

APPENDIX 6. INVESTIGATIONS – TRAFFIC



CODE AMENDMENT
10-20 HALLS ROAD, Highbury
TRANSPORT INVESTIGATIONS REPORT



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10-20 Halls Road, Highbury
Transport Investigations Report

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1. EXECUTIVE SUMMARY

CIRQA has been engaged to undertake transport investigations to inform the Code Amendment for the potential rezoning of 10-20 Halls Road, Highbury. This report summarises investigations undertaken in respect to traffic and transport impacts of the proposed rezoning of the Affected Area from the existing Resource Extraction Zone to a General Neighbourhood Zone (or similar).

Specifically, this report contains advice in respect to the following matters:

- **site access** – review of the number, location and treatments for site access points;
- **external road network impacts** – comparative analysis of conditions on the adjacent road network associated with the existing zoning/land uses and the proposed zoning/land uses;
- **public transport** – review of public transport provisions for the site; and
- **walking and cycling** – review of walking and cycling provisions for the site (both internal and external).

In preparing the assessment, it has been assumed that the rezoning of the Affected Area and subsequent redevelopment could result in the creation of approximately 40 residential allotments (and dwellings).

The potential traffic generation associated with the redevelopment of the Affected Area (following its rezoning) identifies that approximately 30 additional peak hour movements (or 300 daily movements) could be distributed on to the adjacent road network.

The small level of traffic associated with the anticipated redevelopment would be well within the capacity of future access points for the Affected Area and the adjacent road network. The proposal would not alter the nature of function of Halls Road, Lower North East Road, or other surrounding roads.

The existing public transport services in the vicinity of the Affected Area are considered sufficient to service residents (and visitors) of future development outcomes provided adequate pedestrian connections between these services and the Affected Area are delivered through the development.

Any internal connections achieved within the Affected Area should ensure dedicated pedestrian facilities, whereas assuming a slow speed, low volume internal road is achieved (if proposed), cyclists would be able to safely share the carriageway with vehicles.

2. BACKGROUND

2.1 AFFECTED AREA

The Affected Area comprises approximately 1.85 ha of land located between Lower North East Road and Halls Road at Highbury. Specifically, the Affected Area comprises the following allotments:

- 10-14 Halls Road, Highbury; and
- 16-20 Halls Road, Highbury.

Figure 1 illustrates the location and extent of the Affected Area with respect to the adjacent road network.



Figure 1 – Location of the Affected Area with respect to the adjacent road network

The Planning and Design Code identifies that the Affected Area is located within a Resource Extraction Zone, with the following Overlays applicable:

- Hazards (Bushfire - Urban Interface);
- Hazards (Flooding - Evidence Required);
- Prescribed Wells Area;
- Regulated and Significant Tree; and

- Traffic Generating Development.

The northern allotment contains a detached dwelling and associated outbuildings, whereas the southern allotment is vacant/undeveloped. The existing movements between the allotments and the adjacent road network would be very low (less than 10 daily movements).

2.2 ADJACENT ROAD NETWORK

Halls Road is a local road under the care and control of City of Tea Tree Gully Council. Halls Road comprises a 7 m wide carriageway (approximate) with a single traffic lane in each direction. Parking is unrestricted on both sides of the road. Traffic data recorded by Austraffic (on behalf of CIRQA) indicates that daily traffic volumes are very low (in the order of 75 vehicles per day, vpd). The default urban speed limit of 50 km/h applies on Halls Road.

Lower North East Road is an arterial road under the care and control of the Department for Infrastructure and Transport (DIT). Adjacent the site, Lower North East Road comprises a single traffic lane and a bicycle lane in each direction. Traffic data obtained from DIT indicates that this section of Lower North East Road has an Annual Average Daily Traffic (AADT) volume in the order of 12,100 vehicles per day (vpd), of which approximately 3% are commercial vehicles. Adjacent the site, a 60 km/h speed limit applies on Lower North East Road.

Halls Road and Lower North East Road form a priority-controlled T-intersection (with priority assigned to Lower North East Road) approximately 180m north of the Affected Area. A sheltered right turn lane on Lower North East Road is provided at the intersection. The right turn lane also forms a continuous treatment for right turns into Casemate Street at its intersection with Lower North East Road (approximately 25 m to the north).

2.3 WALKING AND CYCLING

No formalised pedestrian or cyclist facilities are provided on Halls Road, with pedestrians and cyclists being required to share the carriageway with vehicles.

Concrete footpaths and full time bike lanes are provided on both sides of Lower North East Road, servicing pedestrians and cyclists.

2.4 PUBLIC TRANSPORT

Public bus services operate regularly in the vicinity of the Affected Area. Bus stops are located within 300 m of the Affected Area on both sides of Lower North East Road, however, as discussed above, no formalised pedestrian facilities are provided for access to/from these services (pedestrians would be likely to walk

within the grassed verge or on the road's carriageway). These stops are serviced by the following bus routes:

- 557 - Tea Tree Plaza Interchange to City (GoZone Service)
- 557S - Paradise Interchange to St Agnes
- 559 - Tea Tree Plaza Interchange to Paradise Interchange
- 559S - Paradise Interchange to St Agnes

3. POTENTIAL REZONING AND FUTURE DEVELOPMENT

3.1 LAND USE AND YIELD

The Affected Area is proposed to be rezoned to accommodate residential development. It is understood that the Affected Area would be defined as being within a General Neighbourhood Zone should the Code Amendment be enacted. For the purposes of these investigations, it has been assumed that the future division and development of the Affected Area would accommodate in the order of 40 dwellings in a medium density format (townhouses, row dwellings, etc.).

3.2 VEHICLE ACCESS AND ROAD INFRASTRUCTURE

It is anticipated that there may be a mix of dwellings accessed directly via Halls Road, as well as via a new public road network within the Affected Area. The design of any new roads would need to ensure appropriate accommodation of likely vehicle movements (including waste collection, emergency services access), driveway provisions, on-street parking and pedestrian/cycling provisions.

3.3 EMERGENCY SERVICES ACCESS

The design of the future internal road network (and associated connections/intersections) should ensure adequate provisions for emergency services vehicles (as well as egress for residents in the event of an emergency, such as a bushfire). This should be undertaken in conjunction with the relevant Emergency Services stakeholders (in particular, the Metropolitan Fire Service). Depending on the internal road alignment, consideration may need to be given to a rear access (fire) track for the Affected Area.

4. TRANSPORT INVESTIGATIONS

Traffic impact analysis has been prepared in relation to the potential future development of the Affected Area in line with the proposed rezoning. This has been prepared to inform the Code Amendment processes.

4.1 TRAFFIC GENERATION

Daily traffic generation rates of 7.5 to 8.0 trips per dwelling are typically adopted within metropolitan Adelaide for traditional, detached dwellings. However, noting the Affected Area's locality, level of public transport servicing and the higher density of development anticipated lower traffic generation rates may be realised (medium density development is often assessed with lower daily generation rates in the order of 6 trips per dwellings). Nevertheless, to provide a conservative assessment of the potential impacts of the rezoning and subsequent development, a rate of 7.5 trips per dwelling has been adopted for assessment of the proposal.

On this basis, the development of up to 40 dwellings within the Affected Area is forecast to be associated with the generation of up to 300 daily traffic movements. With approximately 10% of movements typically generated during the am and pm peak hours (each), there would be approximately 30 peak hour movements associated with the future development of the Affected Area.

4.2 TRIP DISTRIBUTION

Given the Affected Area is bound by existing developed areas, with access only available via Halls Road, creation of any new public roads would direct all of the forecast traffic to/from Halls Road/Lower North East Road intersection. The following distribution assumptions have been adopted for the assessment:

- movements will be 30% inbound and 70% outbound in the am peak hour and vice versa in the pm peak hour;
- 60% of movements will be to/from the south on Lower North East Road;
- 40% of movements will be to/from the north on Lower North East Road; and
- it is assumed that no movements are undertaken between Halls Road and Casemate Street (noting the disconnected road network associated with the two roads).

On the basis of these assumptions, the following additional movements are forecast for the Halls Road/Lower North East Road intersection:

- left-in – 4 am and 8 pm peak hour trips;
- right-in – 5 am and 13 pm peak hour trips;

- left-out – 13 am and 5 pm peak hour trips; and
- right-out – 8 am and 4 pm peak hour trips.

4.3 TRAFFIC IMPACT

As detailed above, the potential development of the Affected Area will distribute a very low level of traffic to the adjacent road network (i.e. an increase in the order of 30 peak hour movements on Halls Road and Lower North East Road). In respect to daily traffic volumes, this would equate to approximately 300 additional movements. Such movements would be well within the capacity of access points associated with the redevelopment of the Affected Area as well as the adjacent roads and intersections. Notably, daily traffic volumes on Halls Road would remain less than 400 vpd which is well below the level of 1,500 vpd typically associated with 'local roads'. The rezoning and subsequent development of the Affected Area would not change the nature or function of Halls Road, Lower North East Road or other surrounding roads.

Notwithstanding the above, for completeness, SIDRA analysis been prepared to assess conditions at the Halls Road/Lower North Road intersection as well as the Casemate/Lower North Road intersection. The SIDRA analysis has been based on existing traffic data recorded at the intersection and the above forecast additional movements.

The detailed output for the SIDRA files is attached in Appendices A and B. Table 1 summarises the key results for the intersection of Halls Road and Lower North East Road.

Table 1 - SIDRA results for am & (pm) peak hours at the Halls Road intersection

	Existing				Future			
	Deg. of Saturation	Average Delay	Level of Service	95th %ile Queue (m)	Deg. of Saturation	Average Delay	Level of Service	95th %ile Queue (m)
Lower North East Road (S)								
Through	0.191 (0.512)	0.1 (0.2)	A (A)	0.0 (0.0)	0.191 (0.512)	0.1 (0.2)	A (A)	0.0 (0.0)
Right	0.001 (0.010)	9.8 (8.6)	A (A)	0.0 (0.3)	0.012 (0.025)	10.0 (8.7)	A (A)	0.0 (0.7)
Halls Road (SE)								
Left	0.021 (0.031)	9.1 (7.8)	A (A)	0.1 (0.6)	0.081 (0.093)	9.3 (7.8)	A (A)	0.3 (1.9)
Right	0.021 (0.031)	19.1 (47.8)	C (E)	0.1 (0.6)	0.081 (0.093)	20.2 (50.4)	C (F)	0.3 (1.9)
Lower North East Road (N)								
Left	0.412 (0.313)	5.2 (5.2)	A (A)	0.0 (0.0)	0.416 (0.317)	5.2 (5.2)	A (A)	0.0 (0.0)
Through	0.412 (0.313)	0.2 (0.1)	A (A)	0.0 (0.0)	0.416 (0.317)	0.2 (0.1)	A (A)	0.0 (0.0)

The above results indicate that the additional volumes will generally have negligible impact on conditions at the Halls Road/Lower North East Road intersection. Levels of Service for all movements will remain as per the existing situation with the exception of the right-out movement from Halls Road in the pm peak hour. The SIDRA suggests that the right-out will worsen from Level of Service 'E' to 'F' in the pm peak hour. However, the number of movements

associated with this turn are very low and the delays associated with the turn typical for such movements from side streets to arterial roads. Furthermore, it is anticipated that the SIDRA results are conservative and that lower delays are likely in reality (noting that some drivers may choose to undertake a two-stage right-out or, if presented with excessive delays turn left out and find alternative routes). Overall, it is considered that there will be negligible change in conditions at the intersection as a result of the rezoning and subsequent development of the Affected Area.

Table 2 summarises the results for the intersection of Casemate Street/Lower North East Road.

Table 2 - SIDRA results for am & (pm) peak hours at the Casemate Street intersection

	Existing				Future			
	Deg. of Saturation	Average Delay	Level of Service	95th %ile Queue (m)	Deg. of Saturation	Average Delay	Level of Service	95th %ile Queue (m)
Lower North East Road (S)								
Through	0.192 (0.510)	0.1 (0.2)	A (A)	0.0 (0.0)	0.199 (0.514)	0.1 (0.2)	A (A)	0.0
Right	0.003 (0.007)	8.1 (6.9)	A (A)	0.1 (0.2)	0.003 (0.007)	8.1 (6.9)	A (A)	0.1
Casemate Street (E)								
Left	0.058 (0.044)	7.8 (6.4)	A (A)	1.3 (0.9)	0.059 (0.046)	7.8 (6.5)	A (A)	1.4
Right	0.058 (0.044)	20.8 (48.7)	C (E)	1.3 (0.9)	0.059 (0.046)	21.1 (50.5)	C (F)	1.4
Lower North East Road (N)								
Left	0.408 (0.313)	6.6 (6.6)	A (A)	0.0 (0.0)	0.408 (0.317)	6.6 (6.6)	A (A)	0.0
Through	0.408 (0.313)	0.2 (0.1)	A (A)	0.0 (0.0)	0.408 (0.317)	0.2 (0.1)	A (A)	0.0

The results for the Casemate Street are reflective of those at the Halls Road intersection. Namely, there will be little change in conditions associated with movements at the intersection, albeit a slight increase in delays for the right-out movement in the pm peak hour will worsen the Level of Service for that movement. As for the Halls Road intersection, the number of right-out movements from Casemate Street in the pm peak hour is very low. Overall conditions at the intersection will be anticipated to be similar to existing conditions will minimal impact as a result of the rezoning and subsequent redevelopment.

Based on the assessments undertaken, it is considered that the additional volumes generated by the future development of the site (following its rezoning) would be adequately accommodated on the surrounding road network. Specific road upgrades are not considered warranted to accommodate the forecast future volumes.

4.4 PUBLIC TRANSPORT

The existing public transport services available within the vicinity of the Affected Area are considered sufficient to service the anticipated future development,

however, additional pedestrian facilities in Halls Road would be deemed necessary in order to connect future development to said services.

4.5 WALKING AND CYCLING

The design of new road(s) within the site should include consideration of pedestrian and cyclist connectivity and safety. Given the relatively low volumes forecast, it is considered appropriate that cyclists share the carriageway with vehicles. However, footpaths should be provided and, desirably, a low speed, 'people' focussed street design should be sought within the site.

APPENDIX A

SIDRA ANALYSIS

EXISTING SITUATION

MOVEMENT SUMMARY

Site: 101 [Existing AM (Halls Road Only) (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Lower North East Road [S]															
2	T1	All MCs	358	2.6	358	2.6	0.191	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3b	R3	All MCs	1	0.0	1	0.0	0.001	9.8	LOS A	0.0	0.0	0.60	0.64	0.60	46.3
Approach			359	2.6	359	2.6	0.191	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
SouthEast: Halls Road [SE]															
21b	L3	All MCs	1	0.0	1	0.0	0.021	9.1	LOS A	0.1	0.5	0.80	0.89	0.80	42.1
23a	R1	All MCs	4	0.0	4	0.0	0.021	19.1	LOS C	0.1	0.5	0.80	0.89	0.80	42.1
Approach			5	0.0	5	0.0	0.021	17.1	LOS C	0.1	0.5	0.80	0.89	0.80	42.1
North: Lower North East Road [N]															
7a	L1	All MCs	1	0.0	1	0.0	0.412	5.2	LOS A	0.0	0.0	0.00	0.00	0.00	57.1
8	T1	All MCs	747	3.7	747	3.7	0.412	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach			748	3.7	748	3.7	0.412	0.2	NA	0.0	0.0	0.00	0.00	0.00	59.7
All Vehicles			1113	3.3	1113	3.3	0.412	0.2	NA	0.1	0.5	0.00	0.01	0.00	59.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 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 Gap.
 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.

MOVEMENT SUMMARY

Site: 101 [Existing PM (Halls Road Only) (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Lower North East Road [S]															
2	T1	All MCs	975	1.7	975	1.7	0.512	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.6
3b	R3	All MCs	9	0.0	9	0.0	0.010	8.6	LOS A	0.0	0.3	0.54	0.67	0.54	47.0
Approach			984	1.7	984	1.7	0.512	0.3	NA	0.0	0.3	0.01	0.01	0.01	59.4
SouthEast: Halls Road [SE]															
21b	L3	All MCs	3	0.0	3	0.0	0.031	7.8	LOS A	0.1	0.6	0.82	0.85	0.82	39.1
23a	R1	All MCs	2	0.0	2	0.0	0.031	47.8	LOS E	0.1	0.6	0.82	0.85	0.82	39.1
Approach			5	0.0	5	0.0	0.031	23.8	LOS C	0.1	0.6	0.82	0.85	0.82	39.1
North: Lower North East Road [N]															
7a	L1	All MCs	4	0.0	4	0.0	0.313	5.2	LOS A	0.0	0.0	0.00	0.00	0.00	57.2
8	T1	All MCs	593	1.1	593	1.1	0.313	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach			597	1.1	597	1.1	0.313	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
All Vehicles			1586	1.5	1586	1.5	0.512	0.3	NA	0.1	0.6	0.01	0.01	0.01	59.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 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 Gap.
 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.

MOVEMENT SUMMARY

Site: 101 [Existing AM (Casemate Street Only) (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Lower North East Road [S]															
2	T1	All MCs	360	2.6	360	2.6	0.192	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3a	R1	All MCs	2	0.0	2	0.0	0.003	8.1	LOS A	0.0	0.1	0.60	0.62	0.60	47.8
Approach			362	2.6	362	2.6	0.192	0.1	NA	0.0	0.1	0.00	0.00	0.00	59.8
NorthEast: Casemate Street [NE]															
24a	L1	All MCs	7	0.0	7	0.0	0.058	7.8	LOS A	0.2	1.3	0.77	0.90	0.77	42.9
26b	R3	All MCs	11	0.0	11	0.0	0.058	20.8	LOS C	0.2	1.3	0.77	0.90	0.77	42.7
Approach			18	0.0	18	0.0	0.058	15.4	LOS C	0.2	1.3	0.77	0.90	0.77	42.7
North: Lower North East Road [N]															
7b	L3	All MCs	1	0.0	1	0.0	0.408	6.6	LOS A	0.0	0.0	0.00	0.00	0.00	57.2
8	T1	All MCs	740	3.7	740	3.7	0.408	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach			741	3.7	741	3.7	0.408	0.2	NA	0.0	0.0	0.00	0.00	0.00	59.7
All Vehicles			1121	3.3	1121	3.3	0.408	0.4	NA	0.2	1.3	0.01	0.02	0.01	59.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 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 Gap.
 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.

MOVEMENT SUMMARY

Site: 101 [Existing PM (Casemate Street Only) (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Lower North East Road [S]															
2	T1	All MCs	971	1.7	971	1.7	0.510	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.6
3a	R1	All MCs	6	0.0	6	0.0	0.007	6.9	LOS A	0.0	0.2	0.54	0.60	0.54	48.5
Approach			977	1.7	977	1.7	0.510	0.3	NA	0.0	0.2	0.00	0.00	0.00	59.5
NorthEast: Casemate Street [NE]															
24a	L1	All MCs	4	0.0	4	0.0	0.044	6.4	LOS A	0.1	0.9	0.83	0.89	0.83	38.7
26b	R3	All MCs	3	0.0	3	0.0	0.044	48.7	LOS E	0.1	0.9	0.83	0.89	0.83	38.6
Approach			7	0.0	7	0.0	0.044	24.5	LOS C	0.1	0.9	0.83	0.89	0.83	38.6
North: Lower North East Road [N]															
7b	L3	All MCs	7	0.0	7	0.0	0.313	6.6	LOS A	0.0	0.0	0.00	0.01	0.00	57.3
8	T1	All MCs	588	1.1	588	1.1	0.313	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.7
Approach			596	1.1	596	1.1	0.313	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.7
All Vehicles			1580	1.5	1580	1.5	0.510	0.3	NA	0.1	0.9	0.01	0.01	0.01	59.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 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 Gap.
 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.

APPENDIX B

SIDRA ANALYSIS

FUTURE SCENARIO

MOVEMENT SUMMARY

Site: 101 [Future PM (Casemate Street Only) (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Lower North East Road [S]															
2	T1	All MCs	979	1.7	979	1.7	0.514	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.6
3a	R1	All MCs	6	0.0	6	0.0	0.007	6.9	LOS A	0.0	0.2	0.54	0.60	0.54	48.5
Approach			985	1.7	985	1.7	0.514	0.3	NA	0.0	0.2	0.00	0.00	0.00	59.5
NorthEast: Casemate Street [NE]															
24a	L1	All MCs	4	0.0	4	0.0	0.046	6.5	LOS A	0.1	0.9	0.84	0.90	0.84	38.4
26b	R3	All MCs	3	0.0	3	0.0	0.046	50.5	LOS F	0.1	0.9	0.84	0.90	0.84	38.2
Approach			7	0.0	7	0.0	0.046	25.4	LOS D	0.1	0.9	0.84	0.90	0.84	38.3
North: Lower North East Road [N]															
7b	L3	All MCs	7	0.0	7	0.0	0.317	6.6	LOS A	0.0	0.0	0.00	0.01	0.00	57.3
8	T1	All MCs	597	1.1	597	1.1	0.317	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.7
Approach			604	1.0	604	1.0	0.317	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.7
All Vehicles			1597	1.5	1597	1.5	0.514	0.3	NA	0.1	0.9	0.01	0.01	0.01	59.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 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 Gap.
 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.

MOVEMENT SUMMARY

Site: 101 [Future AM (Casemate Street Only) (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Lower North East Road [S]															
2	T1	All MCs	373	2.5	373	2.5	0.199	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3a	R1	All MCs	2	0.0	2	0.0	0.003	8.1	LOS A	0.0	0.1	0.60	0.62	0.60	47.8
Approach			375	2.5	375	2.5	0.199	0.1	NA	0.0	0.1	0.00	0.00	0.00	59.8
NorthEast: Casemate Street [NE]															
24a	L1	All MCs	7	0.0	7	0.0	0.059	7.8	LOS A	0.2	1.4	0.77	0.90	0.77	42.7
26b	R3	All MCs	11	0.0	11	0.0	0.059	21.1	LOS C	0.2	1.4	0.77	0.90	0.77	42.6
Approach			18	0.0	18	0.0	0.059	15.7	LOS C	0.2	1.4	0.77	0.90	0.77	42.6
North: Lower North East Road [N]															
7b	L3	All MCs	1	0.0	1	0.0	0.408	6.6	LOS A	0.0	0.0	0.00	0.00	0.00	57.2
8	T1	All MCs	740	3.7	740	3.7	0.408	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach			741	3.7	741	3.7	0.408	0.2	NA	0.0	0.0	0.00	0.00	0.00	59.7
All Vehicles			1134	3.2	1134	3.2	0.408	0.4	NA	0.2	1.4	0.01	0.02	0.01	59.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 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 Gap.
 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.

MOVEMENT SUMMARY

Site: 101 [Future AM (Halls Road Only) (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site

Site Category: (None)

Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV] veh/h	%	[Total HV] veh/h	%				[Veh.] veh	[Dist] m				
South: Lower North East Road [S]															
2	T1	All MCs	358	2.6	358	2.6	0.191	0.1	LOSA	0.0	0.0	0.00	0.00	0.00	59.9
3b	R3	All MCs	8	0.0	8	0.0	0.012	10.0	LOSA	0.0	0.3	0.61	0.73	0.61	46.2
Approach			366	2.6	366	2.6	0.191	0.3	NA	0.0	0.3	0.01	0.02	0.01	59.5
SouthEast: Halls Road [SE]															
21b	L3	All MCs	15	0.0	15	0.0	0.081	9.3	LOSA	0.3	1.9	0.75	0.89	0.75	43.5
23a	R1	All MCs	13	0.0	13	0.0	0.081	20.2	LOS C	0.3	1.9	0.75	0.89	0.75	43.5
Approach			27	0.0	27	0.0	0.081	14.4	LOS B	0.3	1.9	0.75	0.89	0.75	43.5
North: Lower North East Road [N]															
7a	L1	All MCs	5	0.0	5	0.0	0.416	5.2	LOSA	0.0	0.0	0.00	0.00	0.00	57.1
8	T1	All MCs	752	3.6	752	3.6	0.416	0.2	LOSA	0.0	0.0	0.00	0.00	0.00	59.7
Approach			757	3.6	757	3.6	0.416	0.2	NA	0.0	0.0	0.00	0.00	0.00	59.6
All Vehicles			1151	3.2	1151	3.2	0.416	0.6	NA	0.3	1.9	0.02	0.03	0.02	59.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

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 Gap.

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.

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MOVEMENT SUMMARY

Site: 101 [Future PM (Halls Road Only) (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site

Site Category: (None)

Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	[Total HV]	[Total HV]	[Total HV]	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h	%	veh/h	%				veh	m				
South: Lower North East Road [S]															
2	T1	All MCs	975	1.7	975	1.7	0.512	0.2	LOSA	0.0	0.0	0.00	0.00	0.00	59.6
3b	R3	All MCs	23	0.0	23	0.0	0.025	8.7	LOSA	0.1	0.7	0.54	0.71	0.54	46.9
Approach			998	1.7	998	1.7	0.512	0.4	NA	0.1	0.7	0.01	0.02	0.01	59.2
SouthEast: Halls Road [SE]															
21b	L3	All MCs	8	0.0	8	0.0	0.093	7.8	LOSA	0.3	1.9	0.84	0.93	0.84	38.2
23a	R1	All MCs	6	0.0	6	0.0	0.093	50.4	LOS F	0.3	1.9	0.84	0.93	0.84	38.2
Approach			15	0.0	15	0.0	0.093	26.1	LOS D	0.3	1.9	0.84	0.93	0.84	38.2
North: Lower North East Road [N]															
7a	L1	All MCs	13	0.0	13	0.0	0.317	5.2	LOSA	0.0	0.0	0.00	0.01	0.00	57.1
8	T1	All MCs	593	1.1	593	1.1	0.317	0.1	LOSA	0.0	0.0	0.00	0.01	0.00	59.7
Approach			605	1.0	605	1.0	0.317	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.6
All Vehicles			1618	1.4	1618	1.4	0.512	0.6	NA	0.3	1.9	0.02	0.02	0.02	59.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

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 Gap.

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.

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