/hour			4 DWF
D	**Design Calculation**					
	1 Equalization tank					
	Minimum flow capacity	25.72	m^3			
	Tank length	4	m			
	Tank Width	3.5	m			
	Tank depth	3	m			
	Design water depth	2.6	m			
	Effective water level	2.2	m			
	Effective tank volume	30.80	m^3			
	Retention time	2.40	hr			Minimum retention time of 2 hours at peak flow. Retention time = Tank Volume/(Estimated Peak Hourly Flow - Design Flow)
	2 Contact aeration tank					
	Tank length	4.5	m			
	Tank width	4	m			
	Tank depth	3.5	m			
	Design water depth	3.1	m			
	Effective tank volume	55.8	m^3			
	Contact media bed					
	Length	4.5	m			
	Width	4	m			
	Depth	3	m			
	Volume	54	m^3			
	Detention time	2.17	hr			Detention time = Tank Volume/ Design Flow
	3 Final settling tank					
	Hopper length	4	m			
	Hopper width	3.5	m			
	Hopper depth	3	m			
	Hopper Volume	27.72	m^3			
	No. of hopper	1	unit			
	Total volume	27.72	m^3			
	Retention time	2.16	hr			Retention time = Tank Volume/(Estimated Peak Hourly Flow - Design Flow)
	4 Filtration pump sump					
	Tank length	4	m			
	Tank width	3	m			
	Design water depth	3	m			
	Effective tank volume	36	m^2			
	5 Ultra filtration system					
	No. of module	2	module			
	Effective area	50	m^2/module			
	Total volume	100	m^2			
	Design filtration rate	60	mg/L-hr			
	Flow capacity	6	m^3/hour			
	6 Sluge holding tank					
	Tank length	5.5	m			
	Tank width	5	m			
	Design water depth	5	m			
	Effective tank volume	137.5	m^2			
	BOD loading for biological treatment	43.96	kg/day			7.5% BOD removed after fine bar screen
		284.855	mg/l			=BOD loading/ Total estimated daily flow x 1000
	Effluent BOD concentration	20	mg/l			BOD discharge standard
	BOD removal rate	40.870	kg/day			
	Sludge production rate	40.870	kg/day			1.0 kg/kg BOD removal
		2.023	m^3/day			= sludge production rate (kg/day) / 0.02 / 1.01 / 1000 Assuming that the wet sludge solid content is 2% and specific gravity of 1.01.
	Storage time	67.96	days			=Effective tank volume/ Sludge production rate at least 60 days

Notes:

(a) GESF - "Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning" published by Environmental Protection Department (EPD) in 2005.

(b) GDSSTP - "Guidelines for the Design of Small Sewage Treatment Plants" published by Environmental Protection Department (EPD) in 2006.

Appendix D

Relevant Effluent Quality Standards

Table 6 Standards for effluents discharged into Group D inland waters
(All units in mg/L unless otherwise stated; all figures are upper limits unless otherwise indicated)

Determinand / Flow rate (m^3/day)	≦200	>200 and ≦400	>400 and ≦600	>600 and ≦800	>800 and ≦1000	>1000 and ≦1500	>1500 and ≦2000	>2000 and ≦3000
pH (pH units)	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10
Temperature (°C)	30	30	30	30	30	30	30	30
Colour (lovibond units) (25mm cell length)	1	1	1	1	1	1	1	1
Suspended solids	30	30	30	30	30	30	30	30
BOD	20	20	20	20	20	20	20	20
COD	80	80	80	80	80	80	80	80
Oil & Grease	10	10	10	10	10	10	10	10
Iron	10	8	7	5	4	2.7	2	1.3
Boron	5	4	3.5	2.5	2	1.5	1	0.7
Barium	5	4	3.5	2.5	2	1.5	1	0.7
Mercury	0.1	0.05	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	0.1	0.05	0.001	0.001	0.001	0.001	0.001	0.001
Other toxic metals individually	1	1	0.8	0.8	0.5	0.5	0.2	0.2
Total Toxic metals	2	2	1.6	1.6	1	1	0.5	0.4
Cyanide	0.4	0.4	0.3	0.3	0.2	0.1	0.1	0.05
Phenols	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1
Sulphide	1	1	1	1	1	1	1	1
Sulphate	800	600	600	600	600	400	400	400
Chloride	1000	800	800	800	600	600	400	400
Fluoride	10	8	8	8	5	5	3	3
Total phosphorus	10	10	10	8	8	8	5	5
Ammonia nitrogen	20	20	20	20	20	20	20	10
Nitrate + nitrite nitrogen	50	50	50	30	30	30	30	20
Surfactants (total)	15	15	15	15	15	15	15	15
E. coli (count/100ml)	1000	1000	1000	1000	1000	1000	1000	1000

Table 7 Standards for effluents discharged into the coastal waters of Tolo and Port Shelter Water Control Zones

(ALl units in mg/L unless otherwise stated; all figures are upper limits unless otherwise indicated)

Determinand / Flow rate (m^3/day)	≦10	>10 and ≦200	>200 and ≦400	>400 and ≦600	>600 and ≦800	>800 and ≦1000	>1000 and ≦1500	>1500 and ≦2000	>2000 and ≦3000	>3000 and ≦4000	>4000 and ≦5000	>5000 and ≦6000
pH (pH units)	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9
Temperature (°C)	45	45	45	45	45	45	45	45	45	45	45	45
Colour (lovibond units) (25mm cell length)	1	1	1	1	1	1	1	1	1	1	1	1
Suspended solids	30	30	30	30	30	30	15	15	15	15	15	15
BOD	20	20	20	20	20	20	10	10	10	10	10	10
COD	80	80	80	80	80	80	50	50	50	50	50	50
Oil & Grease	20	20	20	20	20	20	10	10	10	10	10	10
Iron	10	10	10	7	5	4	2.7	2	1.3	1	0.8	0.6
Boron	5	4	3	2.5	2	1.6	1.1	0.8	0.5	0.4	0.3	0.2
Barium	5	4	3	2.5	2	1.6	1.1	0.8	0.5	0.4	0.3	0.2
Mercury	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Other toxic metals individually	1	1	0.8	0.5	0.5	0.4	0.1	0.1	0.1	0.1	0.1	0.1
Total toxic metals	2	2	1.6	1	1	0.8	0.2	0.2	0.2	0.2	0.14	0.1
Cyanide	0.1	0.1	0.1	0.1	0.1	0.1	0.05	0.05	0.03	0.02	0.02	0.01
Phenols	0.5	0.5	0.5	0.25	0.25	0.25	0.1	0.1	0.1	0.1	0.1	0.1
Sulphide	5	5	5	5	5	5	2.5	2.5	1.5	1	1	0.5
Total residual chlorine	1	1	1	1	1	1	1	1	1	1	1	1
Total nitrogen	20	20	20	15	15	15	15	15	10	10	10	10
Total phosphorus	8	8	5	5	5	5	5	5	5	5	5	5
Surfactants (total)	15	15	15	15	15	15	10	10	10	10	10	10
E. coli (count/100ml)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Appendix E

Existing Drainage System Capacity Calculation

Proposed Development of Hong Kong Sheng Kung Hui St. Christopher's Complex at the Remaining Portion of Taxlord Lot No. T77 In D.D.34. Tai Po
Existing Drainage System Capacity Calculation

Calculation of Runoff from Site into Storm Drainage Network

Catchment ID	Surface Type	Catchment Area (A), m^2	Catchment Area (A), km^2	Average Slope (H), m/100m	Flow path length (L), m	Inlet time (t_0), min	Time of Concentration (t_0), min	Duration (t_d), min	a (50 year return period)	b (50 year return period)	c (50 year return period)	Runoff intensity (i) mm/hr	Runoff coefficient (C)	C × A	Peak runoff (Q_p), m^3/s
Site Boundary	80% Concrete +20% Grassland (heavysoil), flat	2,208	0.002208	-	-	-	-	5.00	451.3	2.5	0.34	227	0.81	0.001788	0.113

Capacity Flow Estimation and Adequacy Check for Existing Drainage System

Point (channel no.)	Shape	Diameter, m	Depth, m	Slope	Length, m	Manning's roughness coefficient	Cross Section Area, m^2	Wetted perimeter, m	Hydraulic radius, m	Mean velocity, m/s	Capacity flow, m^3/s	Sewage Treatment Plant and Stormwater Catchment Peak Flow, m^3/s	% of capacity flow	Sufficient Capacity? (Y/N)
SMD1000600	Circular Pipe × 2 nos.	0.150	--	0.216	3.0	0.015	0.018	0.471	0.04	3.48	0.123	0.124	101%	N
SWD1011379	Circular Pipe	0.300	--	0.007	18.5	0.015	0.071	0.942	0.08	0.99	0.070	0.124	176%	N
SWD1011376	Circular Pipe	0.300	--	0.011	26.6	0.015	0.071	0.942	0.08	1.22	0.086	0.124	144%	N
SWD1011377	Circular Pipe	0.300	--	0.020	10.7	0.015	0.071	0.942	0.08	1.66	0.117	0.124	105%	N
SWD1011381	Circular Pipe	0.300	--	0.009	8.8	0.015	0.071	0.942	0.08	1.13	0.080	0.124	155%	N
SWD1011383	Circular Pipe	0.300	--	0.018	20.0	0.015	0.071	0.942	0.08	1.59	0.113	0.124	110%	N
SWD1014090	Circular Pipe	0.375	--	0.018	17.4	0.015	0.110	1.178	0.09	1.85	0.204	0.124	61%	Y