DeSPACE (International) Limited

Date: 16th July 2024

BY HAND

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

Dear Sir/Madam,

SECTION 16 APPLICATION
TOWN PLANNING ORDINANCE (CHAPTER 131)

****

PROPOSED RELIGIOUS INSTITUTION (REDEVELOPMENT OF BETHEL BIBLE SEMINARY (BBS) WITH IN-SITU PRESERVATION OF SUN HOK BUILDING)
AT 45 - 47 GRAMPIAN ROAD (PART), KOWLOON CITY, KOWLOON, NEW KOWLOON INLAND LOT NO.1382 (PART)

Planning Application No. A/K18/347

Further Information (6) – Technical Clarifications

Reference is made to the captioned Section 16 planning application. In order to address Transport Department's comments regarding the captioned application, attached please the table of responses-to-comments (R to C) with the following attachment:

- Replacement pages of Traffic Impact Assessment

Please be advised that this FI(6) should be exempted from the publication requirement and/or the recounting requirement in accordance with TPB PG-No. 32B since the it does not involve major changes in the assumptions and methodologies, findings and proposed mitigation measures and involves technical clarifications only.

Should you have any queries, please feel free to contact Mr. Endy CHENG at [redacted] or myself at [redacted]

Yours faithfully,
FOR AND ON BEHALF OF
DeSPACE (INTERNATIONAL) LIMITED

Greg Lam

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Proposed "Religious Institution"
(Redevelopment of Bethel Bible Seminary with in-situ preservation of Sun Hok Building)
at 45-47 Grampian Road, Kowloon City, Kowloon
Town Planning Application No. A/K18/347

Response-to-Comment Table (Departmental Comments)

Departmental Comments	Responses
Memo dated 24 June 2024 refers: **(Commissioner For Transport: Mr. LI Hon-yeung, Simon; Tel: 2399 2512)**	
Please find below our further comments on the subject FI and RTC from traffic engineering perspective: 1) R-to-C item no. 5 and Para. 4.8.4 - The applicant shall clarify the exact figures of the calculated queue lengths at the concerned section of Nga Tsin Wai Road instead of putting ">30"m on Table 4.12 for reference and design scenarios. Furthermore, the applicant shall also review if other possible improvement measures, say by adjustment of the traffic green times / linkage of the junction concerned and upstream junctions, can potentially alleviate the excessive queue length;	**Table 4.12** of the TIA is updated. Both calculated queue lengths at the concerned section of Nga Tsin Wai Road are 42m for reference and design scenarios. Therefore, the impact caused by the proposed development on the queue length is negligible. This section of Nga Tsin Wai Road is bounded by Grampian Road, Junction Road, Man Yuen Mansion and 49-49A Nga Tsin Wai Road, it cannot be elongated nor widened. By adjusting the green time, the vehicles could queue within the allowable queue length. Please refer to **Table 4.13** of the TIA report.
2) Table 6.9 - the pedestrian flows generated / attracted by the proposed development during the peak times at critical section 7 do not tally with the assumption as stated in para. 6.2.9 where	The pedestrian flows were less than 109/103/127 as some people will come to the proposed development by private car and taxi based on the modal split.

maximum of 109/103/127 people will come/leave the subject site within 15 minutes during day/noon/evening time;	Anyway, for conservative, assume 100% of people will use bus/PLB and walk to/ from the proposed development. **Chapter 6** is updated accordingly.
3) R-to-C item no. 8, the applicant shall supplement swept path analysis to demonstrate the proposed permanent location of the on-street metered parking spaces will not affect the passage of buses / coaches due to close proximity to the existing refuge island, the applicant shall commit to follow up the proposed permanent relocation of the affected on-street metered spaces and undertake all the necessary local consultation, by adding a paragraph under appropriate section of the TIA report.	Swept path are shown in **Figures SP-04** to **SP-05**. It is noted that the proposed on-street metered parking spaces will not affect the passage of 12m buses / coaches from Dumbarton Road and 11m HGV left turn from Grampian Road. It is noted that as shown in **Figure SP-06**, 12m buses / coaches cannot be left turn from Grampian Road to Dumbarton Road at present due to the existing traffic refuge island (even without relocate the parking spaces). Thus, our proposal will not affect the passage of other vehicles. **Section 3.5** is added to the TIA to describe the relocation of on-street parking spaces and the applicant will follow up the proposed permanent relocation of the affected on-street metered spaces and undertake all the necessary local consultation.

3.4.2 It reveals that the proposed development is currently well served by the comprehensive public transport services in the vicinity.

3.5 Relocation of On-street Parking Spaces

3.5.1 Due to the provision of new run-in/out at Dumbarton Road, 3 nos. of on-street meter parking spaces will be affected. It is proposed to shift the parking spaces to the right as shown in **Figure RtC – 1**.

3.5.2 As shown in **Figures SP-01** to **SP-05**, the manoeuvring of the vehicles will not be affect by relocation of the parking spaces. **Figures SP-06** shows that 12m buses / coaches cannot be left turn from Grampian Road to Dumbarton Road at present due to the existing traffic refuge island (even without relocate the parking spaces). Thus, our proposal will not affect the passage of other vehicles.

3.5.3 The applicant will follow up the proposed permanent relocation of the affected on-street metered spaces and undertake all the necessary local consultation.

Table 4.12 Queue Length Analysis of Identified Junctions in 2029 (Design Year)

Ref.	Junction	Method of Control	Direction		Length of Road Segment (m)	Calculated Queue Length (m) Design Scenario	
						AM Peak	PM Peak
A	Dumbarton Road/ Inverness Road	Priority	Inverness Road (SB) (SRT+RT)		288	0	0
			Dumbarton Road (WB)(LR+RT)		88	2	2
			Inverness Road (NB)(SRT+LT)		80	2	1
B	Dumbarton Road/ Grampian Road	Priority	Dumbarton Road (EB)(LR+RT)		15	0	0
			Dumbarton Road (WB)(LR+RT)		88	1	1
			Grampian Road (NB)(LT+RT)		284	6	6
C	Dumbarton Road/ Junction Road	Signal	Dumbarton Road (EB) (LR+RT)		119	30	12
			Junction Road (NB) (SRT)		75	54	48
			Junction Road (SB)(SRT+RT)		55	24	18
D	Junction Road/ Carpenter Road	Signal	Carpenter Road (SB) (LT+RT)		68	36	36
			Junction Road (NB) (SRT+RT)		46	36	36
			Junction Road (SB) (SRT+LT)		74	60	42
E	Inverness Road/ Nga Tsin Wai Road	Priority	Inverness Road (SB) (LT+RT)		288	11	6
			Nga Tsin Wai Road (EB) (SRT+LT)		57	0	0
			Nga Tsin Wai Road (SRT+RT)		75	5	6
F	Grampian Road/ Nga Tsin Wai Road	Signal	Grampian Road (SB)(LT+RT)		41	18	12
			Grampian Road (NB)(LT+RT+SRT)		84	30	24
			Nga Tsin Wai Road (WB) (SRT+RT)		30	24	24
			Nga Tsin Wai Road (EB) (SRT+LT)		61	30	30
G	Junction Road/ Nga Tsin Wai Road	Signal	Junction Road (SB) (LT+RT)		81	42	30
			Junction Road (NB) (LT+SRT)		50	24	24
			Nga Tsin Wai Road (WB) (SRT+RT)		40	24	30
			Nga Tsin Wai Road (EB) (SRT)	Reference Case	30	42	30
				Design Case		42	30

4.8.4 The assessment results in **Table 4.12** indicate that all queues are queuing within the allowable road segments *except* for the Junction G (East Bound).

4.8.5 The queue length for Junction G (East Bound) for the reference case (i.e. without the proposed development) is the same as the queue length for design case. Therefore, the impact caused by the proposed development on the queue length is negligible.

4.8.6 In addition, this section of Nga Tsin Wai Road is bounded by Grampian Road, Junction Road, Man Yuen Mansion and 49-49A Nga Tsin Wai Road, it cannot be elongated nor widened. Therefore, the applicant is unable to carry out any mitigation measures that can reduce the queue length.

4.8.7 By adjusting the green time, the vehicles could queue within the allowable queue length.

Table 4.13 Queue Length Analysis of Identified Junctions in 2029 with Adjusted Green Time (Design Year)

Ref.	Junction	Method of Control	Direction	Length of Road Segment (m)	Calculated Queue Length (m) Design Scenario	
					AM Peak	PM Peak
G	Junction Road/ Nga Tsin Wai Road	Signal	Junction Road (SB) (LT+RT)	81	54	36
			Junction Road (NB) (LT+SRT)	50	30	30
			Nga Tsin Wai Road (WB) (SRT+RT)	40	24	30
			Nga Tsin Wai Road (EB) (SRT)	30	30	24

6.2.10 As the nearest MTR stations including both Lok Fu Station and Song Wong Toi Station are out of 500m radius, hence, we assumed the travelers will take either GMB or bus to the MTR station. Hence, the model split is adjusted. The adjusted model split is summarized in the **Table 6.7**.

Table 6.7 Adjusted Model Split

TCS								
	Rail	**Franchised Bus**	**PLB**	**Private Vehicle**	**SPB**	**Taxi**	**Tram**	**Ferry**
Modal Split	30%	27%	13%	12%	9%	6%	2%	1%
Adjusted Modal Split	-	**68%**	**33%**	-	-	-	-	-

6.2.11 The expected peak hour pedestrian flow to/ from the proposed development, bus and GMB stop are estimated and summarized in is summarized in the below **Table 6.8**.

Table 6.8 Expected Peak Hour Pedestrian Flow to Bus/ GMB Stops

Proposed Development	**Period**	**Peak Hour Pedestrian Flow**	**Passenger trip related to Bus in AM Peak (68%)**	**Passenger trip related to GMB in AM Peak (33%)**
Bethel Bible Seminary at 45-47 Grampian Road	AM Peak	109	74 (two- way)	35 (two- way)
	Noon Peak	103	70 (two- way)	33 (two- way)
	PM Peak	127	86 (two- way)	41 (two- way)

6.2.12 A separated pedestrian flow table shows the pedestrian generated and attracted by the proposed development only. The detail is also provided and is shown in the **Table 6.9**.

Table 6.9 Pedestrian Flow Generated and Attracted by the Proposed Development

Critical Sections	Pedestrian Flow Generated and Attracted by the Proposed Development		
	AM Peak (ped/15 mins)	Noon Peak (ped/15 mins)	PM Peak (ped/15 mins)
4	5	5	10
5	5	5	10
6	5	5	10
7	110	105	125
8	30	25	35
9	5	5	10
12	35	30	40
13	20	20	25
14	55	50	65
15	10	10	15
16	5	5	10
17	5	5	10
18	5	5	10
19	5	5	10
20	5	5	10
21	5	5	10
22	5	5	10
23	5	5	10
25	20	15	20
26	5	5	10
27	5	5	10
28	5	5	10
29	5	5	10
30	5	5	10
31	0	0	0
32	20	15	20
34	5	5	5
35	5	5	5
36	5	5	5
40	5	5	5
41	5	5	5
42	5	5	5
48	5	5	10
51	5	5	10
53	5	5	10
55	20	15	20
56	10	10	15
58	20	20	25

Note :

(1) The pedestrian flow results are demonstrated to the nearest units of 5, 0.

Table 6.10 Pedestrian Flow Generated and Attracted by the Proposed Development for the Pedestrian Crossing

Critical Sections	Pedestrian Flow Generated and Attracted by the Proposed Development		
	AM Peak (ped/15 mins)	Noon Peak (ped/15 mins)	PM Peak (ped/15 mins)
C2	5	5	10
C8	5	5	10
C9	5	5	10
C12	5	5	10
C13	5	5	5
C14	5	5	10
C17	5	5	10
C19	5	5	10
C24	5	5	10
C25	10	10	15
C26	20	20	25
C27	20	15	20

Note :

(1) The pedestrian flow results are demonstrated to the nearest units of 5, 0.

6.2.13 The estimated trips are superimposed to the network, the future pedestrian design flow could be estimated and summarized in **Table 6.11 and Table 6.12.**

Table 6.11 Performance of Critical Footpath for Design Scenario in Year 2029

Critical Sections	Total Footpath Width (m)[1]	Effective Width (m)[2]	Design Scenario (with the Proposed Development) in Year 2029								
			AM Peak			Noon Peak			PM Peak		
			Two-way Pedestrian Flow (ped/15 mins)	Two-way Pedestrian Flow Rate (ped/min/m)[3]	LOS	Two-way Pedestrian Flow (ped/15 mins)	Two-way Pedestrian Flow Rate (ped/min/m)[3]	LOS	Two-way Pedestrian Flow (ped/15 mins)	Two-way Pedestrian Flow Rate (ped/min/m)[3]	LOS
1	3.1	2.6	10	0.26	A	10	0.26	A	10	0.26	A
2	3.3	2.8	25	0.60	A	25	0.60	A	30	0.71	A
3	2.9	2.4	100	2.78	A	35	0.97	A	25	0.69	A
4	2.6	2.1	105	3.33	A	45	1.43	A	45	1.43	A
5	3.3	2.3	105	3.04	A	130	3.77	A	55	1.59	A
6	3.3	2.8	125	2.98	A	170	4.05	A	75	1.79	A
7	2.9	1.9	185	6.49	A	120	4.21	A	145	5.09	A
8	2.6	1.6	105	4.38	A	60	2.50	A	85	3.54	A
9	3.3	2.8	100	2.38	A	60	1.43	A	40	0.95	A
10	3.3	2.8	70	1.67	A	55	1.31	A	70	1.67	A
11	2.9	2.4	40	1.11	A	25	0.69	A	10	0.28	A
12	2.6	2.1	145	4.60	A	170	5.40	A	80	2.54	A
13	3.3	2.3	185	5.36	A	85	2.46	A	60	1.74	A
14	3.3	2.3	70	2.03	A	235	6.81	A	160	4.64	A
15	2.9	1.9	165	5.79	A	75	2.63	A	80	2.81	A
16	2.6	1.6	165	6.88	A	80	3.33	A	60	2.50	A
17	3.3	2.3	150	4.35	A	60	1.74	A	85	2.46	A
18	3.3	2.3	130	3.77	A	40	1.16	A	45	1.30	A
19	2.9	1.9	165	5.79	A	120	4.21	A	140	4.91	A
20	2.6	1.6	110	4.58	A	60	2.50	A	80	3.33	A
21	3.3	2.3	150	4.35	A	75	2.17	A	80	2.32	A
22	3.3	2.3	190	5.51	A	95	2.75	A	115	3.33	A
23	2.9	1.9	75	2.63	A	25	0.88	A	55	1.93	A
24	2.6	2.1	55	1.75	A	265	8.41	A	150	4.76	A
25	3.3	2.3	60	1.74	A	90	2.61	A	105	3.04	A
26	3.3	2.3	115	3.33	A	210	6.09	A	210	6.09	A
27	2.9	1.9	130	4.56	A	230	8.07	A	240	8.42	A
28	2.6	1.6	110	4.58	A	210	8.75	A	205	8.54	A
29	3.3	2.3	95	2.75	A	195	5.65	A	200	5.80	A
30	3.3	2.3	80	2.32	A	195	5.65	A	200	5.80	A
31	2.9	1.9	115	4.04	A	145	5.09	A	50	1.75	A
32	2.6	1.6	130	5.42	A	190	7.92	A	135	5.63	A
33	3.3	2.3	190	5.51	A	145	4.20	A	110	3.19	A
34	3.3	2.3	130	3.77	A	200	5.80	A	160	4.64	A
35	2.9	1.9	120	4.21	A	245	8.60	A	330	11.58	A
36	2.6	1.6	195	8.13	A	355	14.79	A	425	17.71	B
37	3.3	2.3	95	2.75	A	120	3.48	A	110	3.19	A
38	3.3	2.3	190	5.51	A	315	9.13	A	155	4.49	A
39	2.9	1.9	115	4.04	A	220	7.72	A	300	10.53	A
40	2.6	1.6	190	7.92	A	210	8.75	A	185	7.71	A
41	3.3	2.3	200	5.80	A	370	10.72	A	400	11.59	A
42	3.3	2.3	180	5.22	A	355	10.29	A	345	10.00	A
43	2.9	1.9	105	3.68	A	165	5.79	A	155	5.44	A
44	2.6	1.6	140	5.83	A	365	15.21	A	210	8.75	A
45	3.3	2.3	45	1.30	A	165	4.78	A	155	4.49	A
46	3.3	2.3	365	10.58	A	355	10.29	A	605	17.54	B
47	2.9	1.9	155	5.44	A	255	8.95	A	285	10.00	A
48	2.6	2.1	90	2.86	A	95	3.02	A	90	2.86	A
49	3.3	2.8	70	1.67	A	75	1.79	A	100	2.38	A
50	3.3	2.8	205	4.88	A	90	2.14	A	115	2.74	A
51	2.9	2.4	210	5.83	A	155	4.31	A	190	5.28	A

52	2.6	1.6	180	7.50	**A**	150	6.25	**A**	185	7.71	**A**
53	3.3	2.8	70	1.67	**A**	70	1.67	**A**	65	1.55	**A**
54	3.3	2.3	105	3.04	**A**	345	10.00	**A**	235	6.81	**A**
55	2.9	1.9	155	5.44	**A**	75	2.63	**A**	90	3.16	**A**
56	2.6	1.6	65	2.71	**A**	40	1.67	**A**	35	1.46	**A**
57	3.3	2.8	55	1.31	**A**	50	1.19	**A**	60	1.43	**A**
58	3.3	2.3	90	2.61	**A**	40	1.16	**A**	55	1.59	**A**
59	2.9	1.9	70	2.46	**A**	80	2.81	**A**	70	2.46	**A**
60	2.6	1.6	60	2.50	**A**	80	3.33	**A**	60	2.50	**A**
61	3.3	2.3	65	1.88	**A**	150	4.35	**A**	120	3.48	**A**

Note:

(1) *Clear Width of Street = Street Width between walls and hoardings. For conservative, assume no pedestrian could walk under the hoardings.*

(2) *Effective Width = Clear Width – Dead Width (There is no shopping frontages along the footpath, and hence assume 0.5m for dead areas for both side – T.P.D.M Vol 2 Chapter 3.4 Table 3.4.11.1)*

(3) *Pedestrian Flow Rate (ped/min/m) = Peak Hour Pedestrian Flow / 15 min. / Effective Width*

(4) *The pedestrian flow results are demonstrated to the nearest units of 5, 0.*

Table 6.12 Performance of Critical Pedestrian Crossing in Design Scenario in Year 2029

Crossing	Method of Control	Design Scenario(with the Proposed Development) in Year 2029								
		AM Peak (ped/hr)			Noon Peak (ped/hr)			PM Peak (ped/hr)		
		Crossing Demand (V)	Crossing Capacity (C)	V/C	Crossing Demand (V)	Crossing Capacity (C)	V/C	Crossing Demand (V)	Crossing Capacity (C)	V/C
C1	Signalized	180	3475	0.05	590	3420	0.17	510	3475	0.15
C2	Signalized	515	6490	0.08	1120	6460	0.17	1225	6490	0.19
C3	Signalized	400	3475	0.12	800	3515	0.23	690	3475	0.20
C4	Signalized	495	3475	0.14	1045	3515	0.30	960	3475	0.28
C5	Signalized	470	3730	0.13	1005	3760	0.27	1515	3730	0.41
C6	Signalized	280	6840	0.04	850	6610	0.13	1050	6840	0.15
C7	Signalized	530	8500	0.06	1190	8550	0.14	1430	8500	0.17
C8	Signalized	140	2365	0.06	75	2430	0.03	90	2365	0.04
C9	Signalized	230	2120	0.11	405	2660	0.15	305	2120	0.14
C10	Signalized	90	2615	0.03	70	2660	0.03	55	2615	0.02
C11	Signalized	455	5980	0.08	365	5930	0.06	325	5980	0.05
C12	Signalized	140	2895	0.05	120	2890	0.04	160	2895	0.06
C13	Signalized	200	4885	0.04	360	4865	0.07	350	4885	0.07
C14	Signalized	120	2895	0.04	140	2890	0.05	205	2895	0.07
C15	Signalized	375	2895	0.13	490	2915	0.17	405	2895	0.14
C16	Signalized	165	2000	0.08	120	2025	0.06	130	2000	0.07
C17	Signalized	290	3835	0.08	340	3880	0.09	280	3835	0.07
C18	Signalized	225	4275	0.05	705	4275	0.16	635	4275	0.15
C19	Signalized	205	3090	0.07	665	2470	0.27	625	3090	0.20
C20	Signalized	250	3325	0.08	710	3325	0.21	660	3325	0.20
C21	Signalized	285	7335	0.04	110	3135	0.04	90	7335	0.01
C22	Signalized	275	5000	0.06	310	7315	0.04	325	5000	0.07
C23	Signalized	235	2620	0.09	75	3230	0.02	110	2620	0.04
C24	Signalized	200	2620	0.08	170	3230	0.05	190	2620	0.07
C25	Signalized	215	2620	0.08	190	3230	0.06	130	2620	0.05
C26	Signalized	50	2600	0.02	140	2660	0.05	90	2600	0.03
C27	Signalized	255	4800	0.05	770	2585	0.30	430	4800	0.09
C28	Signalized	115	2485	0.05	55	2535	0.02	55	2485	0.02
C29	Signalized	170	2340	0.07	35	2365	0.01	65	2340	0.03

6.2.14 From the assessment results in **Tables 6.11 and 6.12**, it is revealed that the concerned sections of footpaths and pedestrian crossings would all operate with LOS A, B and with ample V/C Ratio in peak periods. Therefore, the application is acceptable from the traffic points of view.

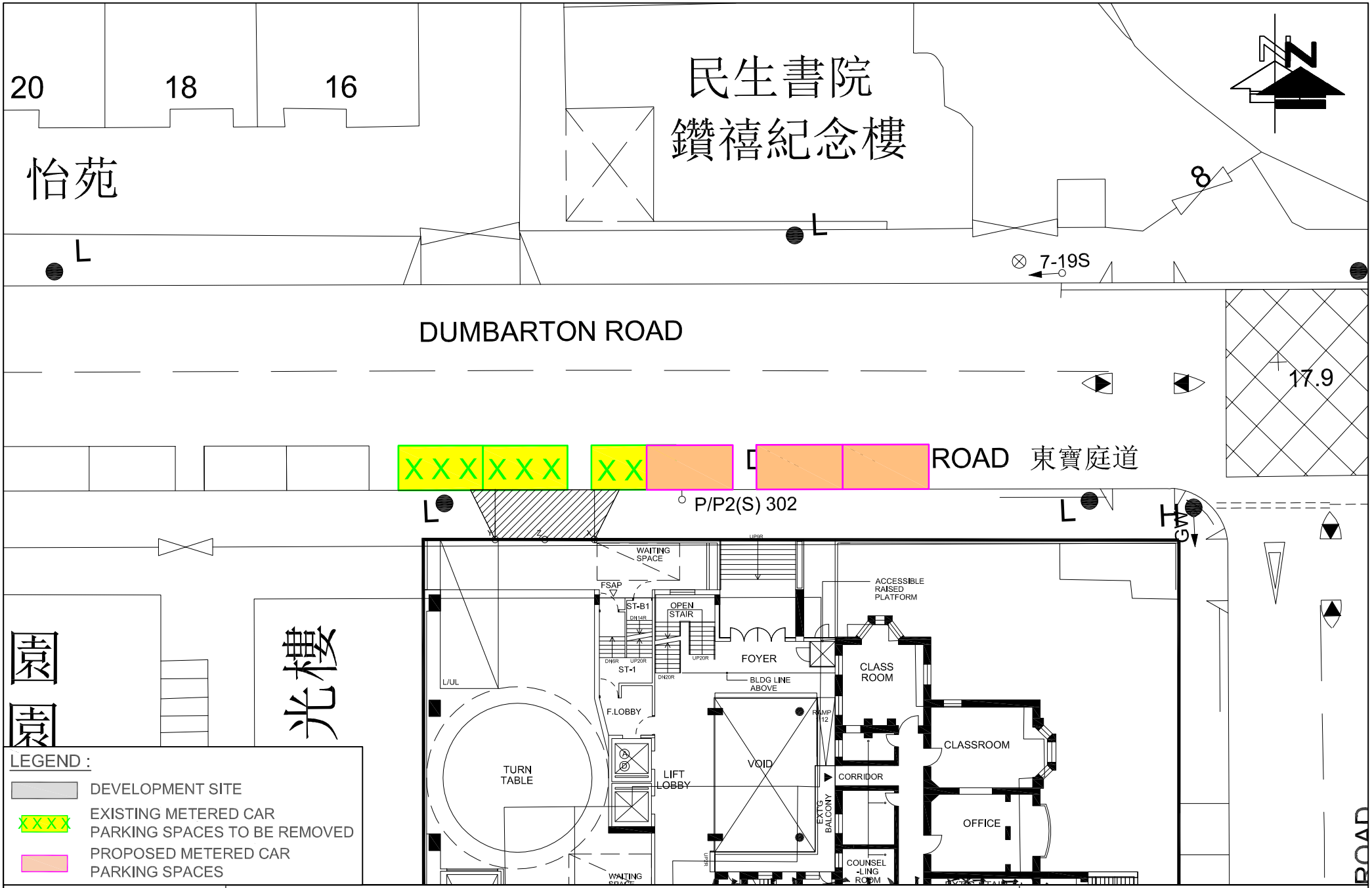

FIGURE NO.: RtC - 1	PROJECT TITLE: Bethel Bible Seminary at 45-47 Grampian Road, Kowloon City (NKIL 1382) Planning Application
PROJECT NO.: 23041HK	DRAWING TITLE: PROPOSED METERED CAR PARKING SPACES
SCALE: 1 : 300 @A4	DATE: 15 JUL 2024

CTA Consultants Limited
志達顧問有限公司

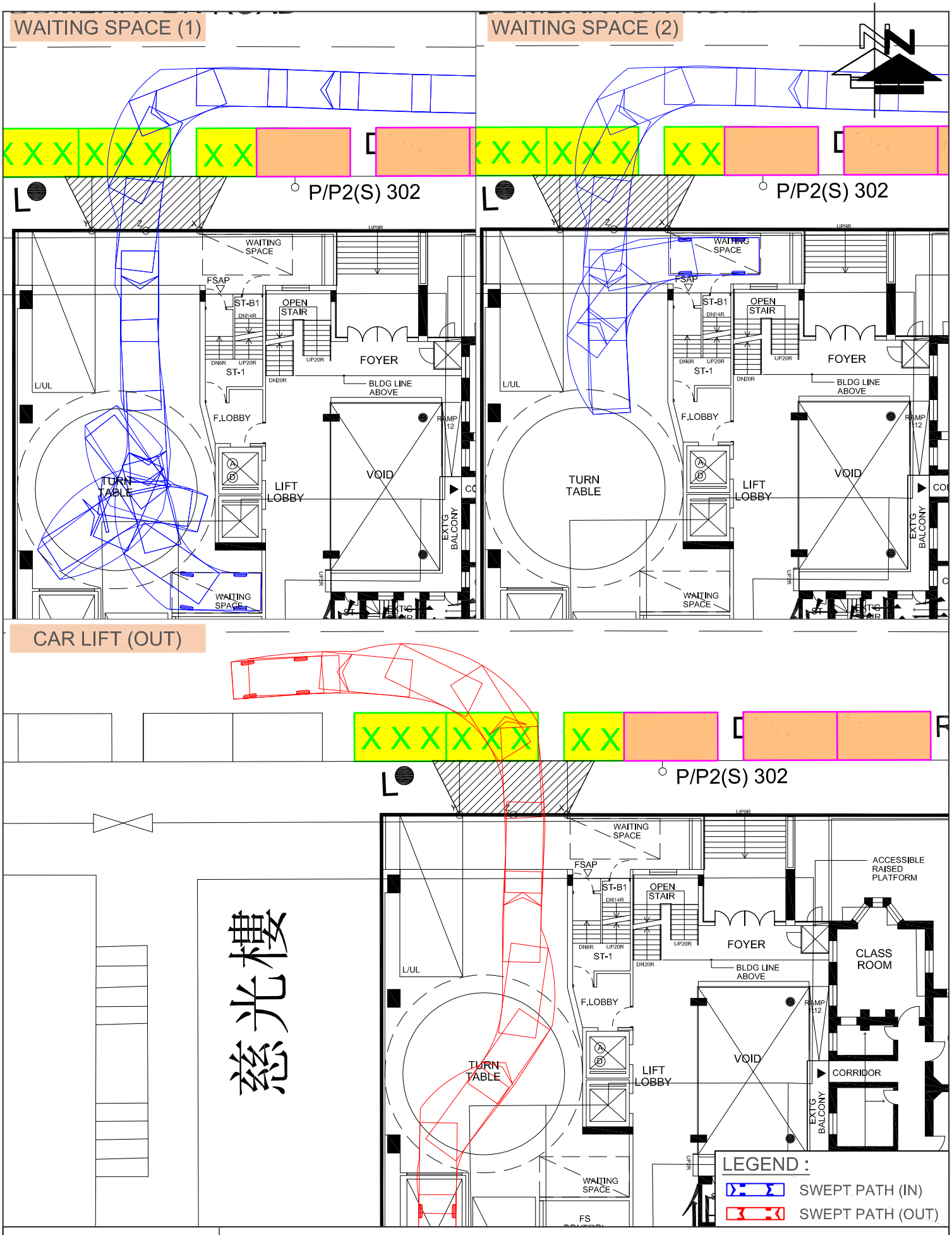

FIGURE NO.: SP-01	PROJECT TITLE: Bethel Bible Seminary at 45-47 Grampian Road, Kowloon City (NKIL 1382) Planning Application
PROJECT NO.: 23041HK	DRAWING TITLE: UG/F - SWEPT PATH ANALYSIS OF WAITING SPACE
SCALE: 1:300 @A4 / DATE: 15 JUL 2024	CTA Consultants Limited 志達顧問有限公司

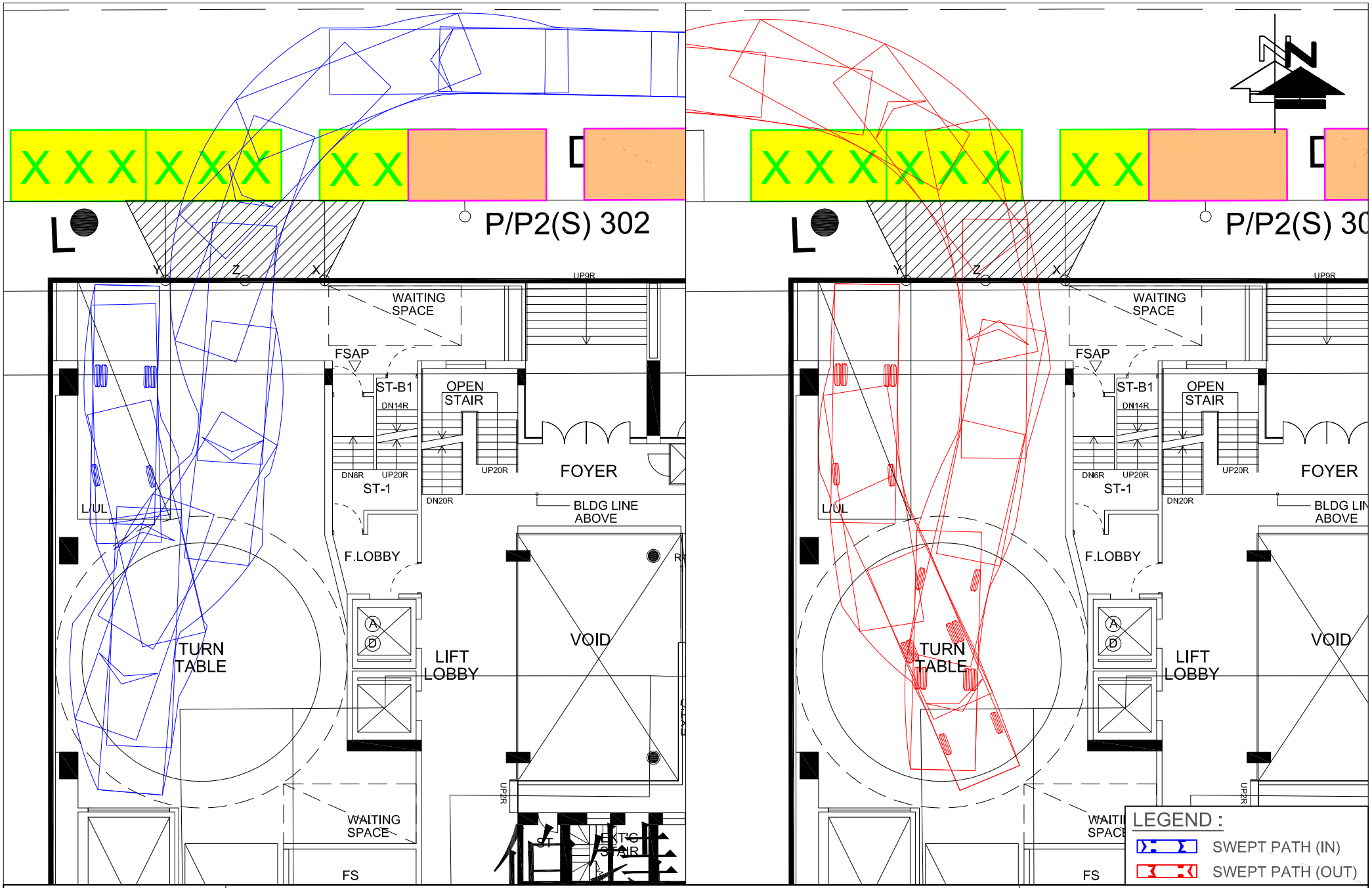

FIGURE NO.: SP-03	PROJECT TITLE: Bethel Bible Seminary at 45-47 Grampian Road, Kowloon City (NKIL 1382) Planning Application	CTA Consultants Limited 志達顧問有限公司
PROJECT NO.: 23041HK	DRAWING TITLE: UG/F - SWEPT PATH ANALYSIS OF LOADING / UNLOADING	
SCALE: 1 : 185 @A4 / DATE: 15 JUL 2024		

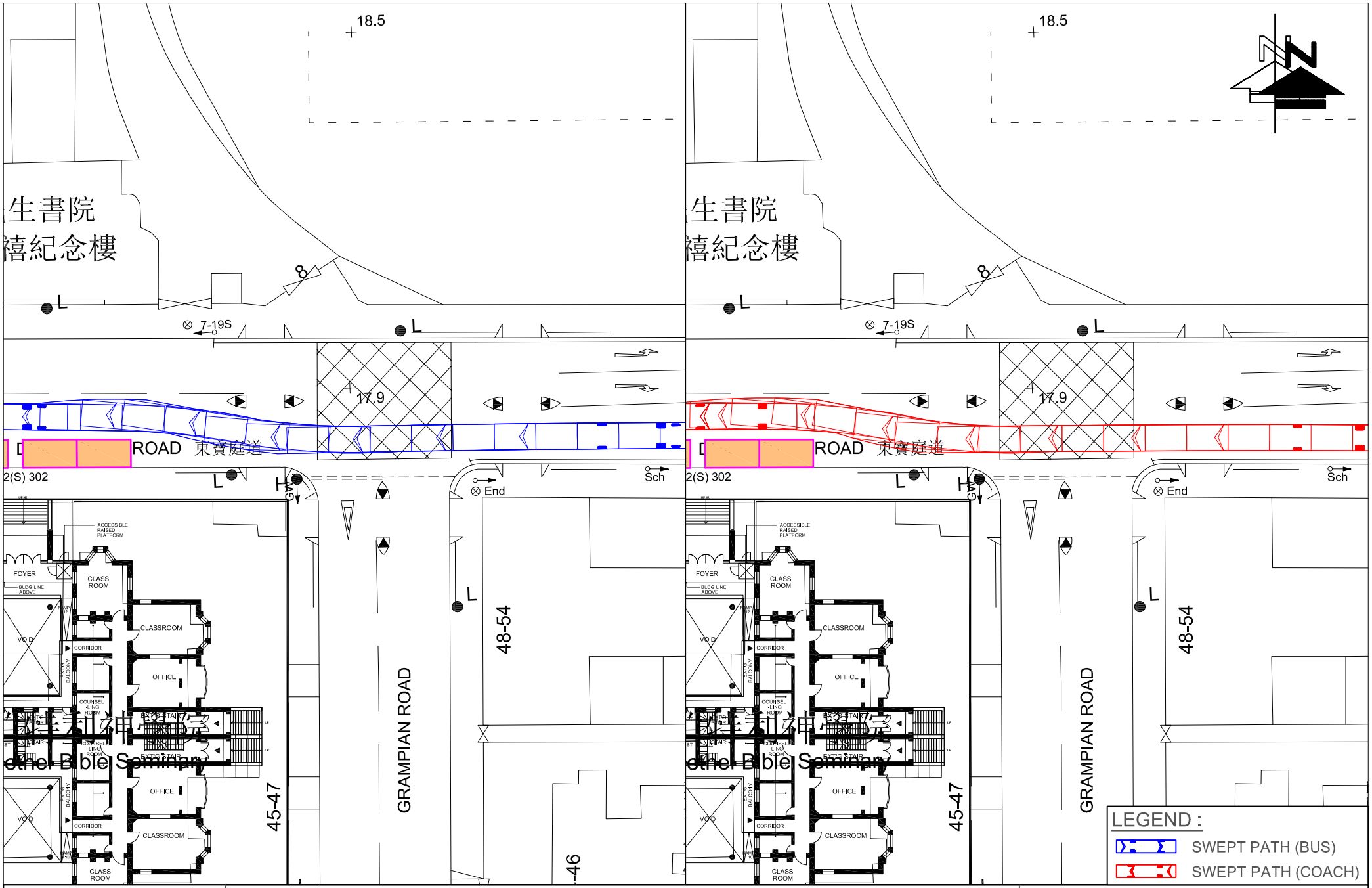

FIGURE NO.: SP-04	PROJECT TITLE: Bethel Bible Seminary at 45-47 Grampian Road, Kowloon City (NKIL 1382) Planning Application	
PROJECT NO.: 23041HK	DRAWING TITLE: SWEPT PATH ANALYSIS OF 12M VEHICLES	
SCALE: 1 : 500 @A4 / DATE: 15 JUL 2024		CTA Consultants Limited 志達顧問有限公司

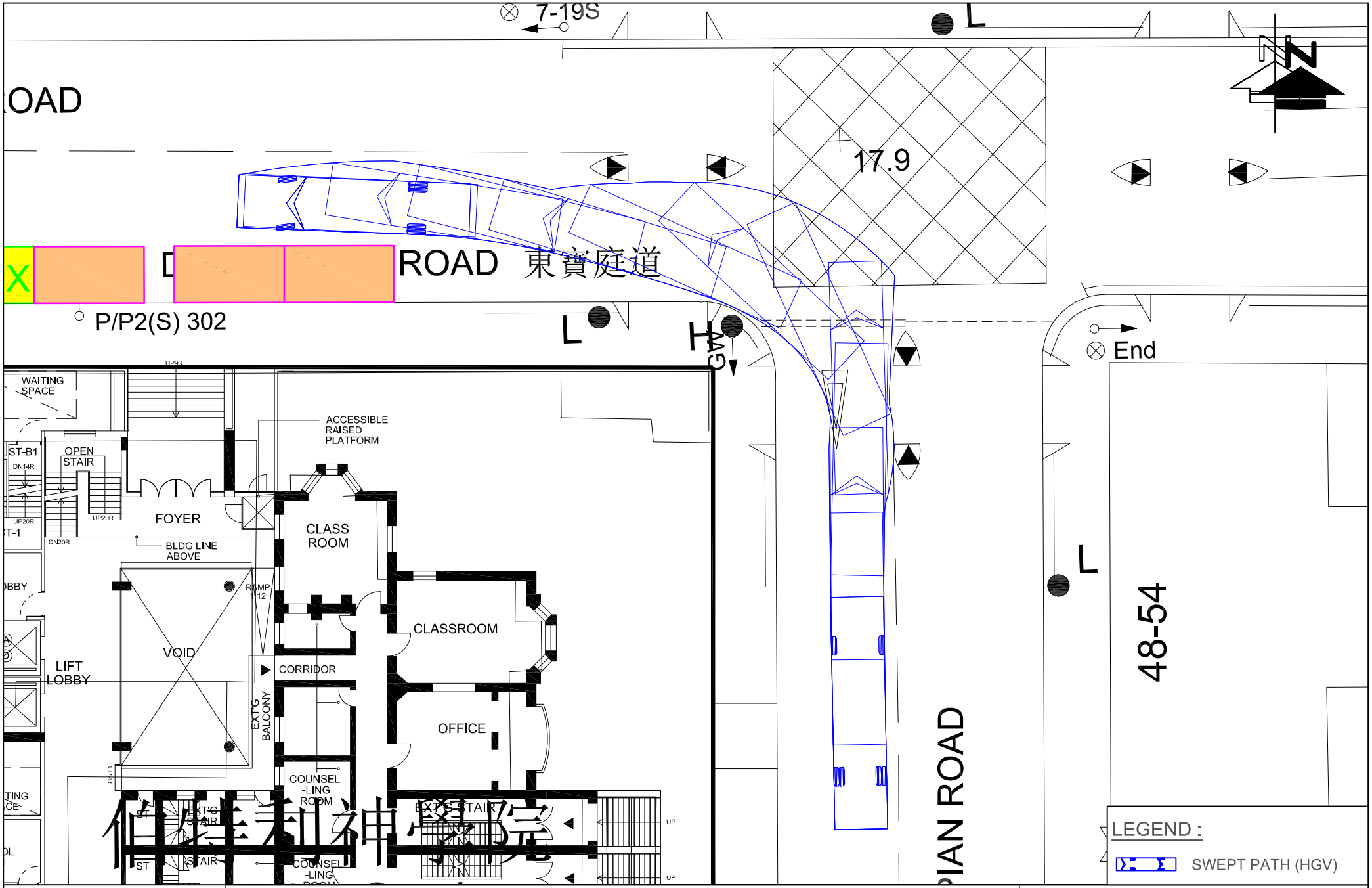

FIGURE NO.: SP-05	PROJECT TITLE: Bethel Bible Seminary at 45-47 Grampian Road, Kowloon City (NKIL 1382) Planning Application	CTA Consultants Limited 志達顧問有限公司
PROJECT NO.: 23041HK	DRAWING TITLE: SWEPT PATH ANALYSIS OF 11M VEHICLES	
SCALE: 1 : 250 @A4 / DATE: 15 JUL 2024		

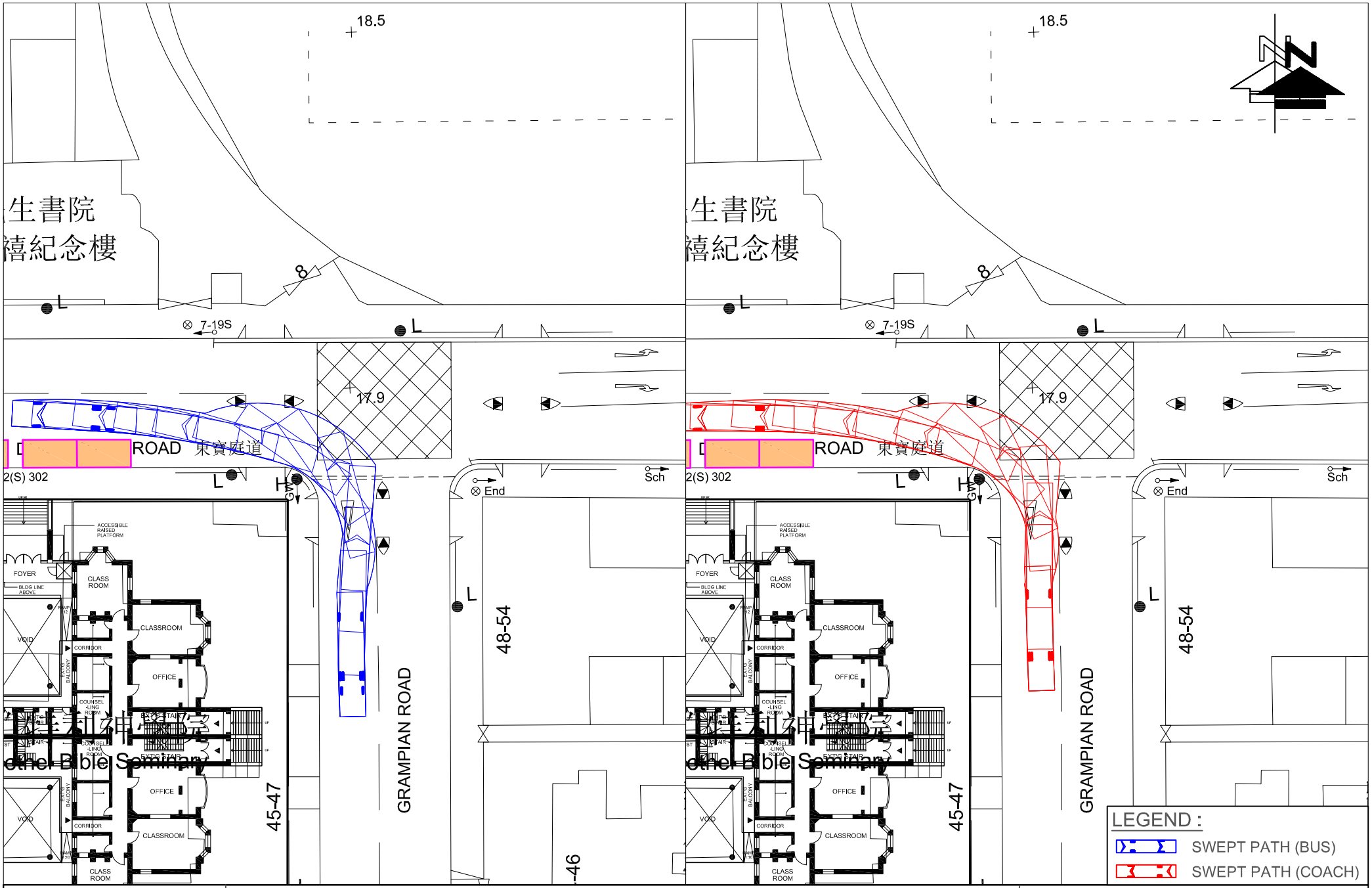

FIGURE NO.: SP-06	PROJECT TITLE: Bethel Bible Seminary at 45-47 Grampian Road, Kowloon City (NKIL 1382) Planning Application	CTA Consultants Limited 志達顧問有限公司
PROJECT NO.: 23041HK	DRAWING TITLE: SWEPT PATH ANALYSIS OF 12M VEHICLES	
SCALE: 1 : 500 @A4 / DATE: 15 JUL 2024		

JUNCTION DELAY CALCULATION Job No: 23041HK **CTA Consultants Ltd.**

Junction: (G) Nga Tsin Wai Road / Junction Road

Description: 2029 Design Scenario (Peak Hour) (With Improvement)

TRRL Method (Transport Road Research Laboratory)

$$d = \frac{c(1-\lambda)^2}{2(1-\lambda X)} + \frac{X}{2q(1-X)} - 0.65\left(\frac{c}{q^2}\right)^{\frac{1}{3}} X^{(2+5\lambda)}$$

where d = average delay per vehicle on the particular arm
λ = proportion of the cycle which is effectively green for the phase under consideration i.e.f g/c
x = The degree of saturation. This is the ratio of actual flow to the maximum possible flow under the given setting of signals and equals 3600q/Es where S = saturation flow in veh/hour
c = Cycle time in seconds
g = Effective green time in seconds
q should be the flow in vehicles per second to give delay in seconds

Approach:	Junction Road (SB) (LT+RT)		Juntion Road (NB) (SRT+LT)		Nga Tsin Wai Road (WB) (SRT+LT)		Nga Tsin Wai Road (EB) (SRT)	
	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak
q (veh/s)	829	638	454	513	371	433	542	429
g (sec)	41	43	41	43	47	35	47	35
c (sec)	120	110	120	110	120	110	120	110
s (veh/hr)	3,333	3,333	1,679	1,679	3,308	3,308	3,267	3,267
λ	0.34	0.39	0.34	0.39	0.39	0.32	0.39	0.32
x	0.73	0.49	0.79	0.78	0.29	0.41	0.42	0.41
M=qc	27.64	19.48	15.14	15.66	12.36	13.24	18.06	13.11
Delay								
d	36.22	25.97	42.21	34.84	25.46	30.09	27.27	30.12
Junction Delay (sec)	**33.4**	**30.0**						

From TPDM Vol4 Table 4.2.5

Average Queue N calculated by

N=q(r/2+d) or qr,whichever the greater

where r = effective red time
q = flow (in same units as r and d)
d = average delay per vehicle

Approach:	Junction Road (SB) (LT+RT)		Juntion Road (NB) (SRT+LT)		Nga Tsin Wai Road (WB) (SRT+LT)		Nga Tsin Wai Road (EB) (SRT)	
	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak
r (sec)	79	67	79	67	73	75	73	75
N (veh)	**18**	**12**	**10**	**10**	**8**	**9**	**11**	**9**
Average Queue length (m)	**54.0**	**36.0**	**30.0**	**30.0**	**24.0**	**30.0**	**30.0**	**24.0**