

**Traffic Impact Assessment “For The Permohonan Pindaan Kebenaran Merancang Pelan
Susunatur Bil. B4/19/94/PD Bertarikh 12 Februari 1994 Mengikut Seksyen 21, Akta 172 Bagi
Cadangan Pembangunan Bercampur, Di Atas Lot 31645, Lot 31642 Dan Pengambilan Semula
Tanah Kerajaan Seluas 0.05 ekar, Persiaran Bukit Raja 1, Bandar Baru Klang, Mukim Kapar,
Daerah Klang, Selangor Darul Ehsan”**

DRAFT REPORT

MAY 2021

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1.0 INTRODUCTION

1.1 BACKGROUND

1.1.1 **Atur Trafik Sdn Bhd (ATSB)** was commissioned by **PNSB ACMAR Sdn Bhd** as the Traffic Consultant to undertake a Traffic Impact Assessment (TIA) for the Proposed Development in Bandar Baru Klang, Daerah Klang, Selangor Darul Ehsan.

1.1.2 The success of such development is dependent upon many factors. One essential factor is to provide adequate countermeasures and facilities to address the transportation needs of the Proposed Development.

1.1.3 The Proposed Development is located on Lot PT 21445 and Lot 31645, Persiaran Bukit Raja, Bandar Baru Klang, Daerah Klang. The site is currently comprising of housing, shop house, shop office, shopping complex and government agencies.

1.1.4 The impact of downloading further travel demand generated or attracted by the Proposed Development on the existing road system is of paramount interest both to the Developer and the Approving Authorities. A Traffic Impact Assessment (TIA) is one of the necessary requirements of Majlis Perbandaran Klang and, Jabatan Kerja Raya (JKR) and Lembaga Lebuhraya Malaysia (LLM) if required.

1.1.5 TIA Report is prepared based upon the statutory requirements and a detail technical study on the accessibility to identify any adverse impact of the Proposed Development would have on the adjacent road networks. If found to be necessary, mitigation measures will be evaluated, and the feasible measures will be recommended to ensure that any residual impacts will be insignificant upon their implementation.

1.2 OBJECTIVES

1.2.1 The objectives of this TIA study are to assess the impact of the Proposed Development on the existing road system as well as to recommend desirable traffic improvement plans. This study shall:

- confirm any residual traffic impact on the surrounding road network due to the Proposed Development insignificant;
- propose necessary traffic engineering measures to mitigate any adverse impact; and
- propose an Urban Transportation Masterplan for the Proposed Development.

1.3 STUDY APPROACH

1.3.1 This study is undertaken to investigate the impact of travel demand generated by the Proposed Development upon the adjacent road system. The general study approach follows the requirement for Traffic Impact Assessment (TIA) as specified by the Engineering Department of Majlis Perbandaran Klang (MPK). The study calls for an analysis of the anticipated traffic condition based on the case of the Proposed Development. Traffic engineering and management measures will be proposed in order to minimize and to alleviate the anticipated adverse impact to the neighbourhood area.

1.3.2 In order to achieve the study objectives, the following works were undertaken:

- (a) Overall Appraisal on the existing road system around the Proposed Development with the:
 - i. Updating of traffic data and quantification of the traffic situation such as traffic flows, road capacity and its utilisation, traffic movement pattern and peak hour flows.
 - ii. Link and Junction Capacity.
 - iii. Public Transport Facilities.
- (b) Estimation of Trip Attraction and Production Rates, Trip Distribution and Modal Choices for the Proposed Development.
- (c) Assess the impact of the Proposed Development to the surrounding road network in terms of existing road and intersections and the location of ingress/egress and the analysis of lane requirements.
- (d) Assess the overall traffic circulation layout in terms of traffic flow and alternative circulation plans if any.

- (e) Assess the pedestrian requirements and public transportation requirements.
- (f) Recommend viable mitigation and traffic amelioration measures and in compliance to the Majlis Perbandaran Klang.
- (g) Preparation and Assessment for the Urban Transportation Masterplan for the Development.
- (h) Submission and making presentation to authority/authorities if any.
- (i) Obtain necessary approval from authority.

1.4 STRUCTURE OF THE REPORT

1.4.1 The Report describes the Traffic Consultant's findings on the existing traffic conditions and the potential impacts of the Proposed Developments on the major access route and it is structured into seven (7) chapters including the introductory chapter.

- **Chapter 2** describes the layout and the components of the Proposed Development.
- **Chapter 3** analyses the various aspects of the existing transportation system related to the road network transport and their operational characteristics.
- **Chapter 4** describes the Traffic Demand Forecasting particularly related to the Trip Generation and Attraction for the Proposed Development.
- **Chapter 5** describes the impact of the Public Transportation and the Public Transportation Transport Masterplan for the Proposed Development.
- **Chapter 6** analyses the Impact of the Proposed Development to the road network and includes findings of other Traffic Study within the vicinity of the Proposed Development.
- **Chapter 7** concludes the finding and the recommendation made for the study.

2.0 PROPOSED DEVELOPMENT

2.1 PROPOSED SITE

2.1.1 The Proposed Development is located on Lot PT 21445 dan Lot 31645, Persiaran Bukit Raja, Bandar Baru Klang, Mukim Kapar, Daerah Klang, Selangor Darul Ehsan. **Figure 2.1** shows the Location Plan of the Proposed Development.

2.1.2 The surrounding areas of proposed development are made up of commercial, government facilities and residential landuses. The site is currently accessible via Persiaran Bukit Raja 1 and Persiaran Bukit Raja 2 through Persiaran Bukit Raja, New North Klang Straits Bypass (Shapadu Highway) and Federal Highway (FT2).

2.2 OUTLINE OF THE DEVELOPMENT PROJECT

2.2.1 **PNSB Acmar Sdn. Bhd** is desirous to develop Residential and Retails on a land area of 17.60 acres.

2.2.2 The Summary of development components are presented in **Table 2.1**.

Table 2.1: Summary of the Proposed Development Components

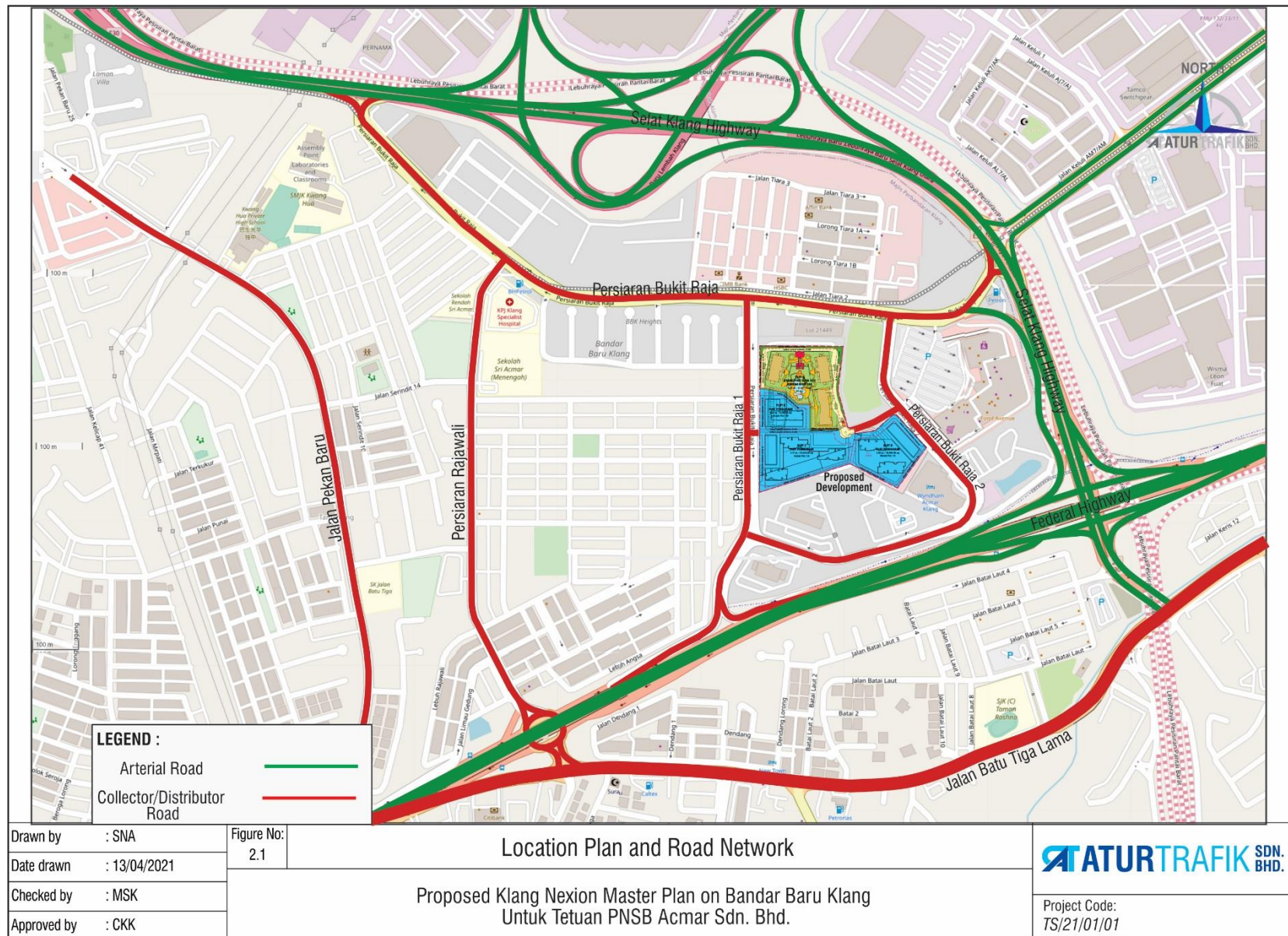
Plot	Land Use Component	Unit
A	Condominium	404
B	Service Apartment	480
C	Service Apartment	920
D	Service Apartment	600

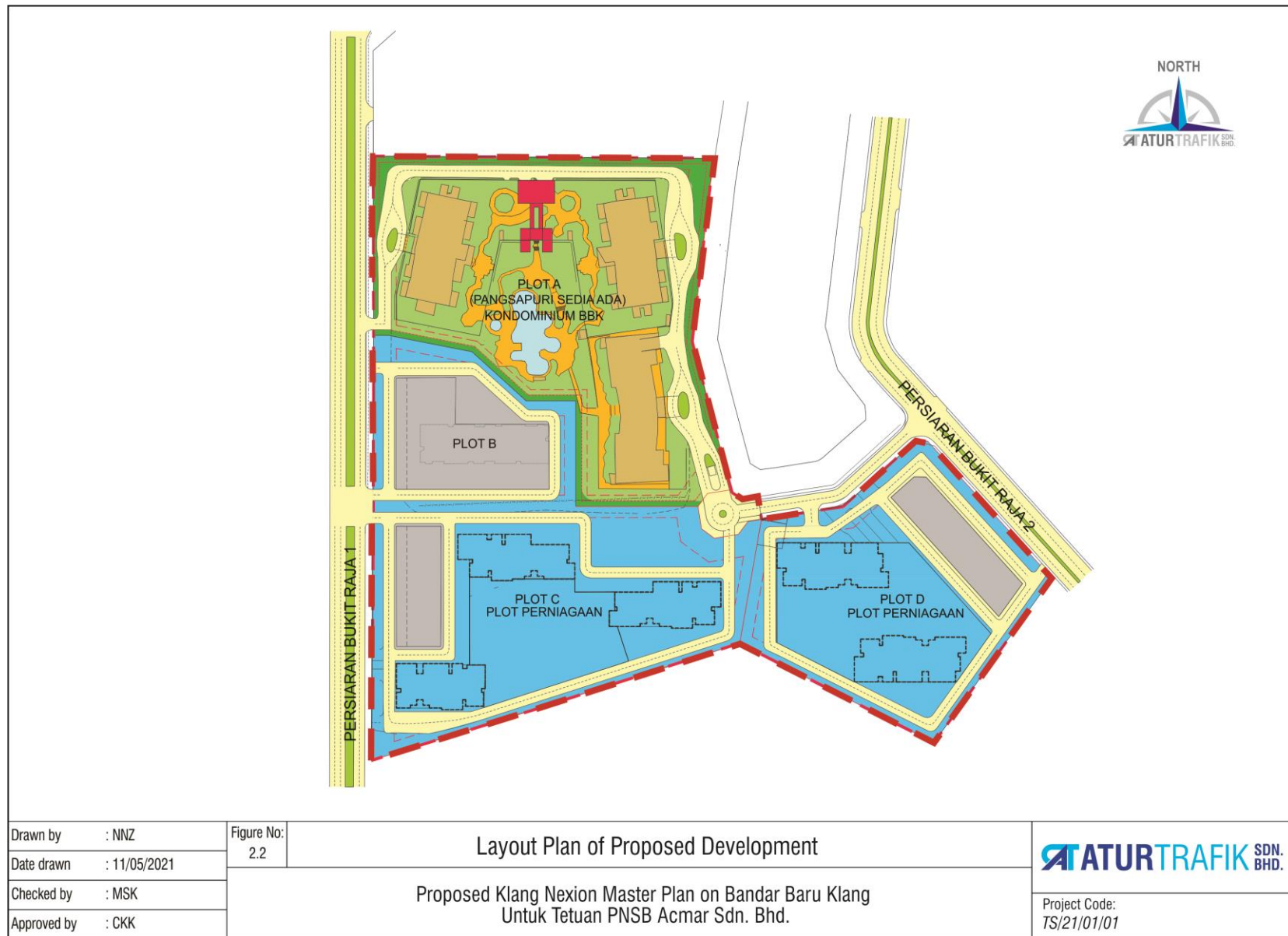
Source: Garis Arkitek

2.2.3 The Proposed Developments are expected to be developed in phases until year 2034 (Ultimate Completion).

2.2.4 **Figure 2.1** depicts Location Plan of the Proposed Development and road network.

2.2.5 **Figure 2.2** exhibits the Layout Plan of the Proposed Development.





3.0 EXISTING CONDITIONS

3.0.1 The travel demand to and from the vicinity of the Study Area are presently served by private vehicles running on a relatively well-developed urban road network and the comprehensive public transportation system comprising of buses.

3.1 EXISTING ROAD SYSTEM

3.1.1 The road network surrounding the Proposed Development site is shown in **Figure 2.1**. The major arterial roads serving the Study Area are Shapadu Highway and Federal Highway which is six lanes dual carriageway road while being supported with Persiaran Rajawali, Persiaran Bukit Raja, Persiaran Bukit Raja 1 and Persiaran Bukit Raja 2.

3.1.2 The characteristics of the roads within the vicinity of the Proposed Development is summarised in **Table 3.1**.

Table 3.1: Road Classification

Road Name	No. of Lanes	Road Classification	Direction
Shapadu Highway	6	Arterial	2-way
Federal Highway	6	Arterial	2-way
Persiaran Rajawali	2	Collector	2-way
Persiaran Bukit Raja	4	Collector	2-way
Persiaran Bukit Raja 1	4	Collector	2-way
Persiaran Bukit Raja 2	4	Collector	2-way

3.2 TRAFFIC SURVEY

3.2.1 A sixteen (16) hour screen line and peak hour junction turning movement count surveys were conducted to elucidate existing traffic flow situation and characteristics in the vicinity of the development area and to obtain some necessary planning parameters for estimating the future traffic demand.

3.2.2 Peak Hour Junction Turning Movement Surveys

a. Objectives

The objective of the screen line traffic count survey, which was carried out to obtain the existing flows on the road in order to ascertain the baseline capacity performance.

The objective of conducting the junction turning movement traffic count survey at the selected intersections are to obtain the existing flows on the approaches in order to ascertain the baseline junction capacity performance and to model the turning movement characteristics of vehicles at strategic intersection in the Study Area.

b. Method of Counting Survey

Traffic Volumes were manually counted. Each enumerator counts the number of vehicles entering the intersection according to vehicular types and the directional flows. Vehicles were classified under five (5) categories as follows:-

1. Car/Van/Taxi/Utility Vehicle
2. Medium Lorry
3. Heavy Lorry
4. Bus
5. Motorcycle

c. Period of Survey

The traffic survey was conducted on 07 April 2021 (Wednesday) which was a normal working day, in order to understand the normal daily commuter traffic situation. Accumulated traffic volumes were recorded in the data sheet at fifteen (15) minute intervals. The peak hour junction movement traffic surveys were carried out for a period of six (6) hours from 0700 hours to 1000 hours at AM Peak and continue from 1600 hours to 1900 hours at PM Peak for J4, J5, J6, J7, J10 and J11. For J1, J2, J3, J9 and J8 was taken sixteen (16) hours from 0600 hours to 2200 hours. The details of the traffic surveys conducted are summarized in **Table 3.2**.

Table 3.2: Types and Periods of Traffic Surveys Conducted at Intersections

No.	Location	Date	Day	Junction Type	Survey Type	Survey Period
1	J1	07/04/2021	Wednesday	Interchange	16-hours	0600-2200
2	J2	07/04/2021	Wednesday	Left-In Left-Out	16-hours	0600-2200
3	J3	07/04/2021	Wednesday	Left-In Left-Out	16-hours	0600-2200
4	J4	07/04/2021	Wednesday	Priority Junction	6-hours	0700-1000 & 1600-1900
5	J5	07/04/2021	Wednesday	Signalised Junction	6-hours	0700-1000 & 1600-1900
6	J6	07/04/2021	Wednesday	Signalised Junction	6-hours	0700-1000 & 1600-1900
7	J7	07/04/2021	Wednesday	Signalised Junction	6-hours	0700-1000 & 1600-1900
8	J8	07/04/2021	Wednesday	Roundabout	16-hours	0600-2200
9	J9	07/04/2021	Wednesday	Left-In Left-Out	16-hours	0600-2200
10	J10	07/04/2021	Wednesday	Priority Junction	6-hours	0700-1000 & 1600-1900
11	J11	07/04/2021	Wednesday	Priority Junction	6-hours	0700-1000 & 1600-1900

J=Junction

d. Survey Location

3.2.1.5 The survey locations comprising of eleven (11) location of junction (J) turning movement surveys and eight (8) screenline locations (SL) are summarised in **Table 3.3** and depicted in **Figure 3.1**.

Table 3.3: Selected Junction and Screenline Location

Junction Location		Screenline Location	
No	Location	No	Location
J1	Shapadu Highway/Federal Highway	SL1	Shapadu Highway
J2	Shapadu Highway/Persiaran Bukit Raja	SL2	Federal Highway
J3	Shapadu Highway/Persiaran Bukit Raja	SL3	Persiaran Bukit Raja 1/Federal Highway
J4	Persiaran Bukit Raja/Jalan Serindit 17	SL4	Persiaran Bukit Raja 1
J5	Persiaran Bukit Raja/Persiaran Rajawali	SL5	Persiaran Bukit Raja 1
J6	Persiaran Bukit Raja/ Persiaran Bukit Raja 1	SL6	Persiaran Bukit Raja
J7	Persiaran Bukit Raja/ Persiaran Bukit Raja 2	SL7	Persiaran Bukit Raja
J8	Persiaran Bukit Raja 1/Persiaran Rajawali/Federal Highway	SL8	Persiaran Bukit Raja
J9	Persiaran Bukit Raja/Federal Highway		
J10	Persiaran Bukit Raja 1/Proposed Development		
J11	Persiaran Bukit Raja 2/ Proposed Development		

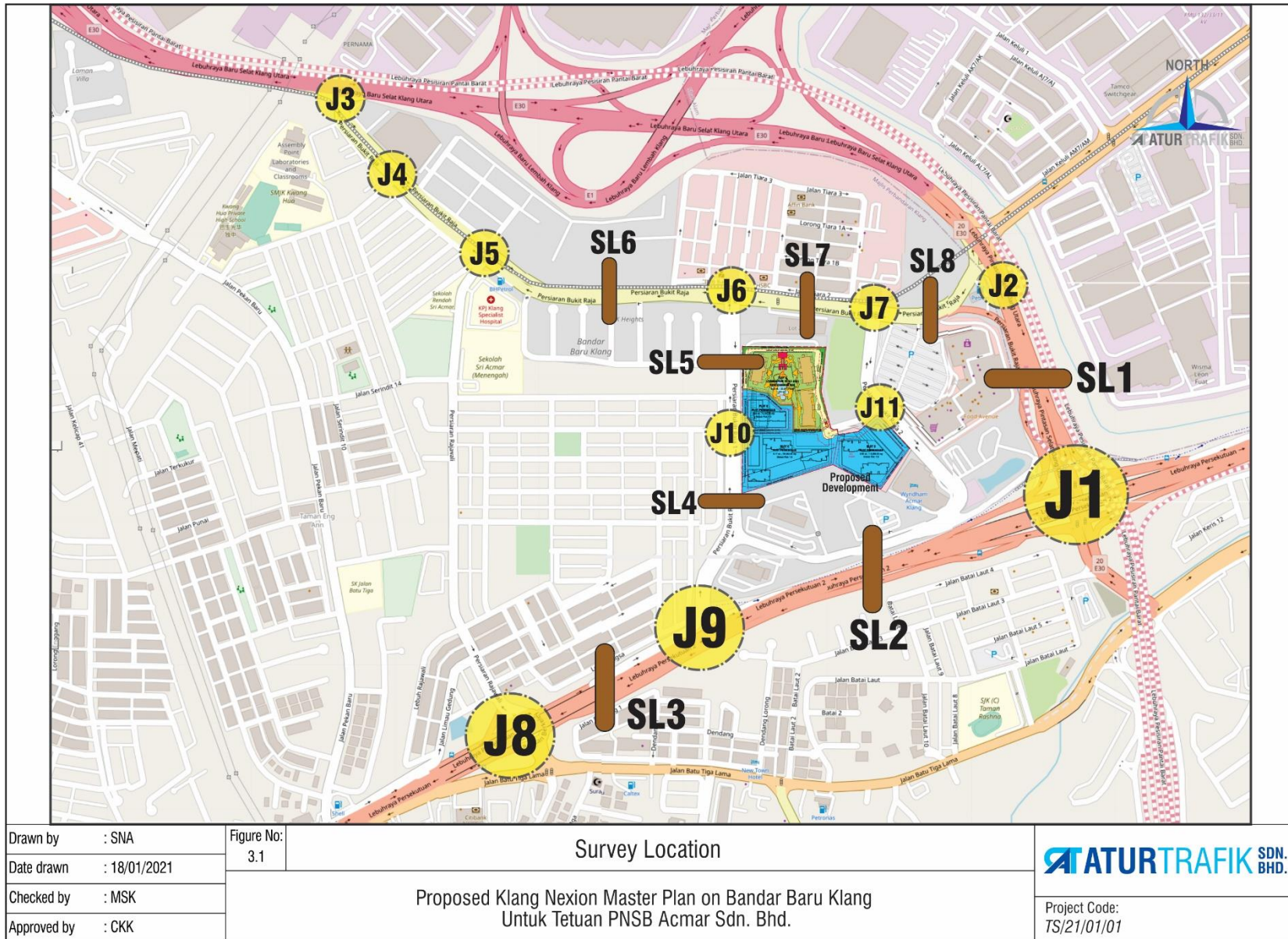
3.3 PCU CONVERSION FACTOR

3.3.1 The traffic survey data is reported in Passenger Car equivalent Units (PCU). The Vehicle to PCU conversion factor is used to convert the vehicular units into the Passenger Car equivalent Units. The Vehicle to PCU conversion factors are listed in **Table 3.4**.

Table 3.4: Conversion Factors to PCU (Junction Turning Movement)

Equivalent Value in PCU				
Type of Vehicle	Two Lane Highways	Multilane Highways	Expressways	Traffic Signal Design
Passenger Car	1.00	1.00	1.00	1.00
Lorries (with 2 axles)/Large Vans	1.44	1.58	1.47	1.19
Large Lorry, Trailers, Heavy Vehicles (with 3 axles and more)	1.83	1.76	1.95	2.27
Buses	1.93	1.65	1.66	2.08
Motorcycle	0.96	0.84	0.63	0.22

Source: Highway Planning Unit, Ministry of Works, Malaysia



3.4 TRAFFIC CHARACTERISTICS

3.4.1 Volume Profile

3.4.1.1 Peak Hours represents the highest traffic volume at certain road sections or intersection during morning and afternoon rush hours. The peak hour traffic volumes for all surveyed junctions were obtained by plotting the graph of traffic volume (in PCU/Hr) versus time of the day to exhibit the hourly pattern for traffic flows.

3.4.1.2 The Volume Profile is depicted in **Figure 3.2**. From the profile we can differentiate the hike of traffic volume during morning and evening peak period which is essential for the traffic analysis.

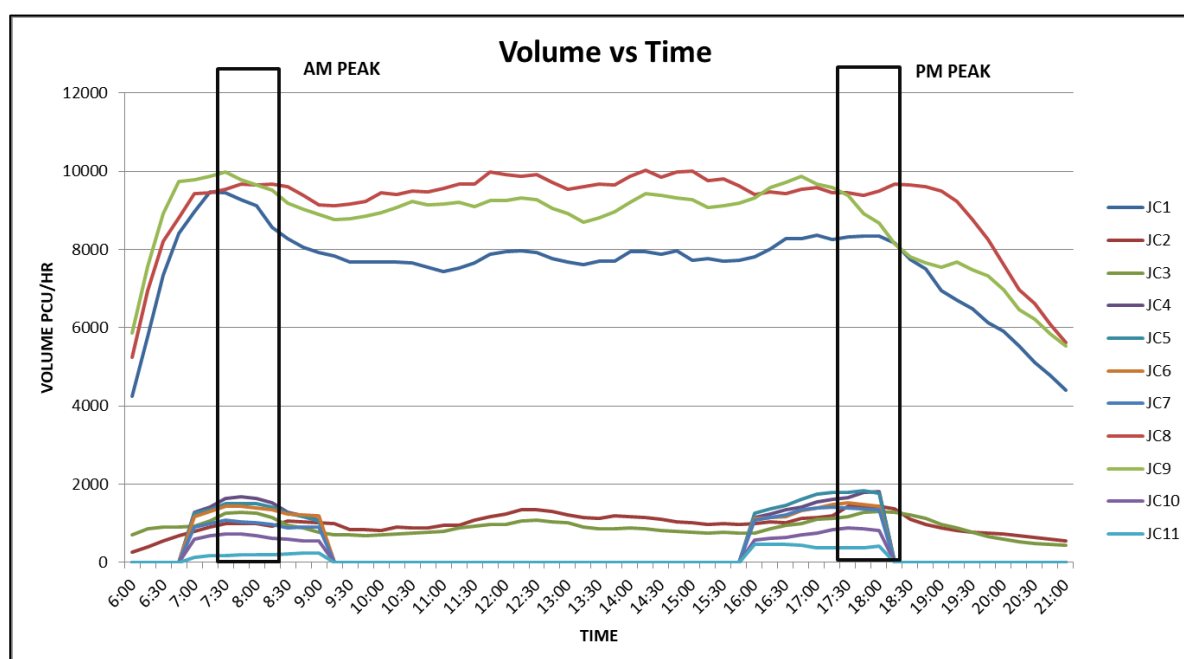


Figure 3.2: Pattern of Hourly Flow for selected section (volume in PCU/Hr versus Time)

3.4.1.3 From the volume profile, it is observed that the AM Peak Hour is from **0730 to 0830** hours while PM Peak Hour is from **1730 to 1830** hours.

3.4.2 Traffic Volume

3.4.2.1 There are two peak hours selected for traffic analyses; AM Peak and PM Peak. The AM and PM peak hours are defined by the busiest hour in the morning and in the evening, respectively. The selections were done according to the highest traffic volume.

3.4.2.2 **Figure 3.3** shows the traffic volumes identified during the traffic survey PCU/Hr conducted, for the morning and evening peak hours, respectively.

3.4.3 Screenline Location

3.4.3.1 **Table 3.5** shows the summary of the observed AM Peak and PM Peak screenline survey location during peak hours from 0730-0830 hours and 1730-1830 hours for the AM Peak and PM Peak hour where '**Segment a**' is northbound or eastbound direction; and '**segment b**' is southbound or westbound direction, where applicable (see **Figure 3.1**).

Table 3.5: Summary of the Screenline Survey Volume

Location	Approaches	AM Peak (PCU)/Hr	PM Peak (PCU)/Hr
SL1a	Shapadu Highway (N)/J3	4,157	4,793
SL1b	Shapadu Highway (S)/J1	4,995	3,946
SL2a	Federal Highway (E)/J1	5,706	4,727
SL2b	Federal Highway (W)/J8	3,846	4,335
SL3a	Persiaran Bukit Raja 1 (E)/J9	2,519	2,695
SL3b	Exit from Federal Highway (E)/J8	3,080	2,557
SL4a	Persiaran Bukit Raja 1 (N)/J10	400	309
SL4b	Persiaran Bukit Raja 1 (S)/J9	276	293
SL5a	Persiaran Bukit Raja 1 (N)/J6	418	508
SL5b	Persiaran Bukit Raja 1 (S)/J10	239	447
SL6a	Persiaran Bukit Raja 1 (E)/J6	488	495
SL6b	Persiaran Bukit Raja 1 (W)/J5	223	435
SL7a	Persiaran Bukit Raja 1 (E)/J7	986	639
SL7b	Persiaran Bukit Raja 1 (W)/J6	316	659
SL8a	Persiaran Bukit Raja 1 (E)/J2	614	623
SL8b	Persiaran Bukit Raja 1 (W)/J7	363	441

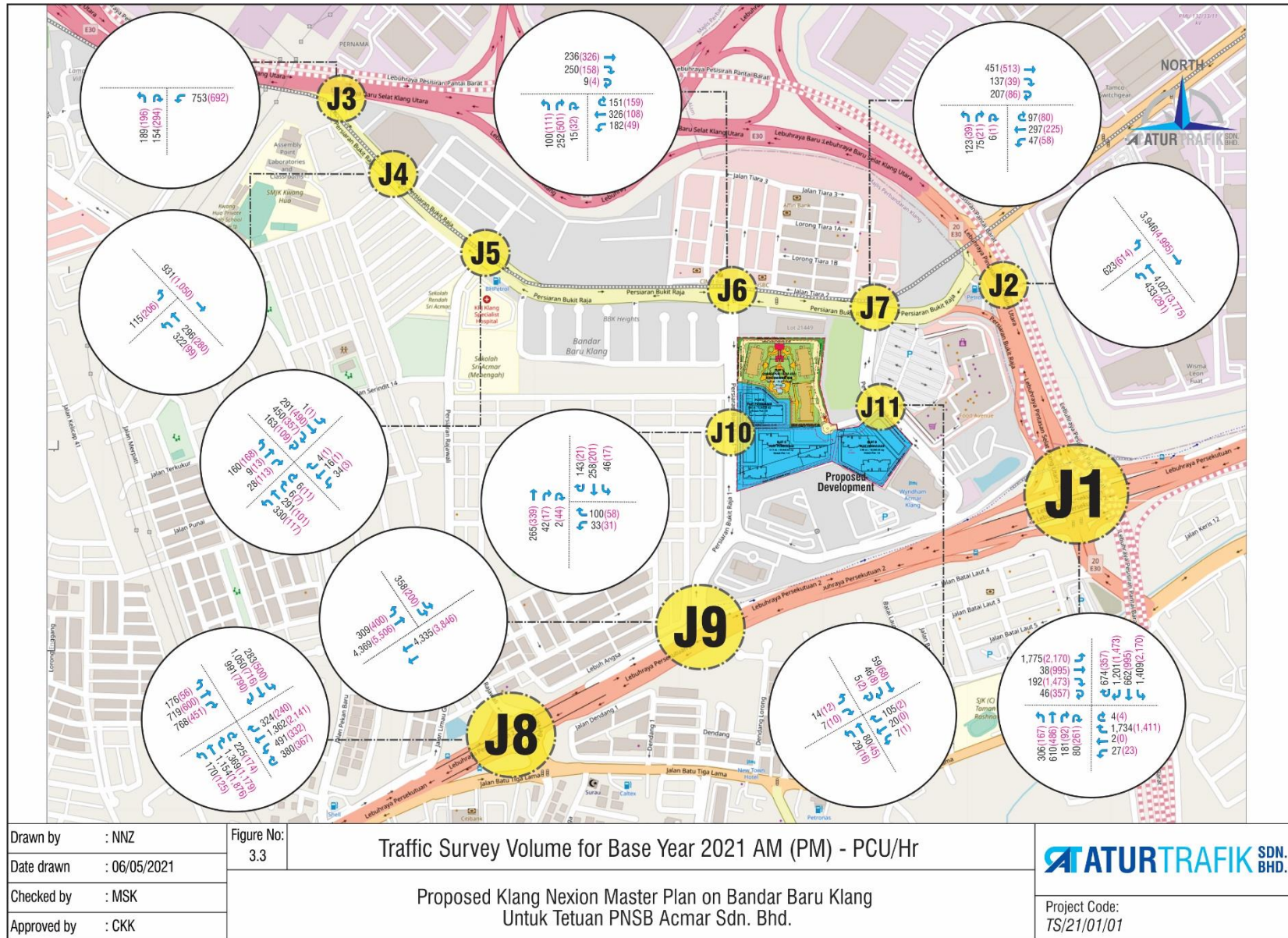
3.4.3.2 The AM Peak Hour traffic volume at the screenline location shows the highest value of 5,706 PCU/hour at SL2a Federal Highway (Eastbound). For PM Peak we noticed that Shapadu Highway (northbound) have the highest value which is 4,793 PCU/hour.

3.4.4 Average Traffic Composition

3.4.4.1 **Table 3.6** shows the summary of average traffic composition at the observed intersections. Cars are still the highest traffic compositor at 65.3% to 82.9% seconded with motorcycles with at most 31.7% composition. Bus composition is less than 1% at all locations during both AM and PM Peak Hours.

Table 3.6: Average Peak Hour Traffic Composition at Intersection (Unit: %)

Location	Period	Car, Taxi, Van	Medium Lorry	Heavy Lorry	Bus	Motorcycle
J1	AM Peak	65.3	2.2	0.5	0.3	31.7
	PM Peak	67.9	3.8	1.3	0.2	26.9
J2	AM Peak	77.2	3.1	1.1	0.4	18.3
	PM Peak	83.1	1.2	0.2	0.2	15.3
J3	AM Peak	77.3	1.0	0.0	0.1	21.5
	PM Peak	79.7	1.5	0.2	0.2	18.5
J4	AM Peak	78.0	0.8	0.0	0.1	21.0
	PM Peak	80.3	1.4	0.1	0.2	17.9
J5	AM Peak	73.3	0.7	0.2	0.3	25.5
	PM Peak	77.8	1.2	0.5	0.2	20.3
J6	AM Peak	79.8	1.2	0.2	0.1	18.7
	PM Peak	82.2	1.5	0.3	0.1	16.0
J7	AM Peak	77.0	2.1	0.2	0.3	20.5
	PM Peak	81.0	0.9	0.1	0.1	18.0
J8	AM Peak	74.3	1.8	0.4	0.2	23.3
	PM Peak	80.6	2.2	0.3	0.2	16.6
J9	AM Peak	67.4	1.1	0.3	0.4	30.8
	PM Peak	74.9	2.5	0.4	0.3	21.9
J10	AM Peak	74.9	1.2	0.1	0.3	23.4
	PM Peak	83.1	1.0	0.5	0.0	15.4
J11	AM Peak	75.0	2.5	0.0	0.0	22.5
	PM Peak	82.9	1.1	0.0	0.2	15.8



3.5 OPERATIONAL LEVEL OF SERVICES (LOS)

3.5.1 The operational conditions of the roadways are based on the level of service (LOS) concept, by giving a letter designation from A to F, with level of service A representing the best operating conditions and level of service F, the worst. The level of service concept can be simplified into the volume of traffic flows to the capacity ratio (V/C) of a given stretch of road. **Table 3.7** illustrates the ranges of v/c ratio consistent with the Levels of Service.

Table 3.7: Level of Service

Level of Service	Status	Remarks
A	Free Flow	Individual users virtually unaffected by the presence of others vehicle in the traffic stream. This is a condition of free flow with low volume and high speed of vehicle travel on the highways
B	Stable Flow	High degree of freedom to select speed and operating condition but with some influence from the other users.
C	Restricted Flow	Flow remains stable but with significant interaction with others in the traffic stream. The general level of comfort and convenience decline noticeable at this level. Speed and manoeuvrability are closely controlled by the higher volume. Most of the drivers are restricted in their freedom to select their own speed, change lane or pass.
D	High-density Flow	Speed and freedom to manoeuvre are severely restricted and comfort and convenience have decline even though flow remain stable. This level represent unstable flow with operating speed are being maintain, though considerably affected by changes in operating condition.
E	Unstable Flow	Near capacity levels with poor levels of comfort and convenience. This level represents operating at lower operating speed with volume with at or near the capacity of the highways. Flow is unstable and stoppage may occur for a momentary duration.
F	Forced Flow	The amount of traffic approaching a point exceeds the amount that can be served. LOS F is characterizing by poor time travel, low comfort, convenience, and increase accident exposure. This condition describes a force flow operation at low speed where volume is below the capacity. Speed is reduced substantially, and stoppage may occur for short or long periods of time because of the downstream condition.

Source: *Highway Capacity Manual Malaysia 2011.*

3.5.2 To obtain the V/C ratio for the present level of service, the capacity of the roadways is calculated based on several factors such as the gradient of the road, number of traffic lanes (width), adjacent interruption of traffic flow (signalised junction), etc. The principal objective of capacity analysis is the estimation of the maximum amount of traffic that can be accommodated by various sections of the road.

3.6 EVALUATION OF THE CAPACITY OF EXISTING ROAD SECTION

3.6.1 The adequacy of the existing road section within the vicinity of the Proposed Development was determined by the current traffic volume and the carrying capacity of the road sections. The capacity of the road network within the vicinity of the Proposed Development was based upon Methodology set upon by Highway Capacity Manual. The capacity of the road is taken at 2,000 PCU/hr/lane for Shapadu Highway and Federal Highway and 1,800 PCU/hr/lane for Persiaran Bukit Raja and Persiaran Bukit Raja 1.

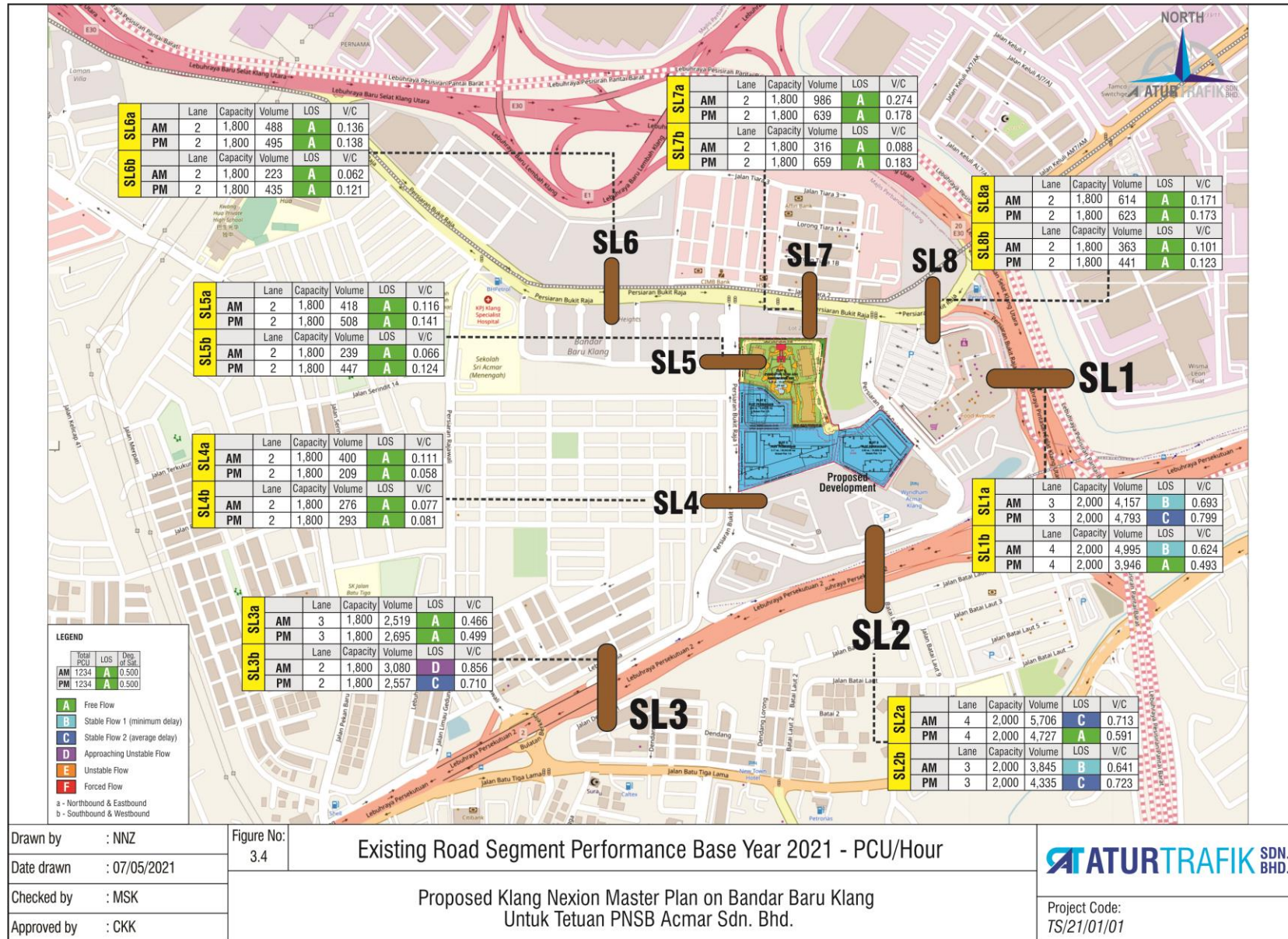
3.7 EVALUATION OF THE PERFORMANCE OF EXISTING ROAD SECTION

3.7.1 The adequacy of the existing road section within the vicinity of the Proposed Development was determined by the current traffic volume and the carrying road section capacity. **Table 3.8** and **Figure 3.4** shows the existing road section (screen line) performance of road.

Table 3.8: Summary of the Existing Screen Line Performance

No.	Link	Location	No. of Lanes	Capacity/ Hr/Lane	AM			PM		
					Vol	V/c	LOS	Vol	V/c	LOS
1	L1a	Shapadu	3	2,000	4,157	0.693	B	4,793	0.799	C
2	L1b	Highway	4	2,000	4,995	0.624	B	3,946	0.493	A
3	L2a	Federal	4	2,000	5,706	0.713	C	4,727	0.591	A
4	L2b	Highway	3	2,000	3,845	0.641	B	4,335	0.723	C
5	L3a	Persiaran	3	1,800	2,519	0.466	A	2,695	0.499	A
6	L3b	Bukit Raja 1	2	1,800	3,080	0.856	D	2,557	0.710	C
7	L4a	Persiaran	2	1,800	400	0.111	A	209	0.058	A
8	L4b	Bukit Raja 1	2	1,800	276	0.077	A	293	0.081	A
9	L5a	Persiaran	2	1,800	418	0.116	A	508	0.141	A
10	L5b	Bukit Raja 1	2	1,800	239	0.066	A	447	0.124	A
11	L6a	Persiaran	2	1,800	488	0.136	A	495	0.138	A
12	L6b	Bukit Raja	2	1,800	223	0.062	A	435	0.121	A
13	L7a	Persiaran	2	1,800	986	0.274	A	639	0.178	A
14	L7b	Bukit Raja	2	1,800	316	0.088	A	659	0.183	A
15	L8a	Persiaran	2	1,800	614	0.171	A	623	0.173	A
16	L8b	Bukit Raja	2	1,800	363	0.101	A	441	0.123	A

3.7.2 From the Volume/Capacity analysis of the observed road sections, the level of service LOS A was estimated for both peak hours for all road section except SL1, SL2 and SL3 that show level of service LOS B, LOS C and LOS D. This implies that Persiaran Bukit Raja and Persiaran Bukit Raja 1 are basically functioning well as a 2 to 3-lane dual carriageway.



3.8 EVALUATION OF THE INTERSECTION PERFORMANCE

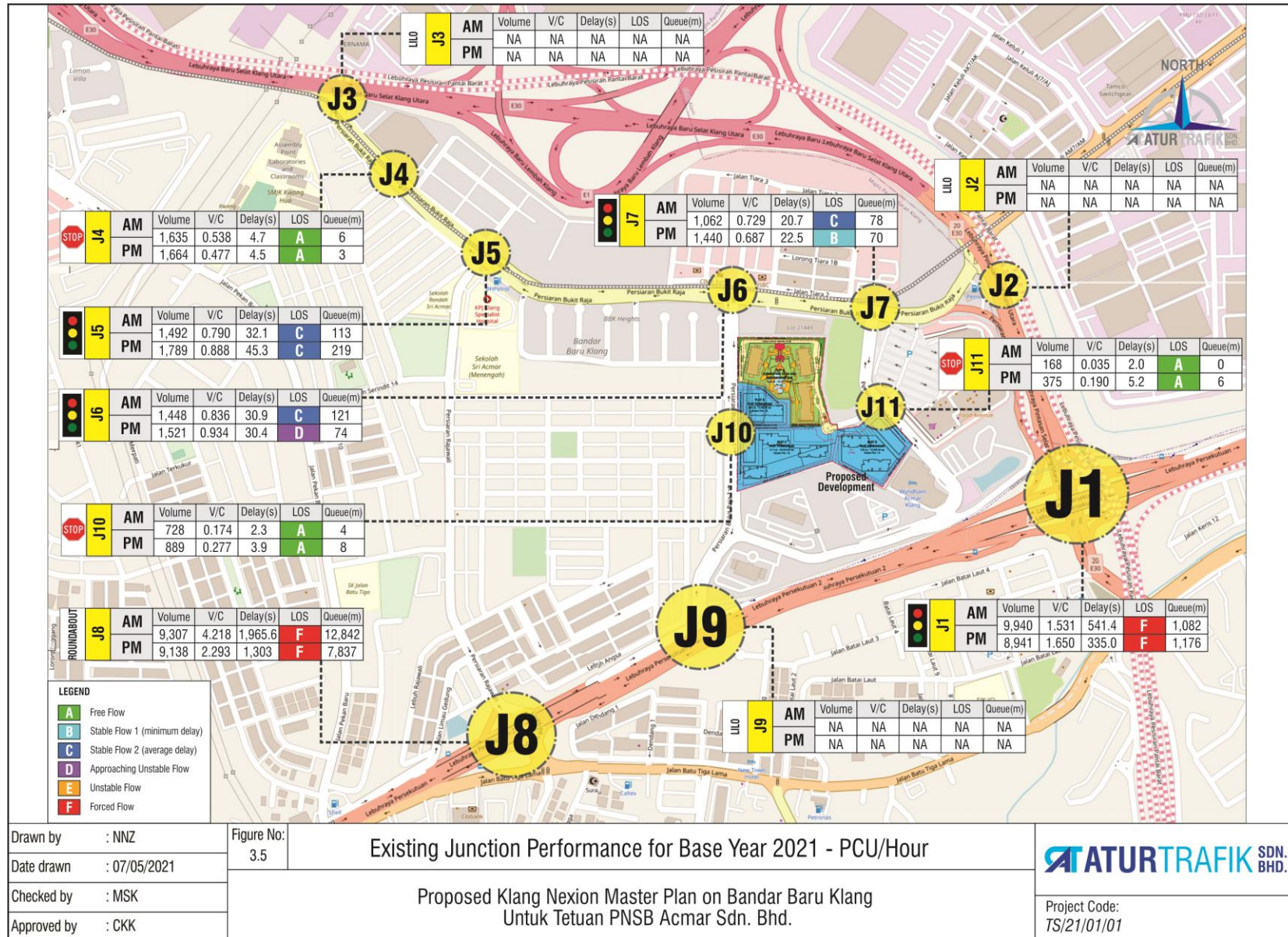
3.8.1 Intersection or junction analysis is different from road section analysis where road sections analysis test the adequacy of road capacity in terms of number of lanes, meanwhile intersection analysis test the adequacy of number of lanes (including storage lanes) as well as turning movement delay (signalised or unsignalized) based on intersection configuration and peak hour turning volume.

3.8.2 The performance of the Intersections during the AM Peak and PM Peak was analysed using SIDRA 9, a Traffic Engineering Software and the summary of the performance is shown in **Table 3.9** and depicted in **Figure 3.5**.

Table 3.9: Summary of the Intersection Performance

Scenario	Junction Type	Junction ID	Period	Volume	Degree of Saturation	Average Delay (s)	LOS	Queue Length (m)
Base Year 2021	Signalized Interchange	J1	AM	9,940	1.531	541.4	F	1,082
			PM	8,941	1.650	335.0	F	1,176
	Left-In Left- Out	J2	AM	No junction analysis for Left-In/Left-Out junction				
			PM					
	Left-In Left- Out	J3	AM	No junction analysis for Left-In/Left-Out junction				
			PM					
	3-Legged Unsignalised	J4	AM	1,635	0.538	4.7	A	6
			PM	1,664	0.477	4.5	A	3
	4-Legged Signalised	J5	AM	1,492	0.790	32.1	C	113
			PM	1,789	0.888	45.3	C	219
	3-Legged Signalised	J6	AM	1,448	0.836	30.9	C	121
			PM	1,521	0.934	30.4	D	74
	3-Legged Signalised	J7	AM	1,062	0.729	20.7	C	78
			PM	1,440	0.687	22.5	B	70
	Roundabout	J8	AM	9,307	4.218	1,965.6	F	12,842
			PM	9,138	2.293	1,303	F	7,837
	Left-In Left- Out	J9	AM	No junction analysis for Left-In/Left-Out junction				
			PM					
	3-Legged Unsignalised	J10	AM	728	0.174	2.3	A	4
			PM	889	0.277	3.9	A	8
	4-Legged Unsignalised	J11	AM	168	0.035	2.0	A	0
			PM	375	0.190	5.2	A	6

- 3.8.3 Based on the Intersection Performance analysis, we found that all junctions are performing at satisfactory levels of services during peak hours except for J1 (Interchange) and J8 (roundabout). In the future, J1 is expected to be upgraded in order to mitigate the traffic issue.
- 3.8.4 In **Chapter 6**, we will include future traffic into the existing road network to simulate the road conditions, hence propose recommendation to improve the levels of services in the vicinity of the Proposed Development.



4.0 TRAFFIC DEMAND FORECASTING

4.1 GENERAL

4.1.1 This chapter describes the traffic demand forecasting methodology and assumptions used for this study. Adopted trip generation and attraction rates were applied to the respective buildings and facilities described in the physical layout plan to forecast the traffic demand for the Proposed Development. This methodology is illustrated by a flowchart in **Figure 4.1**.

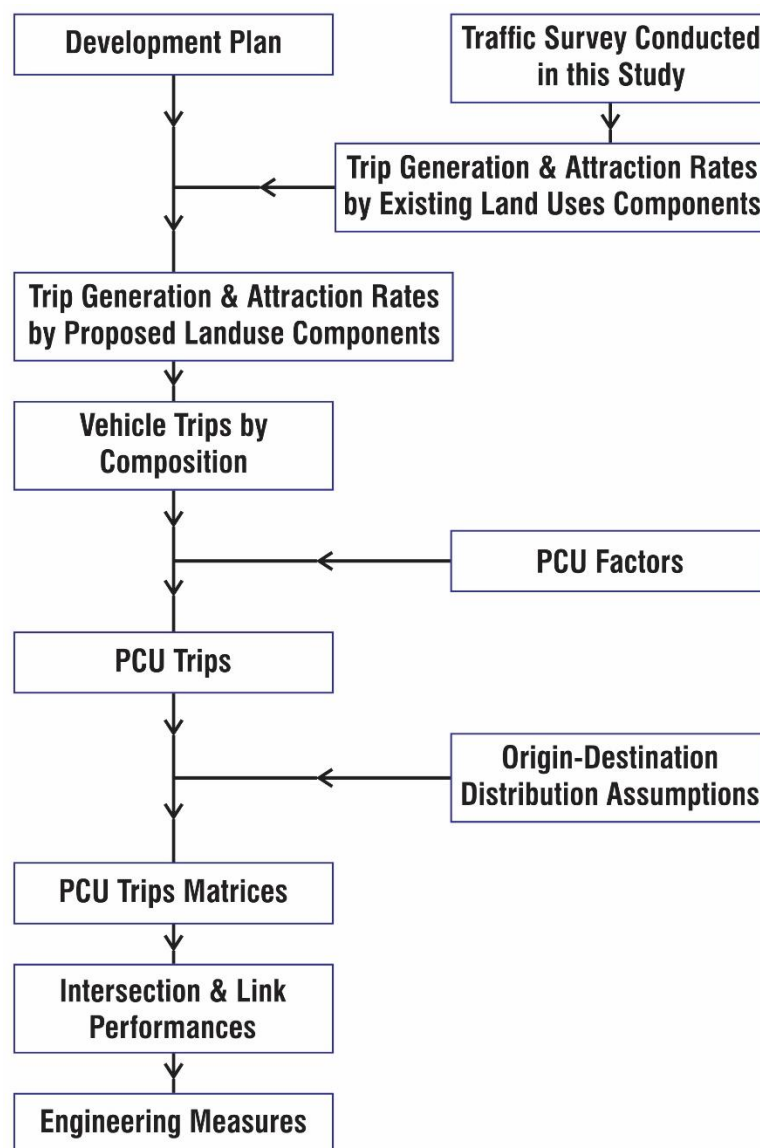


Figure 4.1: Methodology Flowchart for the Traffic Demand Forecasting

- 4.1.2 The future year traffic assessment would be based on the potential land use and the road network updates identified through the assessment of committed and planned development in both land use and transportation infrastructure within the Project Study Area. The forecast for a 3-year period from 2021 is adopted for analysis in this report, with the predicted completion year for this Proposed Development in 2024 for Bandar Baru Klang Condominium.

4.2 PRESUMPTIONS FOR TRAFFIC DEMAND FORECASTING

- 4.2.1 The following presumptions were made in order to forecast traffic demand generated and attracted within the Study Area:
- The scale of buildings and facilities in the Proposed Development is as outlined in Chapter 2.
 - Trip Generation/Attraction rates, ingress/egress split and vehicle composition from the "Trip Generation Manual, 2010" published by the Highway Planning Unit (HPU) were assumed to be applicable to the Proposed Development.
 - The completion of the proposed development is expected to be in full completion by Year 2024.
 - Future traffic generation from areas outside the development's study area is based on the current traffic growth on the existing road network (RTVM 2019)

4.3 TRIP GENERATION RATES

- 4.3.1 The trip rates published by HPU, Ministry of Works have been adopted for the computation of the Trip Generation and Attraction Rates for the Proposed Development.
- 4.3.2 **Table 4.1** shows a variety of minimum Trip Generation rates, average rates, and maximum rates from the Trip Generation Manual 2010 utilized for the traffic demand generated/attracted by the Proposed Development.

Table 4.1: Trip Generation Rates

Land use Components	Unit	AM Peak			PM Peak		
		Min.	Avg.	Max.	Min.	Avg.	Max.
Condominium/Service Apartment	DU	0.13	0.48	1.03	0.08	0.45	1.26

Sources: Trip Generation Rates Highway Planning Unit, Ministry of Works (2010)

Note: DU=Dwelling Unit; TSF=Thousand Square Feet; OR=Occupied Room

4.4 INGRESS /EGRESS SPLIT

4.4.1 The Ingress/egress Split for both AM and PM Peak Hour are shown in **Table 4.2** for each of the development components.

Table 4.2: Ingress/Egress Split (%)

Land use Components	AM Peak		PM Peak	
	In	Out	In	Out
Condominium/Service Apartment	27	73	63	37

Sources: Trip Generation Rates Highway Planning Unit, Ministry of Works (2010) & ITE Ingress/Egress Split for Convention Centre

4.5 VEHICLE COMPOSITION

The vehicle composition based upon the Trip generation and attraction for each of the development component is shown in **Table 4.3**.

Table 4.3: Vehicle Composition (%)

Component	Period	Car /Taxi	Motorcycles	Small Lorry	Heavy Lorry	Bus
Condominium/Service Apartment	AM Peak	71.58	21.75	5.57	0.05	1.05
	PM Peak	71.35	23.40	4.81	0.00	0.44

Sources: Trip Generation Rates Highway Planning Unit, Ministry of Works (2010)

4.6 TRIP GENERATION OF THE PROPOSED DEVELOPMENT

4.6.1 **Table 4.4** shows the summary of AM Peak and PM Peak Total Vehicle generated and attracted to/from the Proposed Development according to HPU Trip Generation Manual 2010 with a total **1,050 PCU Trips/Hour** during AM Peak and **952 PCU Trips/Hour** during PM Peak hour.

Table 4.4: Trip Generation/Attraction for Proposed Development (Raw)

Component	Units/ TSF	Generated and Attracted Trips (PCU/hr)					
		AM Peak			PM Peak		
		In	Out	Total	In	Out	Total
PLOT A: Condominium	404 Units	48	129	176	101	59	160
PLOT B: Service Apartment	480 Units	57	153	210	120	70	190
PLOT C: Service Apartment	920 Units	109	293	402	230	135	364
PLOT D: Service Apartment	600 Units	71	191	262	150	88	238
Total		284	767	1,050	600	352	952

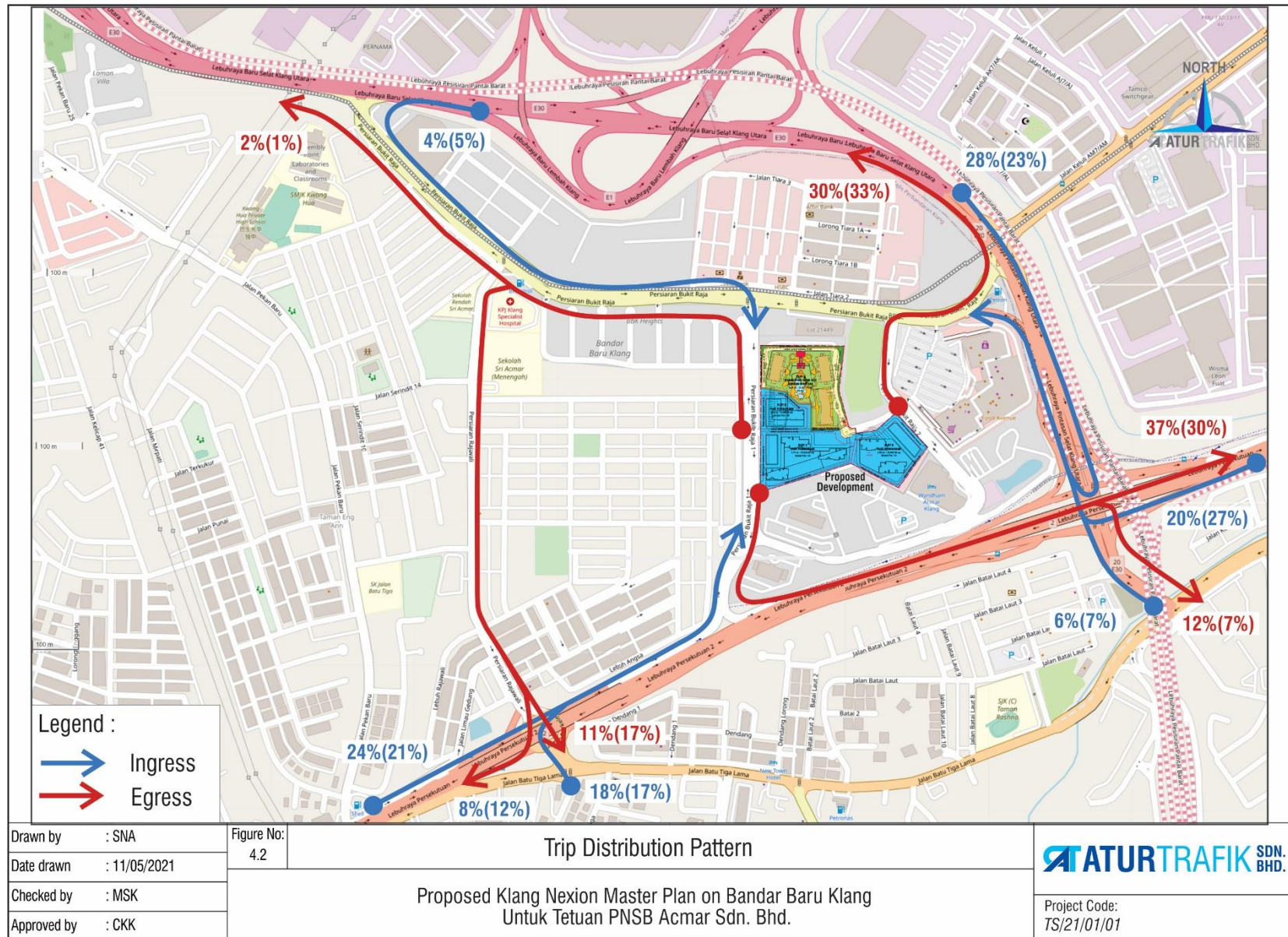
4.7 TRIP DISTRIBUTION

4.7.1 The trip distribution is based upon the result of the traffic survey. Adjustment and modification are made to reflect the changing land use pattern within the vicinity of the Proposed Development.

4.7.2 The external trip distribution for the Proposed Development is summarized in **Table 4.5** and depicted in **Figure 4.2** for future year, respectively.

Table 4.5: Trip Distribution Pattern

Location	AM Peak		PM Peak	
	In	Out	In	Out
Shapadu Highway (East)	4%	2%	5%	1%
Shapadu Highway (North)	28%	30%	23%	33%
Federal Highway (West)	24%	8%	21%	12%
Federal Highway (East)	20%	37%	27%	30%
Jalan Pelangi (South)	18%	11%	17%	17%
Jalan Batu Tiga Lama (South)	6%	12%	7%	7%



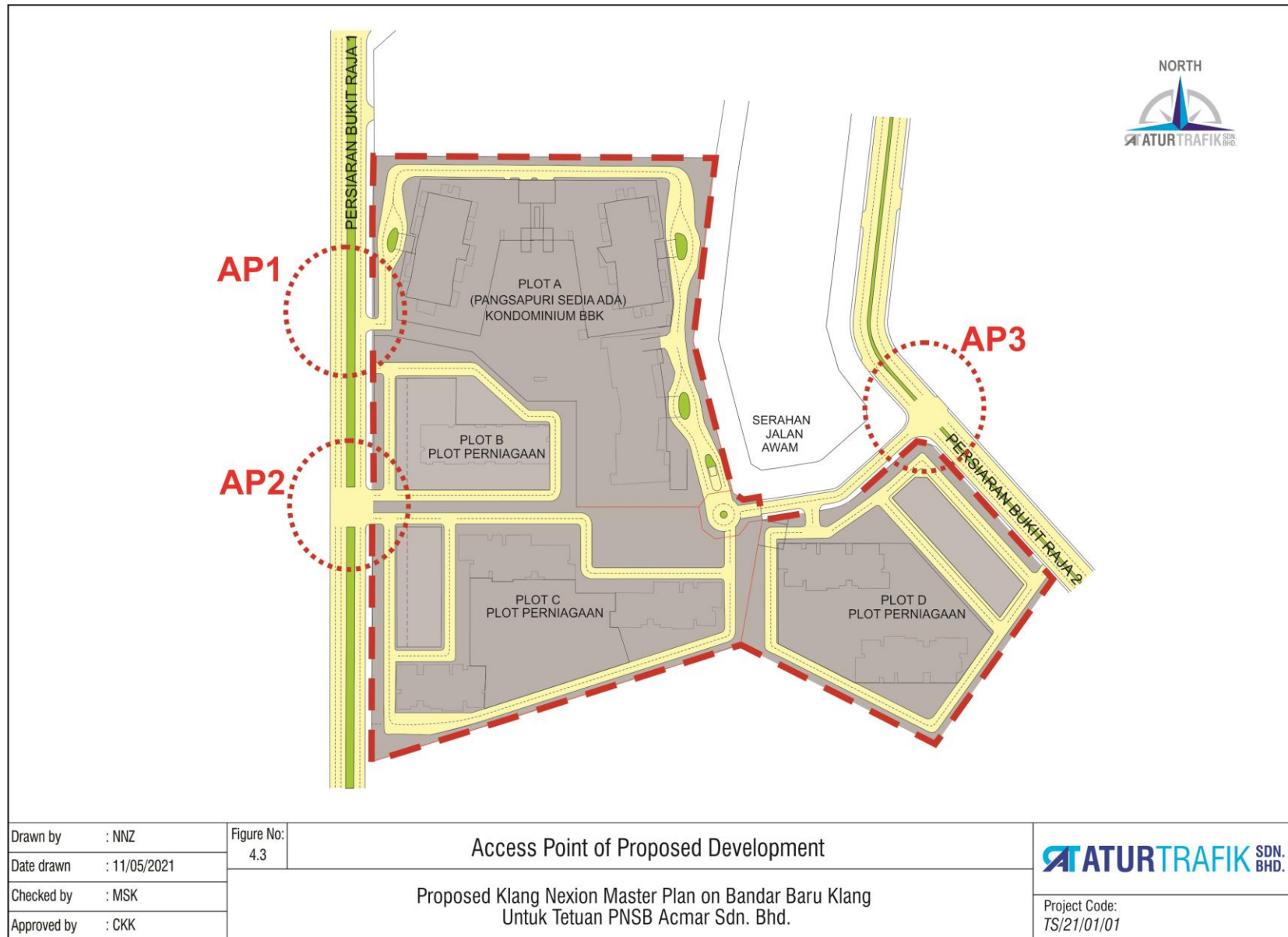
4.8 ACCESS ARRANGEMENT

4.8.1 The likely origin and destinations of traffic entering and exiting the Proposed Development have been assumed using Persiaran Bukit Raja 1 and Persiaran Bukit Raja 2 as main access.

4.8.2 A total of **three (3) access** points has been allocated for the Proposed Development accessibility.

- i. Persiaran Bukit Raja 1 (Left-In Left-Out access point) AP1.
- ii. Persiaran Bukit Raja 1 (J10) AP2.
- iii. Persiaran Bukit Raja 2 (J11) AP3.

4.8.5 **Figure 4.3** depicted the access points to the Proposed Development.



5.0 PUBLIC TRANSPORTATION SYSTEM IMPACT STUDY

5.1 GENERAL

5.1.1 Travel demand to and from the vicinity of the Proposed Development Area are presently served by private vehicles and public transportation system running on relatively well-developed road based public transportation system.

5.1.2 Facilities for the road based public transportation system are available along the Persiaran Bukit Raja, Persiaran Bukit Raja 1 and Persiaran Bukit Raja 2.

5.2 CURRENT ROAD-BASED PUBLIC TRANSPORTATION SYSTEM

5.2.1 The present bus services provided by “Bas Smart Selangorku” are KLG2B Hentian Klang – Klang Parade. **Figure 5.1** shows the bus routes at Proposed Development area.

5.2.2 The nearest bus stop to the proposed development site is located at BBK Condominium and Klang Executive Club. This bus stop serves the bus going to Hentian Klang.

5.2.3 The bus operating time from 6:00 am to 10:00 pm with frequency of 30 minutes. Bus service is provided every day with same route and time. **Table 5.1** and **Table 5.2** shows the bus route and schedule, respectively.

Table 5.1 Bus Service Route

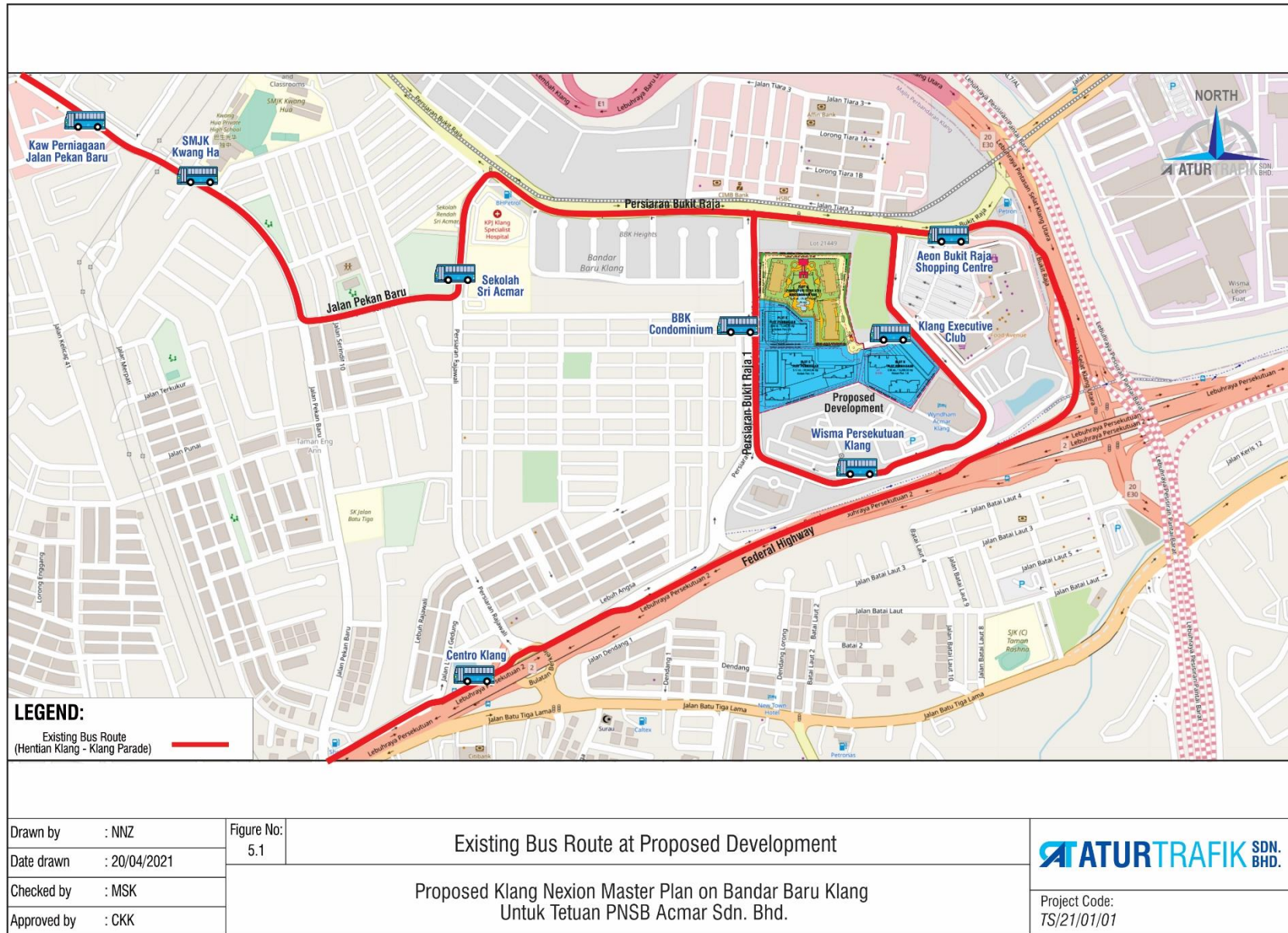
Bus No.	Origin	Route	Destination
KLG2B	Hentian Klang	SRJK Kong Hoe – Hentian Klang – Jejantas Kota Lama – Klang City Square – Masjid Bandar Diraja Klang Utama – Goldcourse Shopping Mall – SMJK Pin Hwa – Pusat Bandar Klang – entro Klang – Aeon Bukit Raja – BBK Condominium – Wisma Persekutuan Klang – Pusat Kegiatan Mayarakat – Klang Executive Club – Sekolah Sri Acmar – SMJK Kwang Hwa – Kawasan Perniagaan Jalan Pekan Baru – Taman Bunga Melor – Pasar Besar Klang – Kampung Batu Belah (Selatan) – Kampung Batu Belah (Utara) – Taman Sri Pekan – Mutiara Bukit Raja – Pasar besar Klang – Klang Parade – SK Jalan Meru 1&2	Klang Parade

Source: Bas Selangorku

Table 5.2 Bus Schedule

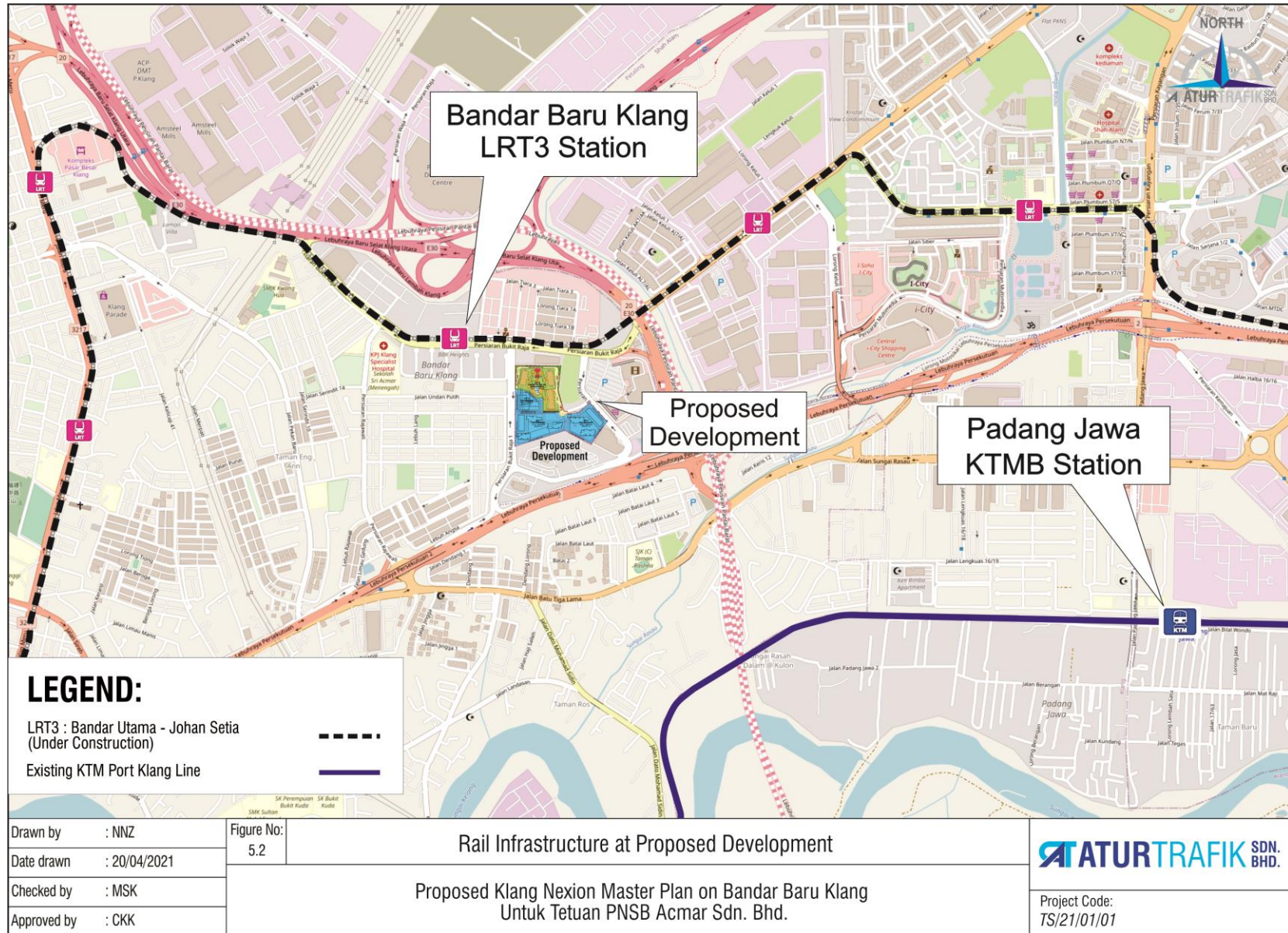
Operating Hour Peak and Off-Peak Period	Weekdays	Saturday	Sunday & Public Holiday
First Bus	6:00 am	6:00 am	6:00 am
Last Bus	10:00 pm	10:00 pm	10:00 pm

Source: Bas Selangorku



5.3 RAIL-BASED PUBLIC TRANSPORTATION SYSTEM

- 5.3.1 The current rail services nearby the Proposed Development area is provided by KTM Berhad. The nearest KTM Station is at Padang Jawa which is about 4 kilometers away and it takes 10 minutes to travel between this station and the Proposed Development area by car.
- 5.3.2 The new LRT3 line is expected to be completed by Year 2024. The 37-kilometer length LRT Johan Setia Line, previously known as the LRT Bandar Utama-Klang Line is based on the Final Railway Scheme approved by the Land Public Transport Agency (APAD).
- 5.3.3 The LRT3 will feature a few interchange stations that will link with other rail line services. The planned interchanges are KG09 Bandar Utama of the MRT Kajang Line and KJ27 CGC-Glenmarie of LRT Kelana Jaya Line.
- 5.3.4 The nearest LRT3 Station for the Proposed Development area is Bandar Baru Klang Station (BK17) which is about 500m or 10-minute walking time. This station is proposed to be an elevated station.
- 5.3.5 **Figure 5.2** exhibits the new LRT alignment based on Land Public Transport Agency (APAD).



6.0 TRAFFIC IMPACT STUDY

6.1 INTRODUCTION

6.1.1 It is anticipated that the Proposed Development when completed in Year 2034 would generate and attract some traffic volume of **1,050 PCU/Hour** and **952 PCU/Hour** during the AM Peak Hour and PM Peak Hour respectively. This traffic would be loaded onto the existing and proposed road system in the vicinity of the project site.

6.1.2 As such, this section is to analyze the impact of traffic generated and attracted to the Proposed Development upon the road system in the vicinity of the project site. If the proposed development is found to cause adverse impacts, then countermeasures to mitigate them will be examined and proposed. The impact study is mainly conducting:

- i. Comparative analysis on traffic demand and road capacity.
- ii. Comparative analysis on the intersections.
- iii. Examination of the circulation system.
- iv. Analysis of the parking demand.

6.2 FUTURE SCENARIO DESCRIPTION

6.2.1 To give an insight to the impact of future traffic, several scenarios were investigated.

- i. Base Year/ Submission Year 2021
- ii. Completion Year 2024 (BBK Condo)
- iii. Impact Analysis Year 2034

6.2.2 The Completion Year 2024 is tested using the current Road Network Configuration with junction upgraded is implemented when needed, locally. The Impact Analysis Year 2034 is tested using upgraded junctions.

6.3 ANALYSIS ON TRAFFIC DEMAND AND ROAD SECTION

6.3.1 The capacity analysis of the basic road segment surrounding the Proposed Development was conducted by comparing the traffic volume to the road capacity. The following main roads and internal roads in the vicinity of the proposed development site are selected for analysis:

- i. Shapadu Highway
- ii. Federal Highway
- iii. Persiaran Bukit Raja 1
- iv. Persiaran Bukit Raja 1
- v. Persiaran Bukit Raja 1
- vi. Persiaran Bukit Raja
- vii. Persiaran Bukit Raja
- viii. Persiaran Bukit Raja

6.3.2 The location of selected analysed road sections is indicated in **Figure 6.1**.

6.3.3 **Table 6.1** and **Table 6.2** shows the computed V/C Ratio and Level of service (LOS) on the road network with during AM and PM Peak Hour for Year 2024 and Year 2034 and depicted in **Figure 6.2**.

Table 6.1: Road Section Performance for Completion Year 2024

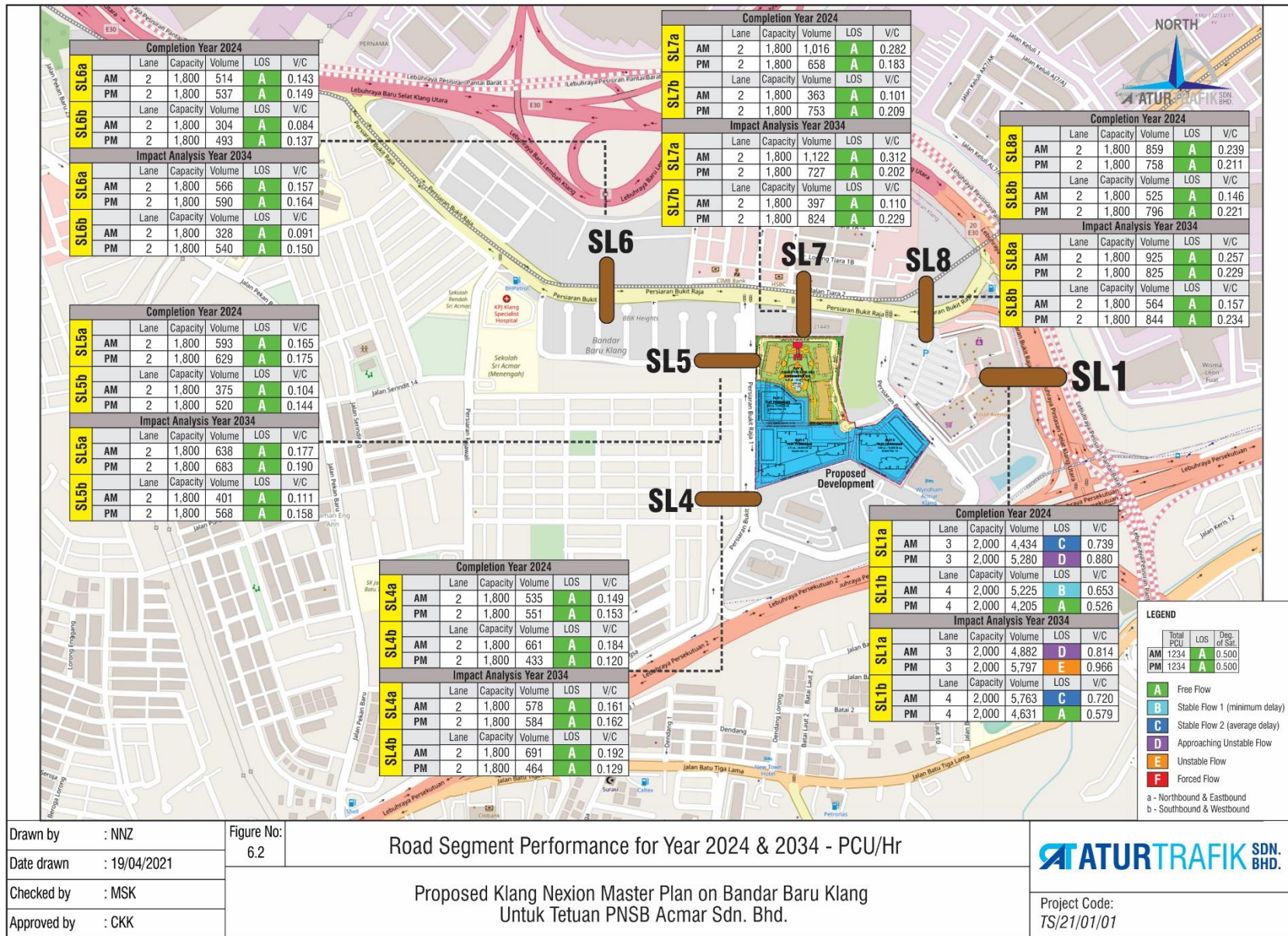
No.	Link	Location	No. of Lanes	Capacity/ Hr/Lane	AM			PM		
					Vol	V/c	LOS	Vol	V/c	LOS
1	L1a	Shapadu Highway	3	2,000	4,434	0.739	C	5,280	0.880	D
2	L1b		4	2,000	5,225	0.653	B	4,205	0.526	A
3	L4a	Persiaran Bukit Raja 1	2	1,800	535	0.149	A	551	0.153	A
4	L4b		2	1,800	661	0.184	A	433	0.120	A
5	L5a	Persiaran Bukit Raja 1	2	1,800	593	0.165	A	629	0.175	A
6	L5b		2	1,800	375	0.104	A	520	0.144	A
7	L6a	Persiaran Bukit Raja	2	1,800	514	0.143	A	537	0.149	A
8	L6b		2	1,800	304	0.084	A	493	0.137	A
9	L7a	Persiaran Bukit Raja	2	1,800	1,016	0.282	A	658	0.183	A
10	L7b		2	1,800	363	0.101	A	753	0.209	A
11	L8a	Persiaran Bukit Raja	2	1,800	859	0.239	A	758	0.211	A
12	L8b		2	1,800	525	0.146	A	796	0.221	A

Table 6.2: Road Section Performance for Impact Analysis Year 2034

No.	Link	Location	No. of Lanes	Capacity /Hr/Lane	AM			PM		
					Vol	V/c	LOS	Vol	V/c	LOS
1	L1a	Shapadu	3	2,000	4,882	0.814	D	5,797	0.966	E
2	L1b	Highway	4	2,000	5,763	0.720	C	4,631	0.579	A
3	L4a	Persiaran Bukit Raja 1	2	1,800	578	0.161	A	584	0.162	A
4	L4b	Persiaran Bukit Raja 1	2	1,800	691	0.192	A	464	0.129	A
5	L5a	Persiaran Bukit Raja 1	2	1,800	638	0.177	A	683	0.190	A
6	L5b	Persiaran Bukit Raja 1	2	1,800	401	0.111	A	568	0.158	A
7	L6a	Persiaran Bukit Raja	2	1,800	566	0.157	A	590	0.164	A
8	L6b	Persiaran Bukit Raja	2	1,800	328	0.091	A	540	0.150	A
9	L7a	Persiaran Bukit Raja	2	1,800	1,122	0.312	A	727	0.202	A
10	L7b	Persiaran Bukit Raja	2	1,800	397	0.110	A	824	0.229	A
11	L8a	Persiaran Bukit Raja	2	1,800	925	0.257	A	825	0.229	A
12	L8b	Persiaran Bukit Raja	2	1,800	564	0.157	A	844	0.234	A

6.3.4 In Base Year 2021, the road segment SL1 is performing LOS B and LOS C with three (3) and four (4) lanes provided towards to proposed development. In future year analysis, SL1 shows satisfactorily level of service LOS D and LOS E for AM and PM Peak hours.

6.3.5 From the road section analysis, the future, with no public transport mode share transfer and implementation of certain road improvement, the selected road sections performances were able to sustain future traffic growth and performing acceptable Levels of Services during Impact Analysis Year 2034.



6.4 ANALYSIS ON INTERSECTION

6.4.1 The analysis of the selected intersections within the study area was conducted based upon the forecasted peak hour turning movements.

6.4.2 Analysis on J1

6.4.2.1 J1 is an existing interchange with coordinated signal phasing. In 2021, the Level of Service for J1 is LOS F for both AM and PM Peak Hour.

6.4.2.2 During Completion Year 2024, J1 is expected to perform LOS F during AM and PM Peak Hour, therefore J1 is proposed to be upgraded to a Divergent Interchange (DI). DI is an interchange with reversed direction at the middle section of the interchange. This reversed direction allows for reduction of signal phasing and timing, hence improving the levels of service for the intersection analysis.

6.4.2.3 **Figure 6.3** exhibits the schematic configuration of Proposed J1 Divergent Interchange with traffic flow and the signal phasing.

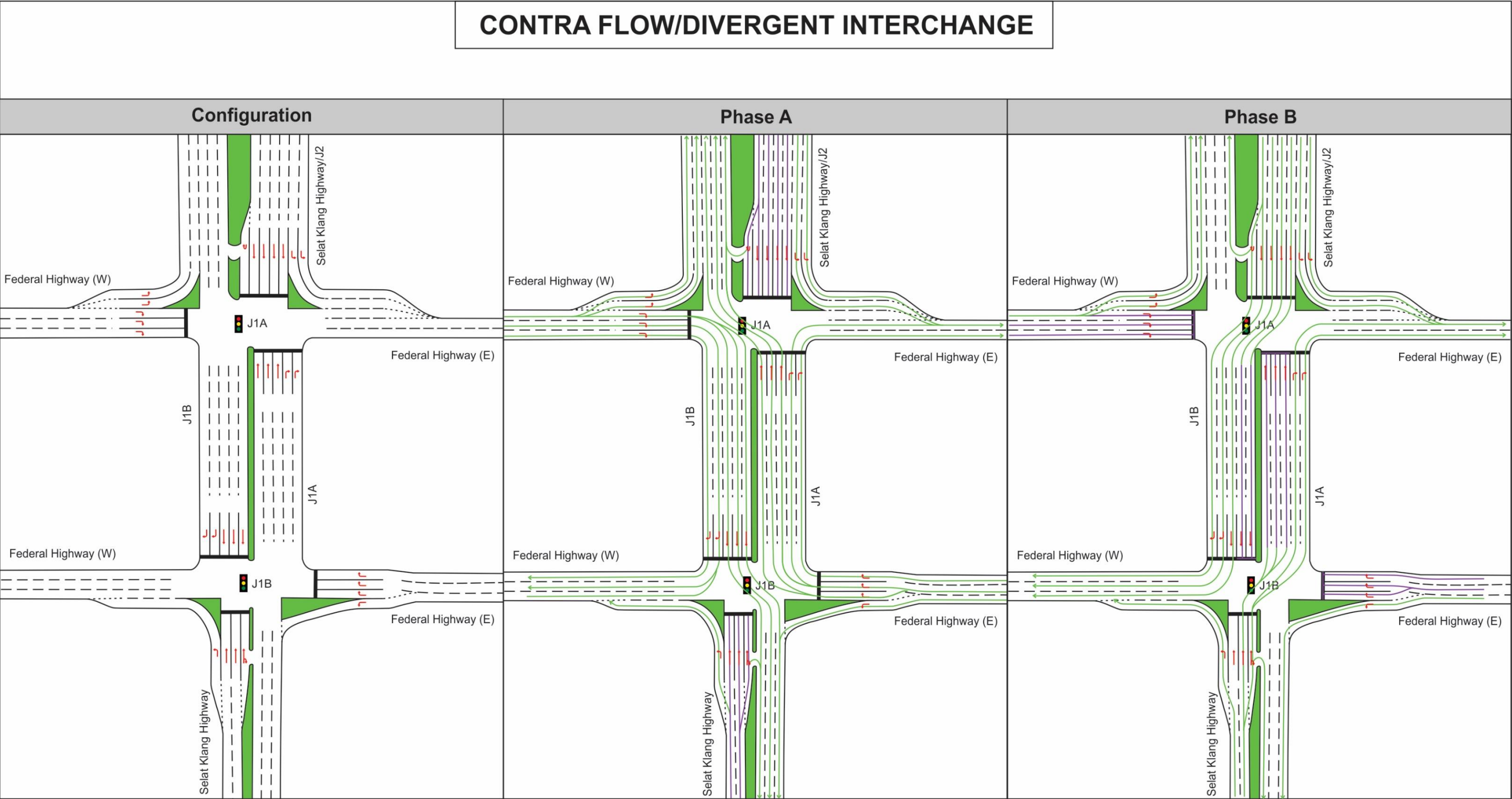


Figure 6.3: J1 Proposed Junction Configuration

6.4.3 Analysis on J4

6.4.3.1 J4 is an existing priority T-junction with full turning traffic movement. When the LRT3 construction started, the right turn was banned and only allow left-in left-out movement. In 2021, the Level of Service for J4 is LOS A for both AM and PM Peak Hour and expected to perform good level of service until Impact Analysis Year 2034.

6.4.4 Analysis on J5

6.4.4.1 J5 is a 4-legged signalized junction with full turning. J5 is expected to perform satisfactorily under Level of Service (LOS) C at AM Peak and LOS D at PM Peak for both Completion Year 2024 and Impact Analysis Year 2034.

6.4.5 Analysis on J6

6.4.5.1 J6 is a 3-legged signalized junction with full turning traffic movement, which serve to main entrance junction of proposed development (J10). During Impact Analysis Year 2034, the junction will not be able to sustain the increase of left-turn traffic to J10, therefore J6 is proposed to add short lane (30m) as shown in **Figure 6.4**.

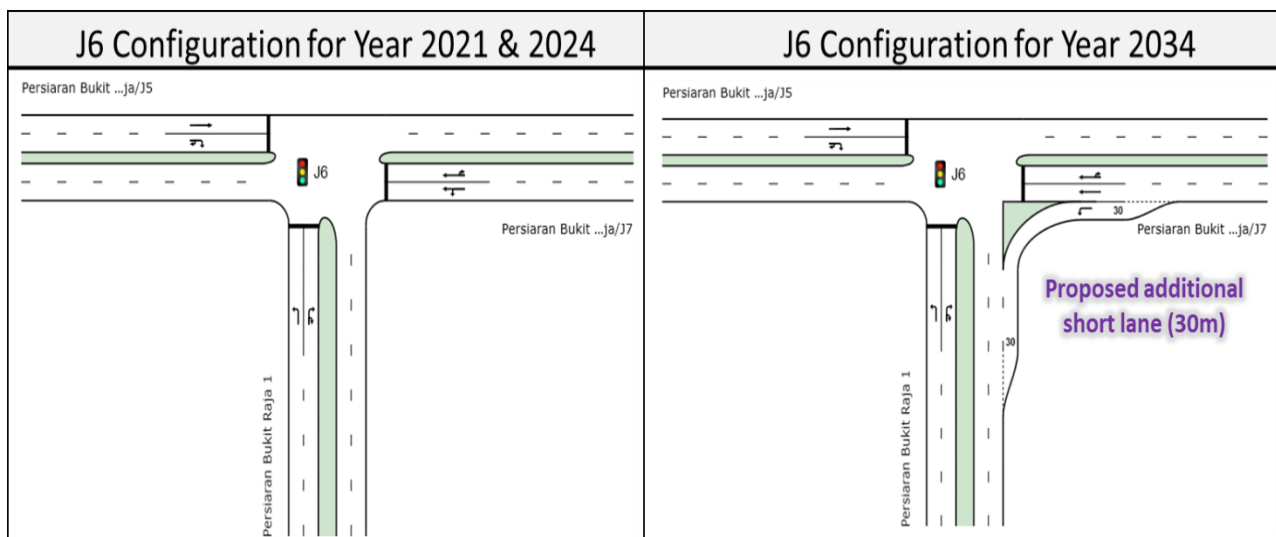


Figure 6.4: J6 Existing and Proposed Junction Configuration

6.4.6 Analysis on J7

6.4.6.1 J7 is a 3-legged signalized junction with full turning which serve to main entrance junction of proposed development (J11). J7 perform under LOS D for both AM and PM peak hour during Completion Year 2024. For Impact Analysis Year 2034, J7 perform under LOS E for both AM and PM peak hour.

6.4.7 Analysis on J10

6.4.7.1 J10 is an existing priority T-junction which serve as main entrance to the proposed development site. During the Completion Year 2024, J10 was predicted to perform at the worst level of service compared to other analysed junctions, which is LOS E for both AM and PM peak hour. To mitigate this scenario, J10 is proposed to be upgraded to a signalized T-junction by Completion Year 2024.

6.4.7.2 **Figure 6.5** depicts the current and proposed J10 configuration.

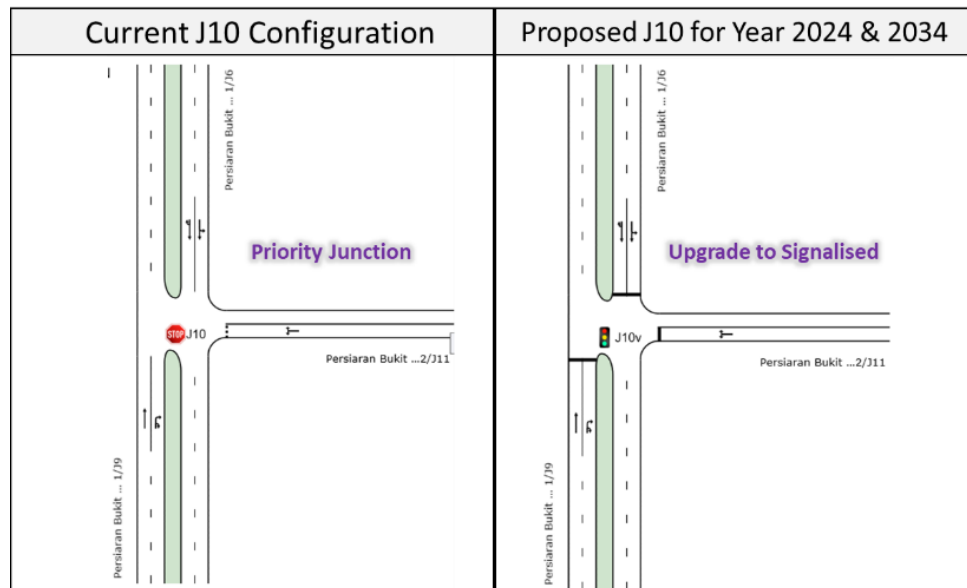


Figure 6.5: J10 Existing and Proposed Junction Configuration

6.4.8 Analysis on J11

6.4.8.1 J11 is an existing priority T-junction which serves as an entrance to the proposed development site. J11 is expected to perform at good level of service until Impact Analysis Year 2034.

6.4.9 **Table 6.3 and Table 6.4** presented the summary of the output from SIDRA for Completion Year 2024 and Impact Analysis Year 2034 respectively.

Table 6.3: Intersection Performance for Completion Year 2024

Scenario	Junction Type	Junction ID	Period	Volume	Degree of Saturation	Average Delay (s)	LOS	Queue Length (m)
Completion Year 2024	Interchange	J1	AM	10,487	0.955	238.1	E	280
			PM	9,578	0.919	24.5	D	207
	3-legged Unsignalized	J4	AM	1,706	0.561	4.6	A	4
			PM	1,745	0.506	4.5	A	3
	3-legged Signalized	J5	AM	1,621	0.874	36.8	C	129
			PM	1,914	0.906	51.6	D	280
	3-legged Signalized	J6	AM	1,615	0.862	32.1	C	132
			PM	1,713	0.969	39.7	E	106
	3-legged Signalized	J7	AM	1,472	0.904	30.2	D	122
			PM	1,941	0.910	33.1	D	96
	3-legged Signalized	J10	AM	1,413	0.814	25.6	C	91
			PM	1,384	0.751	22.4	C	47
	4-legged Unsignalized	J11	AM	512	0.197	4.5	A	6
			PM	769	0.370	7.1	A	13
	Roundabout	JN1	AM	398	0.161	7.0	A	6
			PM	472	0.188	6.7	A	8

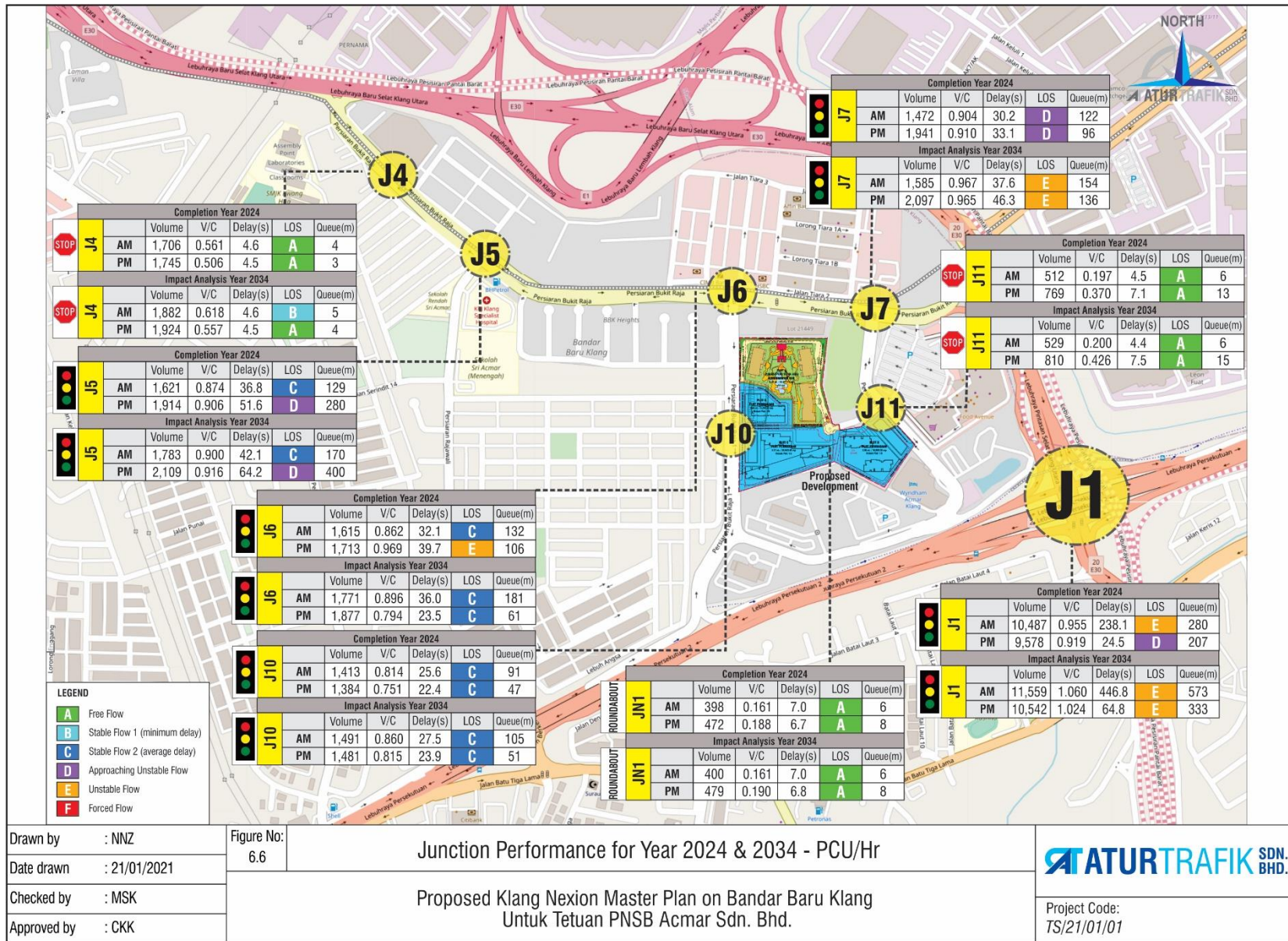
J1 & J10 = Junction Improvement

Table 6.4: Intersection Performance for Impact Analysis Year 2034

Scenario	Junction Type	Junction ID	Period	Volume	Degree of Saturation	Average Delay (s)	LOS	Queue Length (m)
Impact Analysis Year 2034	Diamond Interchange	J1	AM	11,559	1.060	446.8	E	573
			PM	10,542	1.024	64.8	E	333
	3-legged Unsignalized	J4	AM	1,882	0.618	4.6	B	5
			PM	1,924	0.557	4.5	A	4
	3-legged Signalized	J5	AM	1,783	0.900	42.1	C	170
			PM	2,109	0.916	64.2	D	400
	3-legged Signalized	J6	AM	1,771	0.896	36.0	C	181
			PM	1,877	0.794	23.5	C	61
	3-legged Signalized	J7	AM	1,585	0.967	37.6	E	154
			PM	2,097	0.965	46.3	E	136
	3-legged Signalized	J10	AM	1,491	0.860	27.5	C	105
			PM	1,481	0.815	23.9	C	51
	4-legged Unsignalized	J11	AM	529	0.200	4.4	A	6
			PM	810	0.426	7.5	A	15
	Roundabout	JN1	AM	400	0.161	7.0	A	6
			PM	479	0.190	6.8	A	8

J1, J6 & J10 = Junction Improvement

- 6.4.10 **Figure 6.6** exhibits the junction performance for Completion Year 2024 and Impact Analysis Year 2034.
- 6.4.11 Based on the recommendation in this chapter, all junctions are expected to perform satisfactorily during all analysis years.



7.0 FINDINGS & RECOMMENDATIONS

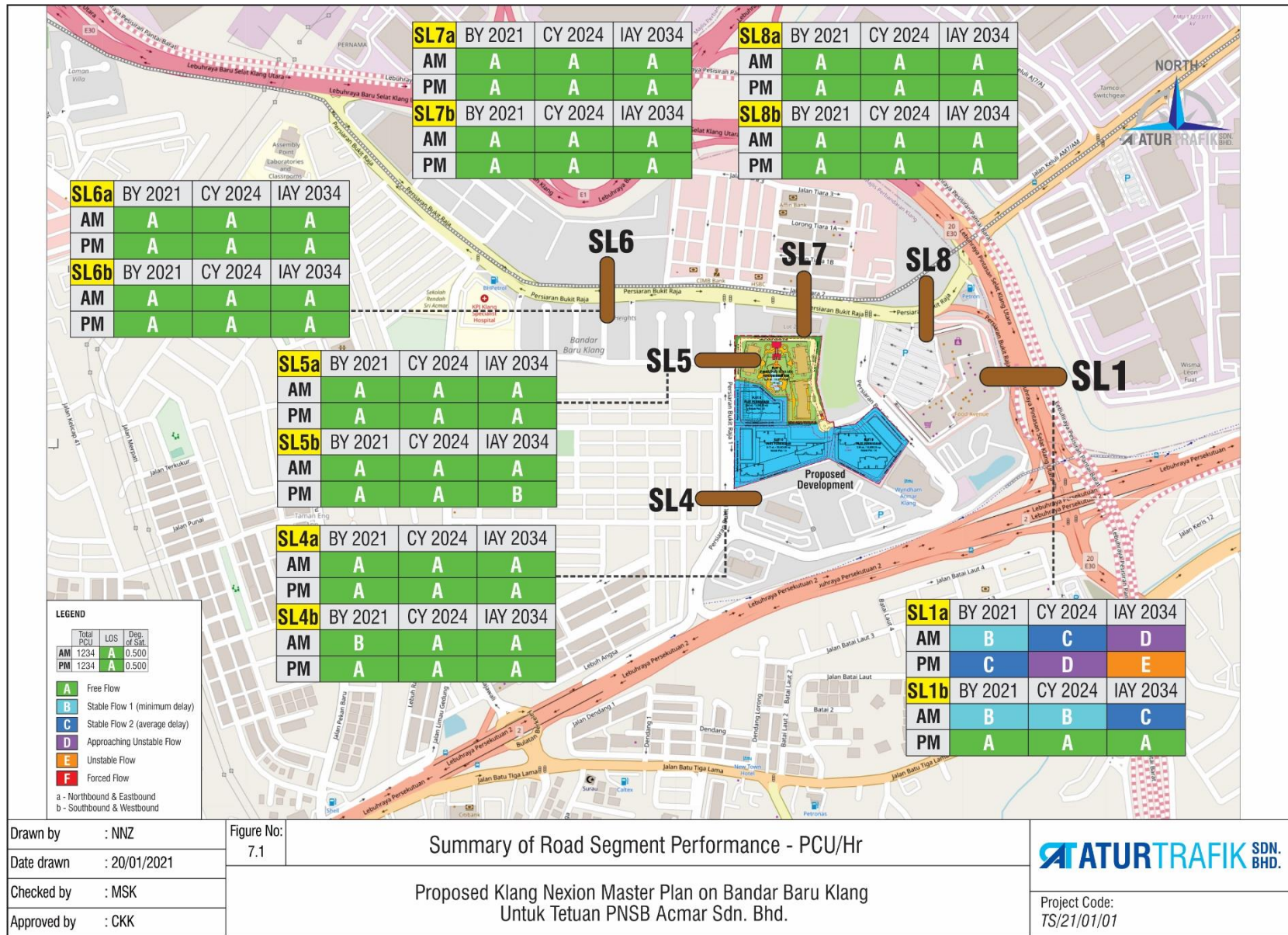
The findings and recommendations produced from this TIA Study will focus on the external traffic, internal traffic circulation and accessibility.

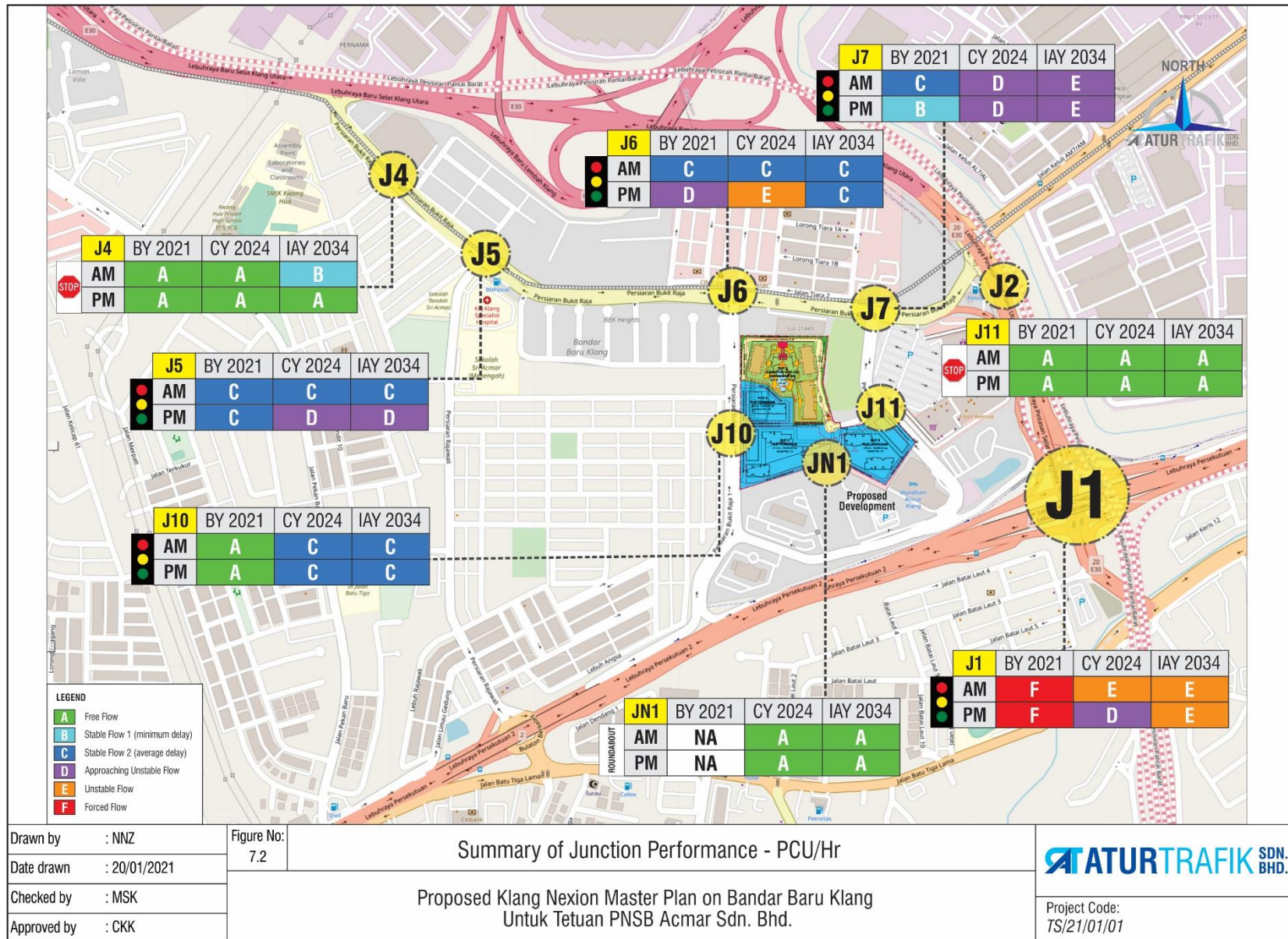
7.1 FINDINGS

- 7.1.1 The Proposed Development when fully completed in Year 2042 is expected to generate and attract some road traffic volume of **1,050 PCU/Hr** and **952 PCU/Hr** during the AM and PM Peak Hour respectively for the Proposed Development.
- 7.1.2 The external access arrangement for the Proposed Development includes Shapadu Highway (north) and Federal Highway (south). While the internal roads consist of Persiaran Bukit Raja, Persiaran Bukit Raja 1 and Persiaran Bukit Raja 2.
- 7.1.3 A new LRT alignment (LRT Johan Setia Line) is expected to be in operation by year 2024 and due to the LRT Station is located near the Proposed Development, it is expected to reduce the road traffic volume within the study area. The reduction of the traffic will eventually improve all the junctions' performance within the Study Area in future years. In this TIA study, the analyses were executed in worst case scenario, where no public transport mode share were considered. This is in accordance with the new TIA Guideline 2018 published by Highway Planning Unit, Ministry of Works, Malaysia.
- 7.1.4 Currently J1 interchange (J1) was found to perform under LOS F. Based on the analysis conducted for both Completion Year 2024 and Impact Analysis Year 2034, the performance of the interchange will deteriorate if it remains operating without any junction improvement. To mitigate this issue, J1 is proposed to be converted to Divergent Interchange (DI) during Completion Year 2024
- 7.1.5 J6 is a full turning priority T-Junction. It was predicted to be able to perform satisfactorily up to Completion Year 2024. However, this junction must be improved during Impact Analysis Year 2034 to maintain the satisfactorily level.
- 7.1.6 J10 is a full turning priority T-Junction. It was predicted to perform under LOS F during Completion Year 2024 if the existing junction configuration remains. To

mitigate this scenario, this junction must be converted to a signalised T-Junction during Completion Year 2024. The junction was predicted to perform satisfactorily with the improvement up to Impact Analysis Year 2034.

- 7.1.7 The summary of road section and junction performances are shown in **Figure 7.1** and **Figure 7.2**.





7.2 RECOMMENDATIONS

7.2.1 Internal Traffic Circulation

7.2.1.1 Internal traffic circulation is proposed to be a 2-way traffic circulation system to smooth traffic circulation. **Figure 7.3** illustrates the internal traffic circulation.

7.2.2 Accessibility

7.2.2.1 There are 3 Access Points provided for the Proposed Development as shown in **Figure 7.4**; namely Access Point 1 (left-in Left-out), Access Point 2 and Access Point 3 (full turning).

7.2.3 In conclusion, the estimated traffic generated by the Proposed Development is predicted not to cause any adverse impact to the future road network in the vicinity. All proposed new accesses to and from the proposed development is projected to operate sufficiently.

