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Transport Planning, Traffic Impact Assessments, Road Safety Audits, Expert Witness

1 June 2023

Reference: 220509.03FA

Precinct Capital Pty Ltd
Level 1, 2 Barrack Street
Sydney NSW 2000
Attention: Dylan Baudinet

SUPPLEMENTARY TRAFFIC AND PARKING ADVICE FOR THE APPROVED BUSINESS PARK AT OLD CASTLEREAGH ROAD AND LUGARD STREET, PENRITH

Dear Dylan,

Reference is made to your request to provide supplementary traffic and parking advice for the Approved Business Park at Old Castlereagh Road and Lugard Street, Penrith. The supplementary advice provided in this letter is in response to the comments provided by TfNSW and DPIE in letters dated 20 March 2023 and 18 April 2023 respectively. Each of the comments has been reproduced, italicised, and responded to in the following Sections.

1 TfNSW Comments

1.1 SIDRA Scope and Calibration / Validation

TfNSW notes that whilst SIDRA outputs are provided, electronic SIDRA files have not been provided to TfNSW for review to validate the findings of the traffic report. From the SIDRA outputs the following is noted:

- that the intersection has been modelled as an isolated site rather than a networked site and therefore consideration has not been given to upstream or downstream conditions.*
- it is unclear if the traffic signal timings used in the model have been validated with SCATS data.*
- If the model has been calibrated.*

The items above would be factors that could greatly influence the results of the model.

The modelling has been re-done using an updated data set from May 2023 to provide a networked model including three intersections, being:

- Castlereagh Road / Andrews Road;
- Castlereagh Road / Lugard Street;
- Castlereagh Road / Jack Williams Drive.

The revised model has been calibrated using:

- Cycle and phase times based on survey video footage;
- Light vehicle, heavy vehicle and pedestrian volumes;
- Observed blockages and arrivals during green.

Validation of the model outputs was completed using queue lengths observations. The base model queue outputs and the observed back of queue (at start of green) have been compared as shown in **Table 1** and indicate that the model is providing a reasonable reflection of the performance of the intersection.

TABLE 1: QUEUE LENGTH OUTPUTS VS OBSERVED

Approach	North Approach			South Approach		West Approach	
Lane	1	2	3	1	2	1	2
AM Peak							
Observed Queue (veh)	2	1.71	1.18	4	5	0.45	1.57
Model Queue(veh, start of green)	3.4	3.4	0.7	3.6	3.8	0.6	1.3
Difference (veh)	1.4	1.69	-0.48	-0.4	-1.2	0.15	-0.27
PM Peak							
Observed Queue (veh)	15	15	2	3	2	1.833333	4.25
Model Queue(veh, start of green)	13.5	12.8	0.6	4.4	4.4	1.7	3.4
Difference (veh)	-1.5	-2.2	-1.4	1.4	2.4	-0.13	-0.85

1.2 Traffic Distribution

The trip generation in the traffic report is provided as:

As shown above, in accordance with the GHD Report assumptions, the proposed development is estimated to generate 1877 trips in the AM peak period (1608 in, 269 out) and 1755 trips in the PM peak period (236 in, 1519 out).

The traffic distribution used in the traffic report is based on the two network access points to the site:

TABLE 4: TRAFFIC DISTRIBUTION

Peak Time	Direction	North Approach Castlereagh Rd		South Approach Castlereagh Rd		West Approach Lugard St	
		Right Turn	Through	Through	Left Turn	Right Turn	Left Turn
AM	IN	15%		5%	25%		
	OUT		5%			15%	25%
PM	IN	15%		5%	25%		
	OUT		5%			15%	25%

Based on this distribution, 1608 inbound trips generated in the AM peak of which 30% or 482 vehicle trips use Castlereagh Road northbound to access the site of which 402 vehicles turn left into Lugard Street. The SIDRA model results for the 2036 Background Only + Full Yield AM models indicates that the model has been inputted with 124 vehicles turning left which is substantially lower than the 30% of development traffic i.e., 402 vehicles. It is not clear why the LT volume decreases from 134 LT vehicles in the 2026 model to 124 in the 2036 model. In this regard there seems to be a major error in the models which has affected the results and therefore the conclusions made.

The revised modelling has been undertaken using the traffic distribution presented in **Table 2** at the Lugard Street intersection.

TABLE 2: TRAFFIC DISTRIBUTION

Peak Hour	Direction	North Approach Castlereagh Rd		South Approach Castlereagh Rd		West Approach Lugard St	
		Right Turn	Through	Through	Left Turn	Right Turn	Left Turn
AM	IN	5%		0%	30%		
	OUT		0%			30%	5%
PM	IN	5%		0%	30%		
	OUT		0%			30%	5%

The modified distribution, in particular the increased right turn movement out of Lugard Street, is a result of the existing poor performance of the road corridor. It is unlikely that drivers heading south would use the other exit point onto Old Castlereagh Road and tolerate the extra delays for southbound traffic travelling on Castlereagh Road between Andrews Road and Lugard Street rather than using the shorter and faster route via the Lugard Street intersection.

For the purposes of sensitivity testing and considering that there remains some disagreement regarding the traffic generation of the site, two sets of traffic generation assumptions have been tested being:

- The trip generation outlined in **Figure 1**.
- A trip generation based on 0.35 trips per 100m² as per the supplementary traffic report completed by TTPA dated 29 October 2021.

Precinct ID	Indicative Land Use	AM peak hour period Trip Generation			PM peak hour period Trip Generation			Weekend Peak hour period Trip Generation		
		In	Out	Total	In	Out	Total	In	Out	Total
Employment Land	Industrial	749	187	936	202	807	1,008	0	0	0
	Office	1,080	120	1,200	90	810	900	0	0	0
	Total	1,829	307	2,136	292	1,617	1,908	0	0	0

FIGURE 1: TRAFFIC GENERATION ADOPTED AS REQUESTED BY DPIE

Further detail regarding the traffic generation and distribution across the three intersections is provide in **Annexure A** for reference.

1.3 Intersection Performance Results

Table 5 and 6 of the traffic report provide summaries of the modelling related to the with and without left turn lane. The tables are based on the average intersection delays for Lugard Street and not the Castlereagh Road approach which is of concern to TfNSW. The table is misleading in that it as does not clearly indicate the change in left turn movement values such as changes in queue lengths and changes in delays to all movements and requires the reader to go to the SIDRA outputs to find this information. Furthermore Table 6 relates to traffic in Lugard Street approach which has no relevance to the removal of the left turn lane in Castlereagh Road.

Results of the revised model are presented in **Table 3**, with detailed results for the left turn movement provided in **Table 4**. Detailed SIDRA outputs are provided in **Annexure B**.

TABLE 3: INTERSECTION PERFORMANCE - OVERALL

Intersection	Peak Hour	Degree of Saturation ⁽¹⁾	Average Delay ⁽²⁾ (sec/vehicle)	Level of Service ⁽³⁾	Control Type	Worst Movement	95th Percentile Queue
PERFORMANCE - GHD Volumes – No Left Turn Lane							
Castlereagh Road / Lugard Street	AM	1.20	18	B	Signals	RT from Castlereagh Road (N)	20.5 veh (155m) Castlereagh Road (N)
	PM	3.10	301.1	F		RT from Lugard Street (W)	171.8 veh (1309.8m) Lugard Street (W)
PERFORMANCE - GHD Volumes – with Left Turn Lane							
Castlereagh Road / Lugard Street	AM	1.33	24.6	B	Signals	RT from Castlereagh Road (N)	23.7 veh (179.5m) Castlereagh Road (N)
	PM	3.14	305.8	F		RT from Lugard Street (W)	172.6 veh (1315.9m) Lugard Street (W)
PERFORMANCE - TTPA Volumes – No Left Turn Lane							
Castlereagh Road / Lugard Street	AM	0.76	6.6	A	Signals	RT from Lugard Street (W)	11.2 veh (86m) Castlereagh Road (S)
	PM	1.22	56.4	D		RT from Lugard Street (W)	77.5 veh (559.5m) Castlereagh Road (N)
PERFORMANCE - TTPA Volumes – with Left Turn Lane							
Castlereagh Road / Lugard Street	AM	0.76	6.5	A	Signals	RT from Lugard Street (W)	10.4 veh (78m) Castlereagh Road (N)
	PM	1.23	56	D		RT from Lugard Street (W)	76.7 veh (554m) Castlereagh Road (N)

TABLE 4: INTERSECTION PERFORMANCE – LEFT TURN FROM SOUTH ONLY

Case	AM			PM		
	Left Turn Demand (veh)	Left Turn Delay (s)	Left Turn Queue (m) ⁽¹⁾	Left Turn Demand (veh)	Left Turn Delay (s)	Left Turn Queue (m) ⁽¹⁾
GHD Volumes – No LT Lane	607	6.4	84.6	110	6.1	136.1
GHD Volumes – LT Lane	607	6.2	22.4	110	8.1	8.6
TTPA Volumes – No LT Lane	191	6.2	76.8	94	6.1	130.8
TTPA Volumes – LT Lane	191	6.1	5.1	94	8.1	7.3

Notes:

- (1) Where no left turn lane is provided, the queue expressed is for the kerbside lane which serves both left turn and through movements.

The results indicate that the addition of a dedicated left turn lane provides no performance improvements for either the left turn or the overall performance of the intersection.

1.4 Traffic Efficiency

Sidra results aside, from a traffic efficiency perspective TfNSW disagrees that with the McClaren conclusion that there would be no network benefits with the left turn lane that the developer has been conditioned to provide as:

- The current traffic signal operation allows the left turn into Lugard Street to operate during two phases of the traffic signal cycle and therefore the additional left turn lane would allow for these vehicles to enter Lugard Street in approximately 80% of the total cycle time whereas in the current arrangement all it would take is for a vehicle in the kerbside lane travelling northbound to prevent this movement from occurring.*
- The left turn lane allows for the storage of left turning vehicles when pedestrians cross Lugard Street in A phase and therefore still allow for two through lanes northbound in Castlereagh Road to be maintained without impediment.*

MTE notes the potential benefits as noted above, however, the outputs of the model indicate that these benefits are minimal, if present at all for this intersection.

Considering the impact on the intersection wholistically, the additional left turn lane would result in an additional lane opposing the filter right turn from the northern approach, which would:

- Increase the critical and follow-up gap for these right turn movements;
- Reduce the number of gaps available for right turn movements;
- Increase delays for the right turn movement;
- Increase the likelihood of crashes at the intersection associated with right turning traffic from the north.

There is no clear and obvious benefit that would result from the addition of the left turn lane. Conversely, there are disbenefits as outlined above in addition to the disruption of traffic flows along Castlereagh Road that would occur during construction.

Further, it is understood that the Castlereagh Road corridor is to be upgraded in the future and these future upgrade works would make redundant the works being discussed. It is unlikely to be in the public interest to undertake two sets of road works at the intersection, particularly when there is no clear and obvious benefit to either safety or efficiency that would result from the left turn lane.

2 DPIE Comments

2.1 Traffic Generation Rates

- The GHD report titled 'Penrith Lakes Traffic and Transport Investigation traffic modelling report' dated 29 July 2021 (GHD report) has been relied on for input in the McLaren Traffic Engineering traffic advice. To allow for review of the figures used, including to verify that figures are correct and have been used in appropriate context, identify where in the GHD report (for example Figure X or Section X.X) the figures are from.
- Data used in Section 1.1 Traffic Generation is identified as being based on the GHD report however, it appears that the below points have been incorrectly identified. Clarify whether the conclusions of the McLaren Traffic Engineering traffic advice need to be updated when considering the correct data.
 - Dot Point 2 of Section 1.1 references that of the total GFA permitted for the site 80% will be used for industrial use and 20% for office use. However, the GHD report identifies that 80% of the land area (not the permitted GFA) will be used for industrial uses and the remaining 20% for office use.
 - Dot Point 3 of Section 1.1 should be updated to refer that 180,000m² of GFA will be industrial uses and 75,000m² of GFA will be office uses noting the typographical error in the GHD report.
- Using the land use percentage split and GFA split recommended in the GHD report, the traffic generation results of the Table below should be used to determine the impacts of the proposed modification:

Precinct ID	Indicative Land Use	AM peak hour period Trip Generation			PM peak hour period Trip Generation			Weekend Peak hour period Trip Generation			Zoning / Use Status	Assumptions and Source
		In	Out	Total	In	Out	Total	In	Out	Total		
Employment Land	Industrial	749	187	936	202	807	1,008	0	0	0	Zoned land Likely use known	GFA is 55% of total land area, based on an economic report by the developer of the employment land detailing the likely development of the site 80% of the Area is industrial uses and 20% of the Area is office GFA were provided by DPIE: 75,000m ² for office and 180,000 for industrial Business parks and industrial estates peak hour trip generation rates for AM (0.52) and PM (0.56) from Page 2 in RMS TDT2013/04a Office blocks peak hour trip generation rates for AM (1.6) and PM (1.2) from Page 2 in RMS TDT2013/04a Assume no weekend trips due to land use type Important note: previously DPE advised a 70% and 30% split of industrial and office. In the current revision supplied to GHD it was updated to 80% and 20%, hence updating total trips.
	Office	1,080	120	1,200	90	810	900	0	0	0		
	Total	1,829	307	2,136	292	1,617	1,908	0	0	0		

The modelling has been revised to adopt the rates presented in the above table in one of the two cases tested. The detailed results of this modelling are presented in **Table 3** and **Table 4**.

2.2 Traffic Distribution

- Explanation is needed as why north and south approach through movements were assumed to carry traffic generated from in the site in Table 4 of Section 1.2 Traffic Distribution.

Initially it was assumed that some traffic seeking to enter the site from the south would use the alternative entrance from Old Castlereagh Road. The revised modelling routes all traffic approaching from the south along Lugard Street.

2.3 Detailed Results

- *Provide a detailed results table for the northbound left turn, including traffic volumes, traffic delay and queue lengths*

The detailed results of this modelling are presented in **Table 3** and **Table 4**.

2.4 SIDRA File

- *Provide a copy of the SIDRA files to enable verification of intersection performance results.*

A copy of the SIDRA file has been provided in conjunction with this advice.

3 Conclusions and Recommendations

In view of the discussion and results presented above, the following findings are relevant to note:

1. To provide a sensitivity analysis, the traffic generation used in the analysis ranged from approximately 690 trips to approximately 2,000 trips. The results indicate that the traffic generation of the site is not critical when considering the need for a left-turn slip lane at the intersection.
2. The results of the modelling indicate that there are no benefits to the performance of either the left-turn movement or the intersection generally to be gained from the construction of the left turn slip lane. The modelling indicates that the delays and queues at the intersection were either the same or worse with the addition of the slip lane.
3. The addition of the left turn slip lane will impact the performance and safety of the right turning movement from Castlereagh Street onto Lugard Street, which represents an unambiguous disbenefit to the works being undertaken.

In view of the foregoing, it is recommended that condition C23 of the Determination of Development Application by Grant of Consent for DA 9876 requiring the construction of a left turn deceleration lane from Castlereagh Road to Lugard Street be removed.

Please contact the undersigned on 9521 7199 should you require further information or assistance.

Yours faithfully,

McLaren Traffic Engineering



Tom Steal

Senior Traffic Engineer

B.E (Civil) MIEAust

Accredited Level 2 Road Safety Auditor



**ANNEXURE A: TRAFFIC GENERATION AND DISTRIBUTION
(2 SHEETS)**

TPPA Numbers (.35 trips per 100m2)

Full Yield

			North Approach Castlereagh Rd			South Approach Castlereagh Rd			West Approach Lugard St			Peak total
			U	R	SB	U	NB	L	U	R	L	
Dist	AM Peak	IN		5%			0%	30%				
		OUT			0%					30%	5%	
	PM Peak	IN		5%			0%	30%				
		OUT			0%					30%	5%	
Cars	AM Peak	IN	0	20	0	0	0	121	0	0	0	0
	AM Peak	OUT	0	0	0	0	0	0	0	51	9	0
	PM Peak	IN	0	9	0	0	0	52	0	0	0	0
	PM Peak	OUT	0	0	0	0	0	0	0	122	20	0
Trucks	AM Peak	IN	0	2	0	0	0	14	0	0	0	0
	AM Peak	OUT	0	0	0	0	0	0	0	19	3	0
	PM Peak	IN	0	3	0	0	0	20	0	0	0	0
	PM Peak	OUT	0	0	0	0	0	0	0	14	2	0

Full Yield

			North Approach Castlereagh Rd			South Approach Castlereagh Rd			West Approach Jack Williams			Peak total
			U	R	SB	U	NB	L	U	R	L	
Dist	AM Peak	IN		0%			30%	0%				
		OUT			30%					0%	0%	
	PM Peak	IN		0%			30%	0%				
		OUT			30%					0%	0%	
Cars	AM Peak	IN	0	0	0	0	121	0	0	0	0	0
	AM Peak	OUT	0	0	51	0	0	0	0	0	0	0
	PM Peak	IN	0	0	0	0	52	0	0	0	0	0
	PM Peak	OUT	0	0	122	0	0	0	0	0	0	0
Trucks	AM Peak	IN	0	0	0	0	14	0	0	0	0	0
	AM Peak	OUT	0	0	19	0	0	0	0	0	0	0
	PM Peak	IN	0	0	0	0	20	0	0	0	0	0
	PM Peak	OUT	0	0	14	0	0	0	0	0	0	0

			North Approach Castlereagh Rd				East Approach Andrews Rd				South Approach Castlereagh Rd				West Approach Old Castlereagh Rd			
			U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L
Dist	AM Peak	IN		25%	5%		0%	0%	40%									
		OUT			0%								5%				40%	25%
	PM Peak	IN		25%	5%		0%	0%	40%									
		OUT			0%								5%				40%	25%
Cars	AM Peak	IN	0	101	20	0	0	0	161	0	0	0	0	0	0	0	0	0
	AM Peak	OUT	0	0	0	0	0	0	0	0	0	0	9	0	0	0	69	43
	PM Peak	IN	0	44	9	0	0	0	70	0	0	0	0	0	0	0	0	0
	PM Peak	OUT	0	0	0	0	0	0	0	0	0	0	20	0	0	0	163	102
Trucks	AM Peak	IN	0	11	2	0	0	0	18	0	0	0	0	0	0	0	0	0
	AM Peak	OUT	0	0	0	0	0	0	0	0	0	0	3	0	0	0	25	16
	PM Peak	IN	0	17	3	0	0	0	27	0	0	0	0	0	0	0	0	0
	PM Peak	OUT	0	0	0	0	0	0	0	0	0	0	2	0	0	0	19	12

DPIE Numbers

Full Yield

		North Approach Castlereagh Rd			South Approach Castlereagh Rd			West Approach Lugard St			Peak total
		U	R	SB	U	NB	L	U	R	L	
Dist	AM Peak	IN	5%			0%	30%				
		OUT		0%					30%	5%	
	PM Peak	IN	5%			0%	30%				
		OUT		0%					30%	5%	
Cars	AM Peak	IN	0	82	0	0	0	493	0	0	0
	AM Peak	OUT	0	0	0	0	0	0	67	11	0
	PM Peak	IN	0	11	0	0	0	64	0	0	0
	PM Peak	OUT	0	0	0	0	0	0	435	73	0
Trucks	AM Peak	IN	0	9	0	0	0	56	0	0	0
	AM Peak	OUT	0	0	0	0	0	0	25	4	0
	PM Peak	IN	0	4	0	0	0	24	0	0	0
	PM Peak	OUT	0	0	0	0	0	0	50	8	0

Full Yield

		North Approach Castlereagh Rd			South Approach Castlereagh Rd			West Approach Jack Williams			Peak total
		U	R	SB	U	NB	L	U	R	L	
Dist	AM Peak	IN	0%			30%	0%				
		OUT		30%					0%	0%	
	PM Peak	IN	0%			30%	0%				
		OUT		30%					0%	0%	
Cars	AM Peak	IN	0	0	0	0	493	0	0	0	0
	AM Peak	OUT	0	0	67	0	0	0	0	0	0
	PM Peak	IN	0	0	0	0	64	0	0	0	0
	PM Peak	OUT	0	0	435	0	0	0	0	0	0
Trucks	AM Peak	IN	0	0	0	0	56	0	0	0	0
	AM Peak	OUT	0	0	25	0	0	0	0	0	0
	PM Peak	IN	0	0	0	0	24	0	0	0	0
	PM Peak	OUT	0	0	50	0	0	0	0	0	0

		North Approach Castlereagh Rd				East Approach Andrews Rd				South Approach Castlereagh Rd				West Approach Old Castlereagh Rd			
		U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L
Dist	AM Peak	IN	25%	5%		0%	0%	40%									
		OUT		0%								5%				40%	25%
	PM Peak	IN	25%	5%		0%	0%	40%									
		OUT		0%								5%				40%	25%
Cars	AM Peak	IN	0	410	82	0	0	0	657	0	0	0	0	0	0	0	0
	AM Peak	OUT	0	0	0	0	0	0	0	0	0	11	0	0	0	90	56
	PM Peak	IN	0	53	11	0	0	0	85	0	0	0	0	0	0	0	0
	PM Peak	OUT	0	0	0	0	0	0	0	0	0	73	0	0	0	580	363
Trucks	AM Peak	IN	0	47	9	0	0	0	75	0	0	0	0	0	0	0	0
	AM Peak	OUT	0	0	0	0	0	0	0	0	0	4	0	0	0	33	21
	PM Peak	IN	0	20	4	0	0	0	32	0	0	0	0	0	0	0	0
	PM Peak	OUT	0	0	0	0	0	0	0	0	0	8	0	0	0	66	41



**ANNEXURE B: SIDRA OUTPUT REPORTS
(24 SHEETS)**

MOVEMENT SUMMARY

📍 Site: 101 [AM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (GHD Vols))]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

📍 Network: N101 [AM EX (Network Folder: Existing + DEV (GHD Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand [Total	Flows HV]	Arrival [Total	Flows HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back [Veh.	Of Queue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Castlereagh Road (S)															
1	L2	All MCs	607	11.2	607	11.2	* 0.570	6.4	LOS A	11.0	84.6	0.34	0.60	0.34	51.1
2	T1	All MCs	1044	11.0	1044	11.0	0.570	5.3	LOS A	17.9	137.0	0.40	0.43	0.40	50.0
Approach			1651	11.1	1651	11.1	0.570	5.7	LOS A	17.9	137.0	0.38	0.49	0.38	50.6
North: Castlereagh Road (N)															
8	T1	All MCs	1719	8.1	1553	7.9	0.529	1.8	LOS A	8.5	63.3	0.21	0.19	0.21	56.3
9	R2	All MCs	145	9.6	139	9.6	* 1.202	269.6	LOS F	20.5	155.0	1.00	1.67	2.68	10.5
Approach			1863	8.2	1692	8.0	1.202	23.9	LOS B	20.5	155.0	0.27	0.31	0.41	33.3
West: Lugard Street (W)															
10	L2	All MCs	39	19.4	39	19.4	0.220	59.6	LOS E	2.1	17.5	0.95	0.74	0.95	19.8
12	R2	All MCs	152	24.6	152	24.6	0.888	75.6	LOS F	10.3	86.9	1.00	1.00	1.37	17.1
Approach			191	23.5	191	23.5	0.888	72.3	LOS F	10.3	86.9	0.99	0.95	1.29	17.6
All Vehicles			3706	10.3	3534	10.8	1.202	18.0	LOS B	20.5	155.0	0.36	0.43	0.44	38.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [PM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (GHD Vols))]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [PM EX (Network Folder: Existing + DEV (GHD Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Phase Times)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand [Total	Flows HV]	Arrival [Total	Flows HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Castlereagh Road (S)															
1	L2	All MCs	110	25.8	110	25.8	* 0.732	6.1	LOS A	18.4	136.1	0.36	0.38	0.36	51.7
2	T1	All MCs	1861	4.1	1861	4.1	0.732	3.4	LOS A	18.4	136.1	0.34	0.34	0.34	53.0
Approach			1971	5.3	1971	5.3	0.732	3.6	LOS A	18.4	136.1	0.34	0.34	0.34	52.9
North: Castlereagh Road (N)															
8	T1	All MCs	1445	3.7	1409	3.6	* 0.996	75.0	LOS F	70.2	506.2	1.00	1.35	1.45	16.2
9	R2	All MCs	62	12.0	60	11.8	0.717	44.4	LOS D	3.6	27.5	0.79	0.91	1.09	31.9
Approach			1507	4.0	1469	3.9	0.996	73.7	LOS F	70.2	506.2	0.99	1.33	1.44	16.9
West: Lugard Street (W)															
10	L2	All MCs	154	7.5	154	7.5	0.618	58.9	LOS E	8.8	65.3	0.99	0.81	0.99	20.1
12	R2	All MCs	578	10.4	578	10.4	3.102	1958.1	LOS F	171.8	1309.8	1.00	2.99	6.10	0.9
Approach			732	9.8	732	9.8	3.102	1557.9	LOS F	171.8	1309.8	1.00	2.53	5.02	1.2
All Vehicles			4210	5.6	4172	5.7	3.102	301.1	LOS F	171.8	1309.8	0.68	1.07	1.55	5.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [AM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (TTPA Vols))]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [AM EX (Network Folder: Existing + DEV (TTPA Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand [Total	Flows HV]	Arrival [Total	Flows HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back [Veh.	Of Queue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Castlereagh Road (S)															
1	L2	All MCs	191	12.3	191	12.3	* 0.431	6.2	LOS A	10.0	76.8	0.33	0.43	0.33	51.2
2	T1	All MCs	1044	11.0	1044	11.0	0.431	4.5	LOS A	11.2	86.0	0.34	0.36	0.34	51.1
Approach			1235	11.2	1235	11.2	0.431	4.7	LOS A	11.2	86.0	0.34	0.37	0.34	51.1
North: Castlereagh Road (N)															
8	T1	All MCs	1719	8.1	1719	8.1	* 0.586	1.9	LOS A	10.4	78.0	0.23	0.21	0.23	56.1
9	R2	All MCs	75	8.7	75	8.7	0.348	14.1	LOS A	1.9	14.1	0.43	0.69	0.43	44.4
Approach			1794	8.1	1794	8.1	0.586	2.4	LOS A	10.4	78.0	0.24	0.23	0.24	54.9
West: Lugard Street (W)															
10	L2	All MCs	36	18.1	36	18.1	0.201	59.3	LOS E	2.0	15.9	0.95	0.73	0.95	19.8
12	R2	All MCs	130	23.9	130	23.9	0.755	66.7	LOS E	8.0	67.5	1.00	0.89	1.16	18.6
Approach			166	22.7	166	22.7	0.755	65.1	LOS E	8.0	67.5	0.99	0.85	1.11	18.8
All Vehicles			3195	10.1	3195	10.1	0.755	6.6	LOS A	11.2	86.0	0.32	0.32	0.32	48.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

 Site: 101 [PM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (TTPA Vols))]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

 Network: N101 [PM EX (Network Folder: Existing + DEV (TTPA Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Phase Times)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand [Total	Flows HV]	Arrival [Total	Flows HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back [Veh.	Of Queue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Castlereagh Road (S)															
1	L2	All MCs	94	25.8	94	25.8	* 0.725	6.1	LOS A	17.7	130.8	0.35	0.37	0.35	51.8
2	T1	All MCs	1861	4.1	1861	4.1	0.725	3.3	LOS A	17.7	130.8	0.33	0.33	0.33	53.2
Approach			1955	5.2	1955	5.2	0.725	3.4	LOS A	17.7	130.8	0.33	0.33	0.33	53.1
North: Castlereagh Road (N)															
8	T1	All MCs	1445	3.7	1445	3.7	* 1.029	94.0	LOS F	77.5	559.5	1.00	1.46	1.59	13.7
9	R2	All MCs	58	10.8	58	10.8	0.684	39.3	LOS C	3.2	24.8	0.76	0.88	1.00	33.4
Approach			1504	4.0	1504	4.0	1.029	91.9	LOS F	77.5	559.5	0.99	1.44	1.56	14.3
West: Lugard Street (W)															
10	L2	All MCs	95	5.5	95	5.5	0.375	56.3	LOS D	5.2	37.9	0.95	0.78	0.95	20.2
12	R2	All MCs	227	9.7	227	9.7	1.222	277.0	LOS F	30.0	227.8	1.00	1.58	2.62	6.0
Approach			322	8.5	322	8.5	1.222	211.9	LOS F	30.0	227.8	0.99	1.34	2.13	7.6
All Vehicles			3781	5.0	3781	5.0	1.222	56.4	LOS D	77.5	559.5	0.65	0.86	0.97	20.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

 Site: 101 [AM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (GHD Vols) - Lugard with LT Lane)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

■ ■ Network: N101 [AM EX w LT (Network Folder: Existing + DEV - Lugard with LT Lane (GHD Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand [Total	Flows HV]	Arrival [Total	Flows HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back [Veh.	Of Queue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Castlereagh Road (S)															
1	L2	All MCs	607	11.2	607	11.2	* 0.392	6.2	LOS A	2.9	22.4	0.17	0.62	0.17	51.1
2	T1	All MCs	1044	11.0	1044	11.0	0.362	3.8	LOS A	8.7	66.8	0.32	0.28	0.32	52.4
Approach			1651	11.1	1651	11.1	0.392	4.7	LOS A	8.7	66.8	0.26	0.41	0.26	51.7
North: Castlereagh Road (N)															
8	T1	All MCs	1719	8.1	1553	7.9	0.529	7.5	LOS A	8.5	63.3	0.21	0.19	0.21	56.3
9	R2	All MCs	145	9.6	139	9.6	* 1.326	382.6	LOS F	23.7	179.5	1.00	1.84	3.15	8.0
Approach			1863	8.2	1692	8.0	1.326	38.4	LOS C	23.7	179.5	0.27	0.33	0.45	28.9
West: Lugard Street (W)															
10	L2	All MCs	39	19.4	39	19.4	0.357	66.4	LOS E	2.3	18.9	0.99	0.74	0.99	18.4
12	R2	All MCs	152	24.6	152	24.6	0.888	75.6	LOS F	10.3	86.9	1.00	1.01	1.37	17.2
Approach			191	23.5	191	23.5	0.888	73.7	LOS F	10.3	86.9	1.00	0.95	1.30	17.4
All Vehicles			3706	10.3	3534	10.8	1.326	24.6	LOS B	23.7	179.5	0.31	0.40	0.41	35.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [PM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (GHD Vols) - Lugard with LT Lane)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [PM EX w LT (Network Folder: Existing + DEV - Lugard with LT Lane (GHD Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand [Total	Flows HV]	Arrival [Total	Flows HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back [Veh.	Of Queue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Castlereagh Road (S)															
1	L2	All MCs	110	25.8	110	25.8	0.083	8.1	LOS A	1.0	8.6	0.17	0.62	0.17	49.6
2	T1	All MCs	1861	4.1	1861	4.1	0.809	4.0	LOS A	20.1	145.7	0.39	0.36	0.39	52.8
Approach			1971	5.3	1971	5.3	0.809	4.2	LOS A	20.1	145.7	0.38	0.38	0.38	52.4
North: Castlereagh Road (N)															
8	T1	All MCs	1445	3.7	1409	3.6	* 0.998	76.2	LOS F	70.5	508.6	1.00	1.35	1.46	16.0
9	R2	All MCs	62	12.0	60	11.8	0.380	31.2	LOS C	2.9	22.6	0.83	0.81	0.83	36.3
Approach			1507	4.0	1468	3.9	0.998	74.3	LOS F	70.5	508.6	0.99	1.33	1.44	16.8
West: Lugard Street (W)															
10	L2	All MCs	154	7.5	154	7.5	0.309	41.5	LOS C	7.1	52.9	0.83	0.78	0.83	24.7
12	R2	All MCs	578	10.4	578	10.4	* 3.141	1992.8	LOS F	172.6	1315.9	1.00	3.14	6.13	0.9
Approach			732	9.8	732	9.8	3.141	1581.6	LOS F	172.6	1315.9	0.96	2.64	5.01	1.2
All Vehicles			4210	5.6	4172	5.7	3.141	305.8	LOS F	172.6	1315.9	0.70	1.11	1.56	5.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [AM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (TTPA Vols) - Lugard with LT Lane)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [AM EX w LT (Network Folder: Existing + DEV - Lugard with LT Lane (TTPA Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand [Total	Flows HV]	Arrival [Total	Flows HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back [Veh.	Of Queue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Castlereagh Road (S)															
1	L2	All MCs	191	12.3	191	12.3	0.124	6.1	LOS A	0.7	5.1	0.12	0.61	0.12	50.6
2	T1	All MCs	1044	11.0	1044	11.0	0.362	3.8	LOS A	8.7	66.8	0.32	0.28	0.32	52.4
Approach			1235	11.2	1235	11.2	0.362	4.2	LOS A	8.7	66.8	0.29	0.33	0.29	51.9
North: Castlereagh Road (N)															
8	T1	All MCs	1719	8.1	1719	8.1	* 0.586	1.9	LOS A	10.4	78.0	0.23	0.21	0.23	56.1
9	R2	All MCs	75	8.7	75	8.7	0.476	14.6	LOS B	2.1	15.7	0.47	0.71	0.47	44.2
Approach			1794	8.1	1794	8.1	0.586	2.5	LOS A	10.4	78.0	0.24	0.23	0.24	54.9
West: Lugard Street (W)															
10	L2	All MCs	36	18.1	36	18.1	0.326	66.1	LOS E	2.1	17.2	0.99	0.73	0.99	18.4
12	R2	All MCs	130	23.9	130	23.9	* 0.755	66.7	LOS E	8.0	67.5	1.00	0.89	1.16	18.6
Approach			166	22.7	166	22.7	0.755	66.6	LOS E	8.0	67.5	1.00	0.86	1.12	18.6
All Vehicles			3195	10.1	3195	10.1	0.755	6.5	LOS A	10.4	78.0	0.30	0.31	0.30	48.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [PM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (TTPA Vols) - Lugard with LT Lane)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [PM EX w LT (Network Folder: Existing + DEV - Lugard with LT Lane (TTPA Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand [Total	Flows HV]	Arrival [Total	Flows HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back [Veh.	Of Queue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Castlereagh Road (S)															
1	L2	All MCs	94	25.8	94	25.8	0.070	8.1	LOS A	0.9	7.3	0.17	0.61	0.17	49.5
2	T1	All MCs	1861	4.1	1861	4.1	0.807	4.0	LOS A	19.9	144.2	0.39	0.36	0.39	52.8
Approach			1955	5.2	1955	5.2	0.807	4.2	LOS A	19.9	144.2	0.38	0.37	0.38	52.5
North: Castlereagh Road (N)															
8	T1	All MCs	1445	3.7	1445	3.7	* 1.027	92.8	LOS F	76.7	554.0	1.00	1.46	1.58	13.8
9	R2	All MCs	58	10.8	58	10.8	0.369	30.0	LOS C	2.8	21.4	0.81	0.80	0.81	36.7
Approach			1504	4.0	1504	4.0	1.027	90.4	LOS F	76.7	554.0	0.99	1.43	1.55	14.5
West: Lugard Street (W)															
10	L2	All MCs	95	5.5	95	5.5	0.188	39.8	LOS C	4.2	30.8	0.80	0.75	0.80	24.7
12	R2	All MCs	227	9.7	227	9.7	* 1.229	282.3	LOS F	30.3	230.0	1.00	1.64	2.64	5.9
Approach			322	8.5	322	8.5	1.229	210.7	LOS F	30.3	230.0	0.94	1.38	2.10	7.6
All Vehicles			3781	5.0	3781	5.0	1.229	56.0	LOS D	76.7	554.0	0.67	0.88	0.99	20.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

LANE SUMMARY

Site: 101 [AM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (GHD Vols))]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [AM EX (Network Folder: Existing + DEV (GHD Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance															
	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %	
South: Castlereagh Road (S)															
Lane 1	829	11.1	829	11.1	1454	0.570	100	6.3	LOS A	11.0	84.6	Full	425	0.0	0.0
Lane 2	822	11.0	822	11.0	1441	0.570	100	5.0	LOS A	17.9	137.0	Full	425	0.0	0.0
Approach	1651	11.1	1651	11.1		0.570		5.7	LOS A	17.9	137.0				
North: Castlereagh Road (N)															
Lane 1	859	8.1	776	7.9	1469	0.529	100	1.8	LOS A	8.5	63.3	Full	450	0.0	0.0
Lane 2	859	8.1	776	7.9	1469	0.529	100	1.8	LOS A	8.5	63.3	Full	450	0.0	0.0
Lane 3	145	9.6	139	9.6	116	1.202	100	269.6	LOS F	20.5	155.0	Short	80	0.0	NA
Approach	1863	8.2	1692	8.0		1.202		23.9	LOS B	20.5	155.0				
West: Lugard Street (W)															
Lane 1	39	19.4	39	19.4	177	0.220	100	59.6	LOS E	2.1	17.5	Full	500	0.0	0.0
Lane 2	152	24.6	152	24.6	171	0.888	100	75.6	LOS F	10.3	86.9	Full	500	0.0	0.0
Approach	191	23.5	191	23.5		0.888		72.3	LOS F	10.3	86.9				
All Vehicles	3706	10.3	3534	10.8		1.202		18.0	LOS B	20.5	155.0				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Approach Lane Flows (veh/h)										
South: Castlereagh Road (S)										
Mov.	L2	T1	Total	%HV		Deg.	Lane	Prob.	Ov.	
From S					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	W	N			veh/h	v/c	%	%	No.	
Lane 1	607	222	829	11.1	1454	0.570	100	NA	NA	
Lane 2	-	822	822	11.0	1441	0.570	100	NA	NA	
Approach	607	1044	1651	11.1		0.570				
North: Castlereagh Road (N)										
Mov.	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From N					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	S	W			veh/h	v/c	%	%	No.	
Lane 1	776	-	776	7.9	1469	0.529	100	NA	NA	
Lane 2	776	-	776	7.9	1469	0.529	100	NA	NA	
Lane 3	-	139	139	9.6	116	1.202	100	66.3	2	
Approach	1553	139	1692	8.0		1.202				
West: Lugard Street (W)										
Mov.	L2	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From W					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	N	S			veh/h	v/c	%	%	No.	
Lane 1	39	-	39	19.4	177	0.220	100	NA	NA	
Lane 2	-	152	152	24.6	171	0.888	100	NA	NA	
Approach	39	152	191	23.5		0.888				
	Total	%HV	Deg.Satn (v/c)							
All Vehicles	3534	10.8	1.202							

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate		Critical Gap	Follow-up Headway	Lane Flow Rate	Capacity	Deg. Satn	Min. Delay	Merge Delay
				veh/h	pcu/h	sec	sec	veh/h	veh/h	v/c	sec	sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis				
	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: Castlereagh Road (S)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
North: Castlereagh Road (N)				

Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
Lane 3	0.0	11.7	363.0	NA
West: Lugard Street (W)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0

LANE SUMMARY

Site: 101 [PM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (GHD Vols))]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [PM EX (Network Folder: Existing + DEV (GHD Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Phase Times)

Lane Use and Performance															
	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %	
South: Castlereagh Road (S)															
Lane 1	975	6.6	975	6.6	1333	0.732	100	4.4	LOS A	18.4	136.1	Full	425	0.0	0.0
Lane 2	996	4.1	996	4.1	1361	0.732	100	2.8	LOS A	16.7	121.3	Full	425	0.0	0.0
Approach	1971	5.3	1971	5.3		0.732		3.6	LOS A	18.4	136.1				
North: Castlereagh Road (N)															
Lane 1	820	3.7	799	3.6	803	0.996	100	71.5	LOS F	70.2	506.2	Full	450	-41.2 ^{N3}	15.7
Lane 2	625	3.7	610	3.6	612 ¹	0.996	100	79.6	LOS F	56.1	405.0	Full	450	-41.2 ^{N3}	0.0
Lane 3	62	12.0	60	11.8	83	0.717	100	44.4	LOS D	3.6	27.5	Short	80	0.0	NA
Approach	1507	4.0	1469	3.9		0.996		73.7	LOS F	70.2	506.2				
West: Lugard Street (W)															
Lane 1	154	7.5	154	7.5	250	0.618	100	58.9	LOS E	8.8	65.3	Full	500	0.0	0.0
Lane 2	578	10.4	578	10.4	186	3.102	100	1958.1	LOS F	171.8	1309.8	Full	500	-41.2 ^{N3}	95.9
Approach	732	9.8	732	9.8		3.102		1557.9	LOS F	171.8	1309.8				
All Vehicles	4210	5.6	4172	5.7		3.102		301.1	LOS F	171.8	1309.8				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

- 1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes.
 Delay and stops experienced by drivers upstream of short lane entry have been accounted for.

N3 Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)										
South: Castlereagh Road (S)										
Mov.	L2	T1	Total	%HV		Deg.	Lane	Prob.	Ov.	
From S					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	W	N			veh/h	v/c	%	%	No.	
Lane 1	110	865	975	6.6	1333	0.732	100	NA	NA	
Lane 2	-	996	996	4.1	1361	0.732	100	NA	NA	
Approach	110	1861	1971	5.3		0.732				
North: Castlereagh Road (N)										
Mov.	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From N					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	S	W			veh/h	v/c	%	%	No.	
Lane 1	799	-	799	3.6	803	0.996	100	NA	NA	
Lane 2	610	-	610	3.6	612 ¹	0.996	100	NA	NA	
Lane 3	-	60	60	11.8	83	0.717	100	0.0	2	
Approach	1409	60	1469	3.9		0.996				
West: Lugard Street (W)										
Mov.	L2	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From W					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	N	S			veh/h	v/c	%	%	No.	
Lane 1	154	-	154	7.5	250	0.618	100	NA	NA	
Lane 2	-	578	578	10.4	186	3.102	100	NA	NA	
Approach	154	578	732	9.8		3.102				
	Total	%HV	Deg.Satn (v/c)							
All Vehicles	4172	5.7	3.102							

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

- 1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes.
 Delay and stops experienced by drivers upstream of short lane entry have been accounted for.

Merge Analysis													
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec		
There are no Exit Short Lanes for Merge Analysis at this Site.													

Variable Demand Analysis				
	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec

South: Castlereagh Road (S)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
North: Castlereagh Road (N)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
Lane 3	0.0	0.0	0.0	0.0
West: Lugard Street (W)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	195.8	3784.4	NA

LANE SUMMARY

Site: 101 [AM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (TTPA Vols))]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [AM EX (Network Folder: Existing + DEV (TTPA Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance															
	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %	
South: Castlereagh Road (S)															
Lane 1	614	11.4	614	11.4	1425	0.431	100	5.3	LOS A	10.0	76.8	Full	425	0.0	0.0
Lane 2	621	11.0	621	11.0	1441	0.431	100	4.2	LOS A	11.2	86.0	Full	425	0.0	0.0
Approach	1235	11.2	1235	11.2		0.431		4.7	LOS A	11.2	86.0				
North: Castlereagh Road (N)															
Lane 1	859	8.1	859	8.1	1467	0.586	100	1.9	LOS A	10.4	78.0	Full	450	0.0	0.0
Lane 2	859	8.1	859	8.1	1467	0.586	100	1.9	LOS A	10.4	78.0	Full	450	0.0	0.0
Lane 3	75	8.7	75	8.7	216	0.348	100	14.1	LOS A	1.9	14.1	Short	80	0.0	NA
Approach	1794	8.1	1794	8.1		0.586		2.4	LOS A	10.4	78.0				
West: Lugard Street (W)															
Lane 1	36	18.1	36	18.1	178	0.201	100	59.3	LOS E	2.0	15.9	Full	500	0.0	0.0
Lane 2	130	23.9	130	23.9	172	0.755	100	66.7	LOS E	8.0	67.5	Full	500	0.0	0.0
Approach	166	22.7	166	22.7		0.755		65.1	LOS E	8.0	67.5				
All Vehicles	3195	10.1	3195	10.1		0.755		6.6	LOS A	11.2	86.0				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Approach Lane Flows (veh/h)										
South: Castlereagh Road (S)										
Mov.	L2	T1	Total	%HV		Deg.	Lane	Prob.	Ov.	
From S					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	W	N			veh/h	v/c	%	%	No.	
Lane 1	191	423	614	11.4	1425	0.431	100	NA	NA	
Lane 2	-	621	621	11.0	1441	0.431	100	NA	NA	
Approach	191	1044	1235	11.2		0.431				
North: Castlereagh Road (N)										
Mov.	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From N					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	S	W			veh/h	v/c	%	%	No.	
Lane 1	859	-	859	8.1	1467	0.586	100	NA	NA	
Lane 2	859	-	859	8.1	1467	0.586	100	NA	NA	
Lane 3	-	75	75	8.7	216	0.348	100	0.0	2	
Approach	1719	75	1794	8.1		0.586				
West: Lugard Street (W)										
Mov.	L2	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From W					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	N	S			veh/h	v/c	%	%	No.	
Lane 1	36	-	36	18.1	178	0.201	100	NA	NA	
Lane 2	-	130	130	23.9	172	0.755	100	NA	NA	
Approach	36	130	166	22.7		0.755				
	Total	%HV	Deg.Satn (v/c)							
All Vehicles	3195	10.1	0.755							

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis													
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec		
There are no Exit Short Lanes for Merge Analysis at this Site.													

Variable Demand Analysis				
	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: Castlereagh Road (S)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
North: Castlereagh Road (N)				

Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
Lane 3	0.0	0.0	0.0	0.0
West: Lugard Street (W)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0

LANE SUMMARY

Site: 101 [PM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (TPPA Vols))]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [PM EX (Network Folder: Existing + DEV (TPPA Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Phase Times)

Lane Use and Performance															
	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %	
South: Castlereagh Road (S)															
Lane 1	969	6.2	969	6.2	1337	0.725	100	4.2	LOS A	17.7	130.8	Full	425	0.0	0.0
Lane 2	986	4.1	986	4.1	1361	0.725	100	2.7	LOS A	16.3	118.0	Full	425	0.0	0.0
Approach	1955	5.2	1955	5.2		0.725		3.4	LOS A	17.7	130.8				
North: Castlereagh Road (N)															
Lane 1	819	3.7	819	3.7	796	1.029	100	90.9	LOS F	77.5	559.5	Full	450	-41.7 ^{N3}	24.8
Lane 2	626	3.7	626	3.7	609 ¹	1.029	100	98.0	LOS F	61.3	442.5	Full	450	-41.7 ^{N3}	3.5
Lane 3	58	10.8	58	10.8	85	0.684	100	39.3	LOS C	3.2	24.8	Short	80	0.0	NA
Approach	1504	4.0	1504	4.0		1.029		91.9	LOS F	77.5	559.5				
West: Lugard Street (W)															
Lane 1	95	5.5	95	5.5	253	0.375	100	56.3	LOS D	5.2	37.9	Full	500	0.0	0.0
Lane 2	227	9.7	227	9.7	186	1.222	100	277.0	LOS F	30.0	227.8	Full	500	-41.7 ^{N3}	0.0
Approach	322	8.5	322	8.5		1.222		211.9	LOS F	30.0	227.8				
All Vehicles	3781	5.0	3781	5.0		1.222		56.4	LOS D	77.5	559.5				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

- 1
- Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes.
Delay and stops experienced by drivers upstream of short lane entry have been accounted for.

N3 Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)										
South: Castlereagh Road (S)										
Mov.	L2	T1	Total	%HV		Deg.	Lane	Prob.	Ov.	
From S					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	W	N			veh/h	v/c	%	%	No.	
Lane 1	94	875	969	6.2	1337	0.725	100	NA	NA	
Lane 2	-	986	986	4.1	1361	0.725	100	NA	NA	
Approach	94	1861	1955	5.2		0.725				
North: Castlereagh Road (N)										
Mov.	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From N					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	S	W			veh/h	v/c	%	%	No.	
Lane 1	819	-	819	3.7	796	1.029	100	NA	NA	
Lane 2	626	-	626	3.7	609 ¹	1.029	100	NA	NA	
Lane 3	-	58	58	10.8	85	0.684	100	0.0	2	
Approach	1445	58	1504	4.0		1.029				
West: Lugard Street (W)										
Mov.	L2	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From W					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	N	S			veh/h	v/c	%	%	No.	
Lane 1	95	-	95	5.5	253	0.375	100	NA	NA	
Lane 2	-	227	227	9.7	186	1.222	100	NA	NA	
Approach	95	227	322	8.5		1.222				
	Total	%HV	Deg.Satn (v/c)							
All Vehicles	3781	5.0	1.222							

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

- 1
- Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes.
Delay and stops experienced by drivers upstream of short lane entry have been accounted for.

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate		Critical Gap	Follow-up Headway	Lane Flow Rate	Capacity	Deg. Satn	Min. Delay	Merge Delay
				veh/h	pcu/h	sec	sec	veh/h	veh/h	v/c	sec	sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis				
	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec

South: Castlereagh Road (S)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
North: Castlereagh Road (N)				
Lane 1	0.0	11.3	51.3	NA
Lane 2	0.0	8.7	51.3	NA
Lane 3	0.0	0.0	0.0	0.0
West: Lugard Street (W)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	20.7	400.5	NA

LANE SUMMARY

Site: 101 [AM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (GHD Vols) - Lugard with LT Lane)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [AM EX w LT (Network Folder: Existing + DEV - Lugard with LT Lane (GHD Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance															
	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh Dist] 					

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Approach Lane Flows (veh/h)										
South: Castlereagh Road (S)										
Mov.	L2	T1	Total	%HV		Deg.	Lane	Prob.	Ov.	
From S					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	W	N			veh/h	v/c	%	%	No.	
Lane 1	607	-	607	11.2	1548	0.392	100	0.0	2	
Lane 2	-	522	522	11.0	1441	0.362	100	NA	NA	
Lane 3	-	522	522	11.0	1441	0.362	100	NA	NA	
Approach	607	1044	1651	11.1		0.392				
North: Castlereagh Road (N)										
Mov.	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From N					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	S	W			veh/h	v/c	%	%	No.	
Lane 1	776	-	776	7.9	1469	0.529	100	NA	NA	
Lane 2	776	-	776	7.9	1469	0.529	100	NA	NA	
Lane 3	-	139	139	9.6	105	1.326	100	80.5	2	
Approach	1553	139	1692	8.0		1.326				
West: Lugard Street (W)										
Mov.	L2	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From W					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	N	S			veh/h	v/c	%	%	No.	
Lane 1	39	-	39	19.4	109	0.357	100	NA	NA	
Lane 2	-	152	152	24.6	171	0.888	100	NA	NA	
Approach	39	152	191	23.5		0.888				
Total		%HV	Deg.Satn (v/c)							
All Vehicles	3534	10.8	1.326							

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.											

Variable Demand Analysis				
	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: Castlereagh Road (S)				

Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
Lane 3	0.0	0.0	0.0	0.0
North: Castlereagh Road (N)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
Lane 3	0.0	17.2	587.2	NA
West: Lugard Street (W)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0

LANE SUMMARY

Site: 101 [PM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (GHD Vols) - Lugard with LT Lane)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Network: N101 [PM EX w LT (Network Folder: Existing + DEV - Lugard with LT Lane (GHD Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance															
	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back [Veh	Of Queue Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Castlereagh Road (S)															
Lane 1	110	25.8	110	25.8	1333	0.083	100	8.1	LOS A	1.0	8.6	Short	60	0.0	NA
Lane 2	913	4.1	913	4.1	1129 ¹	0.809	100	4.3	LOS A	18.3	132.6	Full	425	0.0	0.0
Lane 3	948	4.1	948	4.1	1171	0.809	100	3.6	LOS A	20.1	145.7	Full	425	0.0	0.0
Approach	1971	5.3	1971	5.3		0.809		4.2	LOS A	20.1	145.7				
North: Castlereagh Road (N)															
Lane 1	812	3.7	791	3.6	793	0.998	100	73.5	LOS F	70.5	508.6	Full	450	-42.0 ^{N3}	16.1
Lane 2	633	3.7	617	3.6	618 ¹	0.998	100	79.6	LOS F	56.1	404.9	Full	450	-42.0 ^{N3}	0.0
Lane 3	62	12.0	60	11.8	157	0.380	100	31.2	LOS C	2.9	22.6	Short	80	0.0	NA
Approach	1507	4.0	1468	3.9		0.998		74.3	LOS F	70.5	508.6				
West: Lugard Street (W)															
Lane 1	154	7.5	154	7.5	500	0.309	100	41.5	LOS C	7.1	52.9	Full	500	0.0	0.0
Lane 2	578	10.4	578	10.4	184	3.141	100	1992.8	LOS F	172.6	1315.9	Full	500	-42.0 ^{N3}	96.3
Approach	732	9.8	732	9.8		3.141		1581.6	LOS F	172.6	1315.9				
All Vehicles	4210	5.6	4172	5.7		3.141		305.8	LOS F	172.6	1315.9				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

- ¹ Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes.
Delay and stops experienced by drivers upstream of short lane entry have been accounted for.
- ^{N3} Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)										
South: Castlereagh Road (S)										
Mov.	L2	T1	Total	%HV		Deg.	Lane	Prob.	Ov.	
From S					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	W	N			veh/h	v/c	%	%	No.	
Lane 1	110	-	110	25.8	1333	0.083	100	0.0	2	
Lane 2	-	913	913	4.1	1129 ¹	0.809	100	NA	NA	
Lane 3	-	948	948	4.1	1171	0.809	100	NA	NA	
Approach	110	1861	1971	5.3		0.809				
North: Castlereagh Road (N)										
Mov.	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From N					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	S	W			veh/h	v/c	%	%	No.	
Lane 1	791	-	791	3.6	793	0.998	100	NA	NA	
Lane 2	617	-	617	3.6	618 ¹	0.998	100	NA	NA	
Lane 3	-	60	60	11.8	157	0.380	100	0.0	2	
Approach	1409	60	1468	3.9		0.998				
West: Lugard Street (W)										
Mov.	L2	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From W					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	N	S			veh/h	v/c	%	%	No.	
Lane 1	154	-	154	7.5	500	0.309	100	NA	NA	
Lane 2	-	578	578	10.4	184	3.141	100	NA	NA	
Approach	154	578	732	9.8		3.141				
Total		%HV	Deg.Satn (v/c)							
All Vehicles	4172	5.7	3.141							

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

- ¹ Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes.
Delay and stops experienced by drivers upstream of short lane entry have been accounted for.

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis			
	Initial	Residual	Time for Duration

	Queued Demand	Queued Demand	Residual Demand to Clear sec	of Oversatn sec
	veh	veh		
South: Castlereagh Road (S)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
Lane 3	0.0	0.0	0.0	0.0
North: Castlereagh Road (N)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
Lane 3	0.0	0.0	0.0	0.0
West: Lugard Street (W)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	197.0	3853.6	NA

LANE SUMMARY

Site: 101 [AM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (TTPA Vols) - Lugard with LT Lane)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

■ ■ Network: N101 [AM EX w LT (Network Folder: Existing + DEV - Lugard with LT Lane (TTPA Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance															
	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh Dist] 					

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Approach Lane Flows (veh/h)										
South: Castlereagh Road (S)										
Mov.	L2	T1	Total	%HV		Deg.	Lane	Prob.	Ov.	
From S					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	W	N			veh/h	v/c	%	%	No.	
Lane 1	191	-	191	12.3	1536	0.124	100	0.0	2	
Lane 2	-	522	522	11.0	1441	0.362	100	NA	NA	
Lane 3	-	522	522	11.0	1441	0.362	100	NA	NA	
Approach	191	1044	1235	11.2		0.362				
North: Castlereagh Road (N)										
Mov.	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From N					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	S	W			veh/h	v/c	%	%	No.	
Lane 1	859	-	859	8.1	1467	0.586	100	NA	NA	
Lane 2	859	-	859	8.1	1467	0.586	100	NA	NA	
Lane 3	-	75	75	8.7	158	0.476	100	0.0	2	
Approach	1719	75	1794	8.1		0.586				
West: Lugard Street (W)										
Mov.	L2	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From W					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	N	S			veh/h	v/c	%	%	No.	
Lane 1	36	-	36	18.1	110	0.326	100	NA	NA	
Lane 2	-	130	130	23.9	172	0.755	100	NA	NA	
Approach	36	130	166	22.7		0.755				
Total		%HV	Deg.Satn (v/c)							
All Vehicles	3195	10.1	0.755							

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.											

Variable Demand Analysis				
	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: Castlereagh Road (S)				

Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
Lane 3	0.0	0.0	0.0	0.0
North: Castlereagh Road (N)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
Lane 3	0.0	0.0	0.0	0.0
West: Lugard Street (W)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0

LANE SUMMARY

Site: 101 [PM EX - Lugard / Castlereagh (Site Folder: Existing + DEV (TPPA Vols) - Lugard with LT Lane)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

■ ■ Network: N101 [PM EX w LT (Network Folder: Existing + DEV - Lugard with LT Lane (TPPA Vols))]

New Site
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance															
	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back [Veh	Of Queue Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Castlereagh Road (S)															
Lane 1	94	25.8	94	25.8	1334	0.070	100	8.1	LOS A	0.9	7.3	Short	60	0.0	NA
Lane 2	916	4.1	916	4.1	1135 ¹	0.807	100	4.3	LOS A	18.4	133.2	Full	425	0.0	0.0
Lane 3	945	4.1	945	4.1	1171	0.807	100	3.6	LOS A	19.9	144.2	Full	425	0.0	0.0
Approach	1955	5.2	1955	5.2		0.807		4.2	LOS A	19.9	144.2				
North: Castlereagh Road (N)															
Lane 1	813	3.7	813	3.7	792	1.027	100	89.9	LOS F	76.7	554.0	Full	450	-41.9 ^{N3}	23.9
Lane 2	632	3.7	632	3.7	615 ¹	1.027	100	96.6	LOS F	61.5	444.4	Full	450	-41.9 ^{N3}	3.9
Lane 3	58	10.8	58	10.8	159	0.369	100	30.0	LOS C	2.8	21.4	Short	80	0.0	NA
Approach	1504	4.0	1504	4.0		1.027		90.4	LOS F	76.7	554.0				
West: Lugard Street (W)															
Lane 1	95	5.5	95	5.5	506	0.188	100	39.8	LOS C	4.2	30.8	Full	500	0.0	0.0
Lane 2	227	9.7	227	9.7	185	1.229	100	282.3	LOS F	30.3	230.0	Full	500	-41.9 ^{N3}	0.0
Approach	322	8.5	322	8.5		1.229		210.7	LOS F	30.3	230.0				
All Vehicles	3781	5.0	3781	5.0		1.229		56.0	LOS D	76.7	554.0				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

- 1

Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes.
Delay and stops experienced by drivers upstream of short lane entry have been accounted for.
- N3

Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)										
South: Castlereagh Road (S)										
Mov.	L2	T1	Total	%HV		Deg.	Lane	Prob.	Ov.	
From S					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	W	N			veh/h	v/c	%	%	No.	
Lane 1	94	-	94	25.8	1334	0.070	100	0.0	2	
Lane 2	-	916	916	4.1	1135 ¹	0.807	100	NA	NA	
Lane 3	-	945	945	4.1	1171	0.807	100	NA	NA	
Approach	94	1861	1955	5.2		0.807				
North: Castlereagh Road (N)										
Mov.	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From N					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	S	W			veh/h	v/c	%	%	No.	
Lane 1	813	-	813	3.7	792	1.027	100	NA	NA	
Lane 2	632	-	632	3.7	615 ¹	1.027	100	NA	NA	
Lane 3	-	58	58	10.8	159	0.369	100	0.0	2	
Approach	1445	58	1504	4.0		1.027				
West: Lugard Street (W)										
Mov.	L2	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From W					Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	N	S			veh/h	v/c	%	%	No.	
Lane 1	95	-	95	5.5	506	0.188	100	NA	NA	
Lane 2	-	227	227	9.7	185	1.229	100	NA	NA	
Approach	95	227	322	8.5		1.229				
Total		%HV	Deg.Satn (v/c)							
All Vehicles	3781	5.0	1.229							

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

- 1

Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes.
Delay and stops experienced by drivers upstream of short lane entry have been accounted for.

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis			
	Initial	Residual	Time for Duration

	Queued Demand	Queued Demand	Residual Demand to Clear sec	of Oversatn sec
	veh	veh		
South: Castlereagh Road (S)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
Lane 3	0.0	0.0	0.0	0.0
North: Castlereagh Road (N)				
Lane 1	0.0	10.5	47.8	NA
Lane 2	0.0	8.2	47.8	NA
Lane 3	0.0	0.0	0.0	0.0
West: Lugard Street (W)				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	21.1	411.4	NA