APPENDIX 5

TRAFFIX
TRAFFIC AND TRANSPORT PLANNERS

TRAFFIC IMPACT ASSESSMENT

Planning Proposal for a Proposed Residential Development (Homes NSW)
36 Howard Boulevard, Goulburn, NSW 2529

Reference: 24.040r01v02
Date: March 2024

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CONTENTS

Appendices

1. INTRODUCTION

TRAFFIX has been commissioned by Homes NSW to undertake a Traffic Impact Assessment (TIA) in support of a Planning Proposal (PP) relating to the proposed rezoning the of 36 Howard Boulevard, Goulburn from RE1 – Public Recreation to R1 – General Residential in order to facilitate a multi dwelling residential development.

A concept scheme has been envisaged by Homes NSW, comprising a multi dwelling residential development with up to 30 units.

This report assesses the traffic impacts and parking requirements arising from this scheme, which is considered to be representative of the site being developed to its full potential when incorporating the proposed planning controls.

The report is structured as follows:

- Section 2: Describes the site and its location
- Section 3: Documents existing traffic conditions
- Section 4: Describes the planning proposal
- Section 5: Assesses the parking requirements
- Section 6: Assesses traffic impacts
- Section 7: Discusses access and internal design aspects
- Section 8: Presents the overall study conclusions

2. LOCATION AND SITE

The subject site is located at 36 Howard Boulevard, Goulburn (Lot 164 on DP250803).). It is situated on the southeast corner of the intersection of Howard Boulevard and Gibson Street. In a regional context, it is located approximately 2.2km north of Goulburn City Centre and 500 metres west of Charles Sturt University, Goulburn Campus.

The site is an irregular-shaped configuration and has a total site area of approximately 3,219m^2. It has a northern frontage to Howard Boulevard measuring approximately 79 metres and a western frontage to Gibson Street measuring approximately 45 metres. It is bounded on both the southern and eastern sides by neighbouring residential developments.

The site is currently vacant and is not currently configured with any vehicular access driveways.

A Location Plan is presented in Figure 1 and a Site Plan is presented in Figure 2 which provides an appreciation of the site in the context of neighbouring properties and surrounding streets.

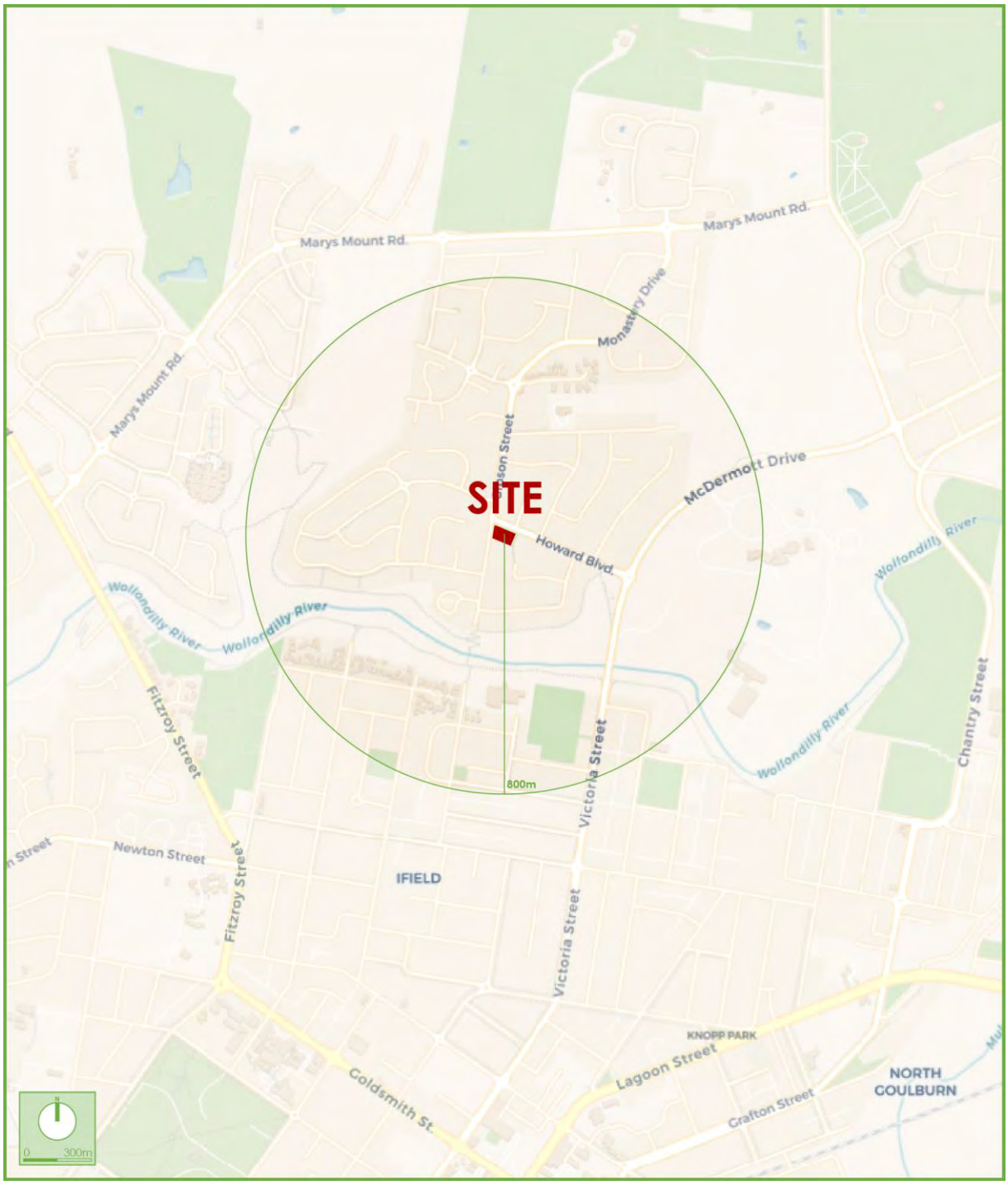

Figure 1: Location Plan

Figure 2: Site Plan

3. EXISTING TRAFFIC CONDITIONS

3.1 Road Network

The road hierarchy in the vicinity of the site is shown in Figure 3 with the following roads of particular interest:

- Howard Boulevard: a local road that generally runs in an east-west direction between Gibson Street in the west and McDermott Drive in the east. Howard Boulevard accommodates a single lane of traffic in either direction within an undivided carriageway and has a posted speed limit of 50 km/h. Unrestricted kerbside parking is generally permitted on both sides of Howard Boulevard.
- Gibson Street: a local road that generally runs in a north-south direction between Monastery Drive in the north and cul-de-sac in the south. Gibson Street accommodates a single lane of traffic in either direction within an undivided carriageway and has a posted speed limit of 50 km/h. Unrestricted kerbside parking is generally permitted on both sides of Gibson Street.
- McDermott Drive: a local road that generally runs in an east-west direction between Queen Street in the east and Victoria Road in the West. McDermott Drive accommodates a single lane of traffic in either direction within an undivided carriageway and has a posted speed limit of 50 km/h. Unrestricted kerbside parking is generally permitted on both sides of McDermott Drive.

It can be seen from Figure 3 that the site is conveniently located with respect to local and arterial roads serving the region, with connectivity to the north and south using McDermott Drive.

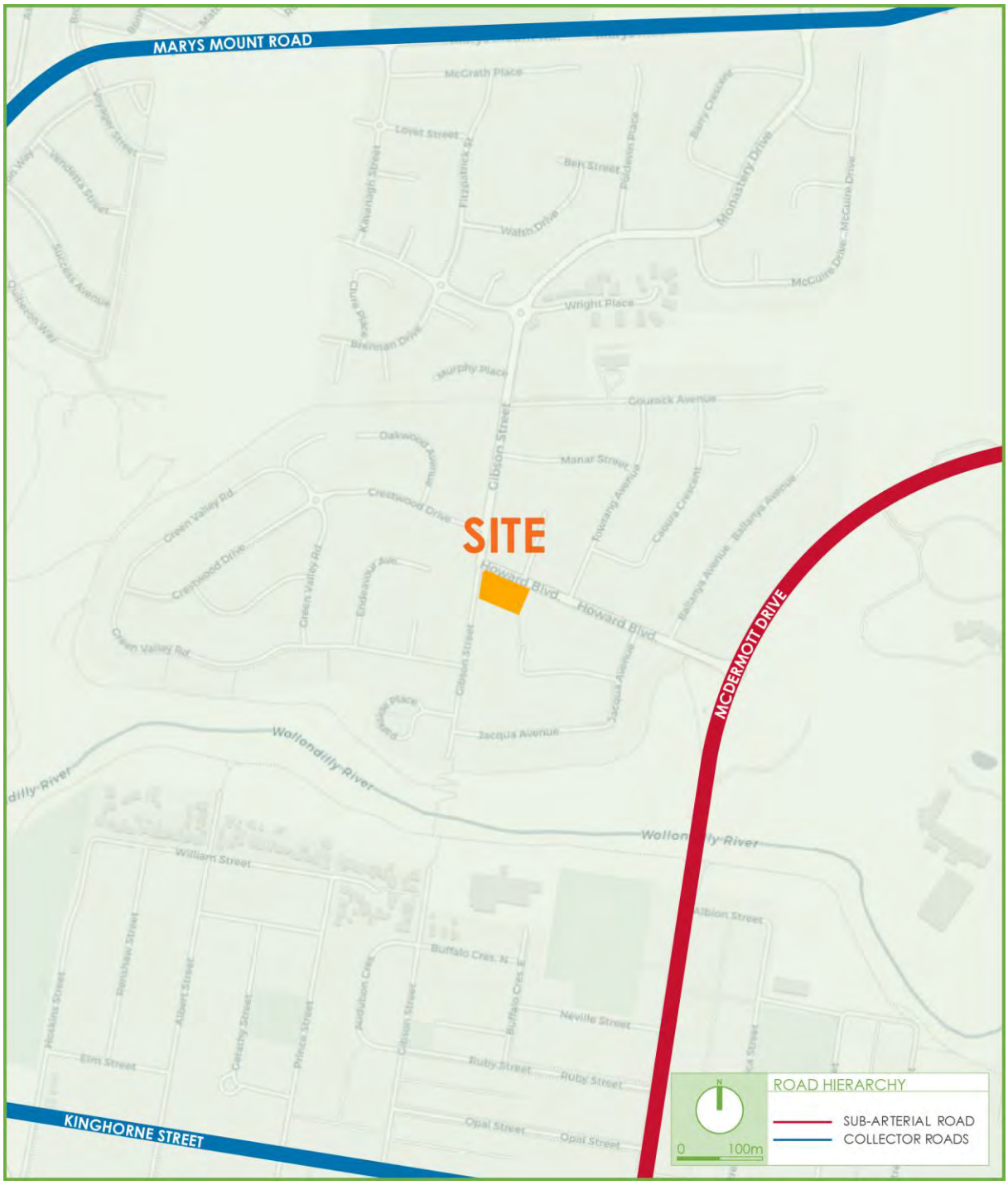

Figure 3: Road Hierarchy

3.2 Public Transport

Standard transport planning guidelines state that a development is advantageously located to benefit bus services if it is within 400 metres walking distance of a bus stop.

As shown in Figure 4, there are four (4) bus stops within a 400-metre walk of the site. The nearby bus services are summarised in Table 1 below:

Bus No.	Route	Mondays to Fridays	Saturday	Sunday
821A	Goulburn to Kenmore (Loop Service anti-clockwise)	Every 80 minutes	Every 80 minutes	-
821B	Goulburn to Kenmore (Loop Service clockwise)	Every 80 minutes	Every 60 minutes	-

These services provide convenient connections to Goulburn, Bradfordville and Kenmore.

It must be noted that due to the frequency of the surrounding bus services, the subject site is not considered to be located within an "accessible area" as defined by SEPP (Housing) (2021).

More information concerning all bus service information can be found on the Transport for NSW Info website: https://www.transportnsw.info.

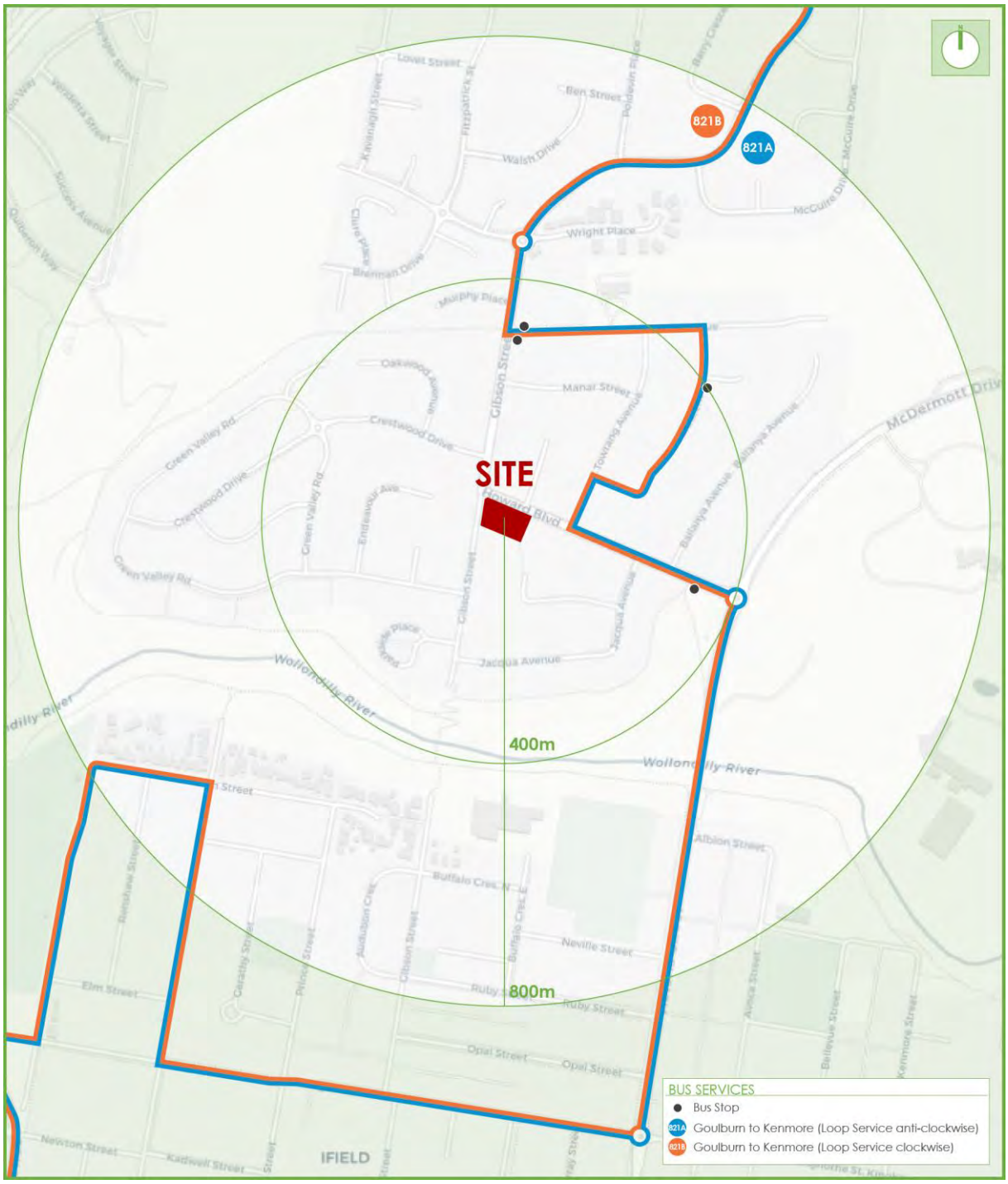

Figure 4: Public Transport

3.3 Key Intersections

Two (2) key intersections have been identified in the vicinity of the site being Gibson Street / Howard Boulevard and McDermott Drive / Howard Boulevard. These are the primary intersections which will be utilised by road users associated with this development.

3.3.1 Gibson Street and Howard Boulevard Intersection

It can be seen from Figure 5 that the intersection of Gibson Street and Howard Boulevard is a three-legged priority-controlled intersection, with Gibson Street being the major road.

Figure 5: Gibson Street and Howard Boulevard Intersection

The main attributes of each approach are outlined as follows:

- Gibson Street (north and south legs)
  - The southbound approach provides a single through lane permitting left turns.
  - The northbound approach provides a single through lane permitting right turns.
- Howard Boulevard (east leg)
  - The westbound approach provides a single lane permitting all movements.

3.3.2 McDermott Drive and Howard Boulevard

It can be seen from Figure 6 that the intersection of McDermott Drive and Howard Boulevard is a three-legged roundabout intersection, with McDermott Drive being the major road.

Figure 6: McDermott Drive and Howard Boulevard Intersection

The main attributes of each approach are outlined as follows:

- McDermott Drive (north and south legs)
  - The southbound approach provides a single lane permitting all movements.
  - The northbound approach provides a single lane permitting all movements.
- Howard Boulevard (west leg)
  - The eastbound approach provides a single lane permitting all movements.

4. DESCRIPTION OF PROPOSED DEVELOPMENT

The Planning Proposal (PP) seeks to rezone 36 Howard Boulevard, Goulburn from RE1 – Public Recreation to R1 – General Residential in order to facilitate a multi dwelling residential development.

For the purpose of the PP assessment, a concept development scheme for a multi dwelling residential development has been envisaged, which is representative of the full development potential of the site under the proposed rezoning comprised of the following:

- Up to 30 residential units made up of the following mix:
  - 18 × one-bedroom units; and
  - 12 × two-bedroom units.
- Off-street parking facilities to be provided in accordance with statutory requirements.
- Vehicular access is envisaged via Howard Boulevarde for the purposes of this PP, however other vehicular access options could be explored at Development Application (DA) stage including:
  - Access via Gibson Street; or,
  - Access via extension of Gundary Street at the rear of the site.

The parking and traffic impacts of the proposed development are discussed in Section 5 and Section 6.

5. PARKING REQUIREMENTS

5.1 Car Parking

5.1.1 State Environmental Planning Policy (Housing) 2021

The State Environmental Planning Policy (Housing) (2021) provides the statutory car parking requirements for a multi dwelling residential development on the site.

Based on the information provided and noting the site is not situated within an "accessible area", the future residential development will be subject to parking requirements specified under Part 2, Division 6, Clause 42 (f). These requirements are summarised in Table 1.

Table 1: SEPP (Housing) (2021) Car Parking Rates and Provisions

Type	Type of Dwelling	No. / Size	Minimum Parking Rate	Required Parking
Multi-Dwelling Housing	One-Bedroom	18	0.5 parking spaces per dwelling	9
	Two-Bedroom	12	1 parking spaces per dwelling	12
			Total	21

As highlighted above the SEPP requires a total of 21 spaces to accommodate thirty (30) affordable housing units which will be ultimately provided on the site in compliance with SEPP (Housing) (2021) requirements and designed in accordance with AS 2890.1 (2004). These matters are to be assessed in detail at DA stage.

5.2 Refuse Collection and Servicing

Preliminary waste collection arrangements involve collection occurring along the kerbside for the purposes of this planning proposal. Service and waste collection arrangements are to be confirmed at DA Stage and all loading areas are to be designed in accordance with AS 2890.2 (2018).

6. TRAFFIC AND TRANSPORT IMPACTS

6.1 Existing Development Traffic Generation

The subject site is currently vacant, and as such, does not currently generate any traffic.

6.2 Proposed Development Trip Generation

The impacts of the proposed development on the external road network have been assessed having regard for the indicative yield scenarios as summarised in Section 4 above. This assessment has been undertaken in accordance with the requirements of the TfNSW Guide to Traffic Generating Developments 2002 (GTGD) and the TfNSW Technical Direction (TDT 2013/04a).

The GTGD provides the following trip generation advice for medium density residential development which have been adopted for assessing the traffic generating potential of the subject development. The relevant trip rates are as follows:

- 0.50 vehicle trips per unit during both the morning and evening peak hour.

Application of these trip rates to the 30 residential apartments proposed, and adopting an 80:20 split, results in the following predicted trip generation volumes:

- 15 vehicle trips per hour during the morning peak period; (3 in, 12 out); and
- 15 vehicle trips per hour during the evening peak period; (12 in, 3 out)

6.3 Traffic Distribution

An analysis of the surrounding road network has been used to determine the future distribution of traffic to and from the proposed development assuming vehicular access is to be provided via Howard Boulevarde. In this regard the localised distribution of traffic at the key intersection in the vicinity of the site is summarised in Figure 7 and Figure 8. Notwithstanding, it is appreciated that minor variations to the expected traffic distribution under alternate vehicular access arrangements via either Gibson Street or Gundary Street is expected to have negligible impacts on the outcome of this traffic study.

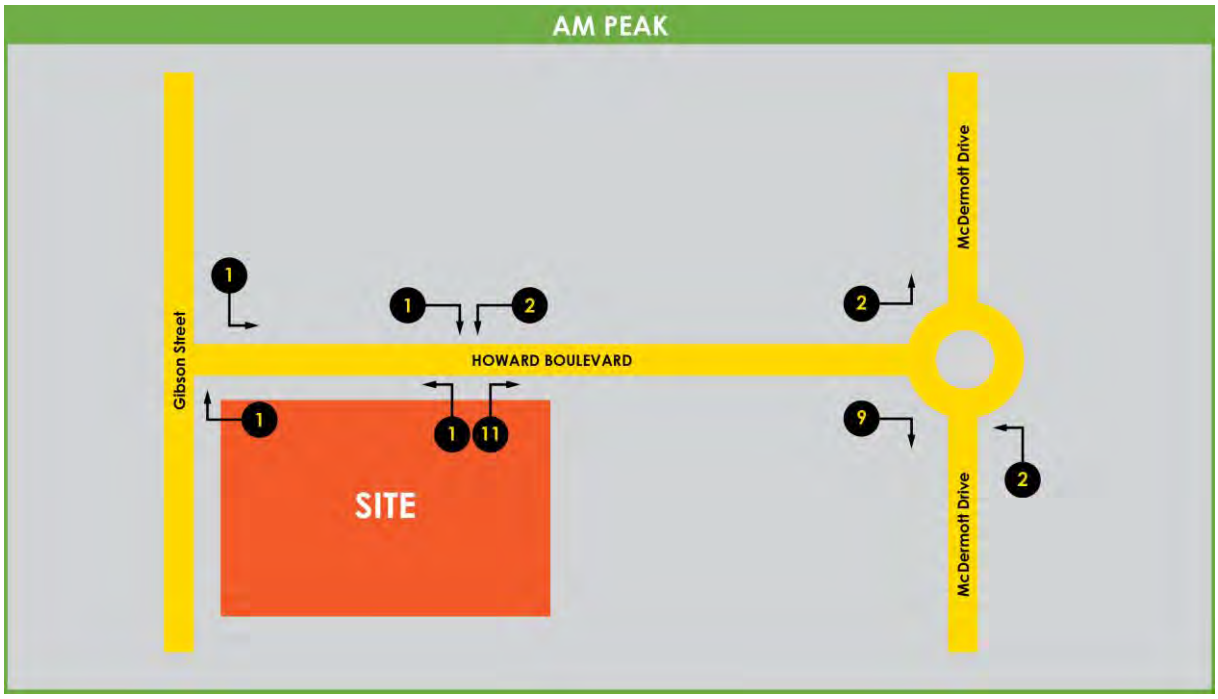

Figure 7: Development Traffic Distribution – AM Peak

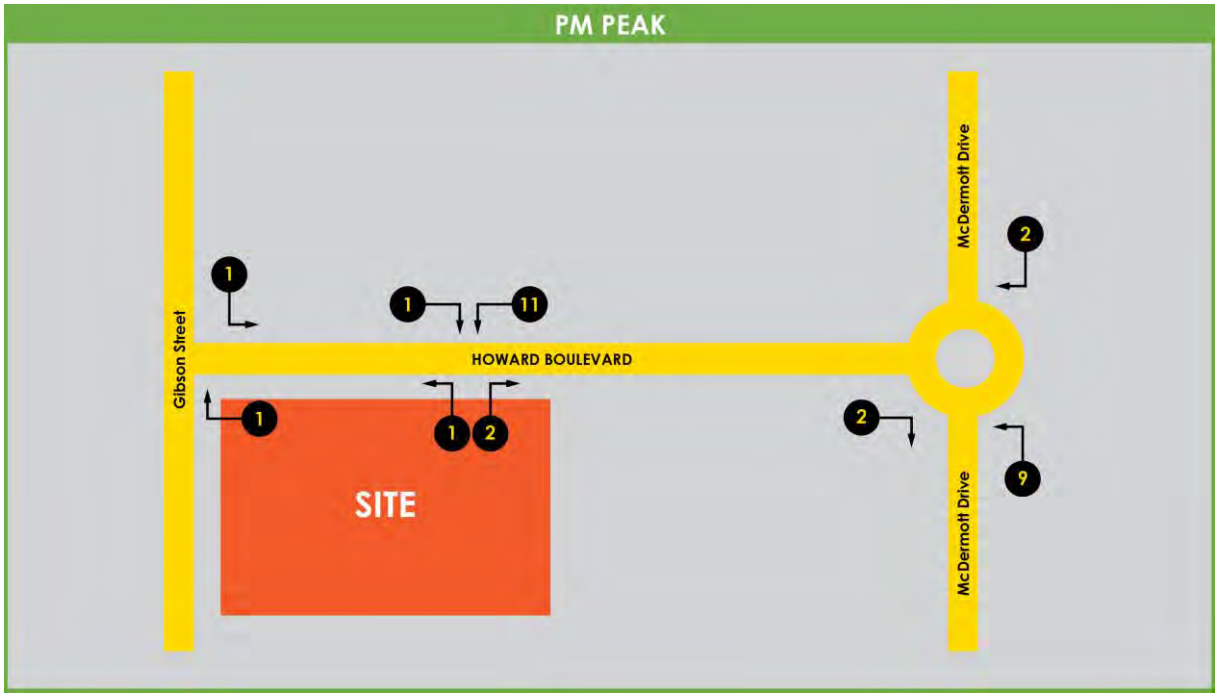

Figure 8: Development Traffic Distribution – PM Peak

6.4 Peak Period Intersection Performance

In order to assess the potential traffic impacts of the proposed development, the following scenarios were identified:

- 2024 Base Case; and
- 2024 Base Case + Development.

Traffic surveys were undertaken on Wednesday, 21st February 2024 at Gibson Street/Howard Boulevard intersection and McDermott Drive/Howard Boulevard adjacent to the site during the road network peak periods between 7:00am and 9:00am and 3:00pm and 6:00pm.

The traffic volumes in these surveys formed the base case for modelling purposes to assess intersection performance characteristics under existing traffic conditions.

The SIDRA Intersection 9 model produces a range of outputs, the most useful of which are the Degree of Saturation (DOS) and Average Vehicle Delay per vehicle (AVD). The AVD is in turn related to a level of service (LOS) criteria. These performance measures can be interpreted using the following explanations:

DoS - the DoS is a measure of the operational performance of individual intersections. As both queue length and delay increase rapidly as DoS approaches 1, it is usual to attempt to keep DoS to less than 0.9. When DoS exceeds 0.9 residual queues can be anticipated, as occurs at many major intersections throughout the metropolitan area during peak periods. In this regard, a practical limit at 1.1 can be assumed. For intersections controlled by roundabout or give way/stop control, satisfactory intersection operation is generally indicated by a DoS of 0.8 or less.

AVD - the AVD for individual intersections provides a measure of the operational performance of an intersection. In general, levels of acceptability of AVD for individual intersections depend on the time of day (motorists generally accept higher delays during peak commuter periods) and the road system being modelled (motorists are more likely to accept longer delays on side streets than on the main road system).

LOS - this is a comparative measure which provides an indication of the operating performance of an intersection.

A summary of the modelled results is provided below in Table 3. Reference should also be made to the SIDRA outputs provided in Appendix A which provide detailed results for individual lanes and approaches.

Table 3: Existing and Proposed Intersection Performance

Intersection	Control	Period	Scenario	Degree of Saturation (DoS)	Average Delay	Level of Service
Gibson Street and Howard Boulevard	Priority*	AM	Existing	0.140	5.6s	A
			Existing + Development	0.141	5.6s	A
		PM	Existing	0.451	11.8s	A
			Existing + Development	0.452	11.8s	A
McDermott Drive and Howard Boulevard	Roundabout*	AM	Existing	0.091	9.1s	A
			Existing + Development	0.099	9.2s	A
		PM	Existing	0.089	9.0s	A
			Existing + Development	0.091	9.0s	A

* LoS for priority/roundabout intersections based on the worst performing movement in accordance with TfNSW Guide to Traffic Generating Development.

It can be seen from Table 3 that all key intersections with Howard Boulevard operates satisfactorily at LoS 'A' under both the Base Case (2024) and Base Case plus Development scenarios and the latter is the scenario that reflects the criteria for assessing impacts under RMS Guidelines, That is , the EP&A Act as well as the RMS Guidelines require that a development need only be assessed for improvements that are required to support the development itself. This is a consequence of the need to identify a nexus between the development and any measures required to manage associated impacts.

In summary, the SIDRA modelling analysis demonstrates that the development proposal will not result in any unacceptable traffic implications, and all nearby critical intersections are expected to continue to operate satisfactorily, and as such, there are no road improvements or intersection upgrades required.

As highlighted above the Howard Boulevard and Gibson Street intersection operates at LOS A under both the Base Case (2024) and Base Case plus Development scenarios noting there are no road improvements or intersection upgrades required. However, Council could consider the installation of "No Stopping" signages 10m from the intersection to ensure a greater compliance with road rules.

It is again reiterated that any traffic impacts associated with minor variations to the expected traffic distribution under alternate vehicular access arrangements via either Gibson Street or Gundary Street is expected to be negligible from a road network capacity perspective.

7. ACCESS AND INTERNAL DESIGN ASPECTS

7.1 Site Vehicular Access

The PP envisages vehicular access to the future development will be provided via Howard Boulevard. The access driveway will be category 1 as less than 25 parking spaces would be proposed, and Howard Boulevard is a local road. Therefore, entry width will be provided between 3.0m to 5.5m in accordance with AS 2890.1 (2004). Furthermore, the proposed access driveway location will be provided outside the prohibited zone of access driveways in accordance with AS 2890.1 (2004) as illustrated in Figure 10.

Figure 10: Prohibited Zones of Access Driveways

7.2 Alternative Vehicular Access Arrangements

7.2.1 Gibson Street

A preliminary assessment of a potential alternative vehicular access via Gibson Street has been undertaken. Similarly, the access driveway at this location will be category 1 as less than 25 parking spaces would be proposed, and Gibson Street is a local road. Therefore, entry width will be provided between 3.0m to 5.5m in accordance with AS 2890.1 (2004).

7.2.2 Gundary Street

A preliminary assessment was also undertaken for a potential alternative vehicular access via Gundary Street. Similarly, the access driveway at this location will be category 1 as less than 25 parking spaces would be proposed, and Gundary Street is a local road. Therefore, entry width will be provided between 3.0m to 5.5m in accordance with AS 2890.1 (2004).

7.3 Internal Design

The carparks and servicing areas will be assessed and designed in full compliance in with the requirements of AS 2890.1 (2004), AS 2890.2 (2018) and AS 2890.6 (2009) at DA Stage.

8. CONCLUSIONS

In summary:

- The Planning Proposal (PP) seeks approval to rezone 36 Howard Boulevard, Goulburn (Lot 164, DP250803) from RE1 – Public Recreation to R1 – General Residential in order to facilitate a multi dwelling residential development.
- For the purposes of this assessment a concept scheme has been envisaged by Homes NSW, comprising a multi dwelling residential development with up to 30 units.
- The planning proposal envisaged vehicular access will be provided via Howard Boulevard in accordance with AS 2890.1 (2004) requirements. Notwithstanding, vehicular access options via Gibson Street or Gundary Street will also be explored at DA stage and are inconsequential for the purposes of this PP traffic assessment.
- A detailed design of the access arrangements, off-street parking and loading facilities will be conducted at DA stage in full compliance with AS 2890.1 (2004) requirements.
- The total provision of off-street parking will be assessed at DA stage in accordance with SEPP (Housing) (2021) requirements.
- The traffic generation arising from the development has been assessed as a net change over existing condition. SIDRA modelling shows a LoS 'A' in all scenarios for the key intersections surrounding the site. As such, there are no road improvements or intersection upgrades required to support the planning proposal.

This traffic impact assessment therefore demonstrates that the planning proposal is supportable on traffic planning grounds. TRAFFIX anticipates an ongoing involvement during the approval process. It is further noted that a detailed assessment will occur at development application stage, based on final development yields and associated plans.

APPENDIX A

SIDRA Movement Summaries

MOVEMENT SUMMARY

Site: 101 [Gibson St x Howard Blvd - EX_AM (Site Folder: Exisiting Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection: Gibson Street and Howard Boulevard
Scenario: Existing
Period: AM Peak
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Gibson Street															
2	T1	All MCs	8	12.5	8	12.5	0.047	0.0	LOS A	0.2	1.5	0.36	0.51	0.36	45.4
3	R2	All MCs	58	3.6	58	3.6	0.047	5.6	LOS A	0.2	1.5	0.36	0.51	0.36	43.9
Approach			66	4.8	66	4.8	0.047	4.9	NA	0.2	1.5	0.36	0.51	0.36	44.1
East: Howard Boulevard															
4	L2	All MCs	13	8.3	13	8.3	0.094	4.7	LOS A	0.3	2.4	0.14	0.52	0.14	44.1
6	R2	All MCs	91	3.5	91	3.5	0.094	5.4	LOS A	0.3	2.4	0.14	0.52	0.14	44.7
Approach			103	4.1	103	4.1	0.094	5.3	LOS A	0.3	2.4	0.14	0.52	0.14	44.7
North: Gibson Street															
7	L2	All MCs	261	0.8	261	0.8	0.140	4.6	LOS A	0.0	0.0	0.00	0.51	0.00	45.4
8	T1	All MCs	7	14.3	7	14.3	0.140	0.0	LOS A	0.0	0.0	0.00	0.51	0.00	46.1
Approach			268	1.2	268	1.2	0.140	4.5	NA	0.0	0.0	0.00	0.51	0.00	45.4
All Vehicles			438	2.4	438	2.4	0.140	4.7	NA	0.3	2.4	0.09	0.51	0.09	45.1

Site Level of Service (LOS) Method: Delay (RTA NSW). 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: 102 [Gibson St x Howard Blvd - EX_PM (Site Folder: Exisiting Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection: Gibson Street and Howard Boulevard
Scenario: Existing
Period: PM Peak
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Gibson Street															
2	T1	All MCs	37	0.0	37	0.0	0.199	0.0	LOS A	0.9	6.4	0.70	0.82	0.70	42.9
3	R2	All MCs	112	0.0	112	0.0	0.199	11.8	LOS A	0.9	6.4	0.70	0.82	0.70	41.7
Approach			148	0.0	148	0.0	0.199	8.9	NA	0.9	6.4	0.70	0.82	0.70	42.0
East: Howard Boulevard															
4	L2	All MCs	20	15.8	20	15.8	0.075	4.8	LOS A	0.2	2.3	0.28	0.51	0.28	42.1
6	R2	All MCs	26	60.0	26	60.0	0.075	11.2	LOS A	0.2	2.3	0.28	0.51	0.28	42.2
Approach			46	40.9	46	40.9	0.075	8.4	LOS A	0.2	2.3	0.28	0.51	0.28	42.1
North: Gibson Street															
7	L2	All MCs	825	0.9	825	0.9	0.451	4.7	LOS A	0.0	0.0	0.00	0.50	0.00	45.3
8	T1	All MCs	38	8.3	38	8.3	0.451	0.2	LOS A	0.0	0.0	0.00	0.50	0.00	46.0
Approach			863	1.2	863	1.2	0.451	4.5	NA	0.0	0.0	0.00	0.50	0.00	45.3
All Vehicles			1058	2.8	1058	2.8	0.451	5.3	NA	0.9	6.4	0.11	0.55	0.11	44.7

Site Level of Service (LOS) Method: Delay (RTA NSW). 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: 201 [McDermott Dr x Howard Blvd - EX_AM (Site Folder: Exisiting Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection: McDermott Drive and Howard Boulevard
Scenario: Exisiting
Period: AM Peak
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: McDermott Drive															
1	L2	All MCs	14	15.4	14	15.4	0.062	3.7	LOS A	0.3	2.8	0.19	0.40	0.19	46.0
2	T1	All MCs	49	48.9	49	48.9	0.062	3.9	LOS A	0.3	2.8	0.19	0.40	0.19	46.3
3u	U	All MCs	1	0.0	1	0.0	0.062	8.9	LOS A	0.3	2.8	0.19	0.40	0.19	46.1
Approach			64	41.0	64	41.0	0.062	4.0	LOS A	0.3	2.8	0.19	0.40	0.19	46.2
North: McDermott Drive															
8	T1	All MCs	49	29.8	49	29.8	0.082	3.7	LOS A	0.4	3.3	0.17	0.52	0.17	45.1
9	R2	All MCs	19	11.1	19	11.1	0.082	7.3	LOS A	0.4	3.3	0.17	0.52	0.17	44.4
9u	U	All MCs	32	0.0	32	0.0	0.082	8.8	LOS A	0.4	3.3	0.17	0.52	0.17	44.8
Approach			100	16.8	100	16.8	0.082	6.0	LOS A	0.4	3.3	0.17	0.52	0.17	44.9
West: Howard Boulevard															
10	L2	All MCs	65	6.5	65	6.5	0.091	3.8	LOS A	0.4	3.4	0.25	0.52	0.25	45.4
12	R2	All MCs	39	13.5	39	13.5	0.091	7.7	LOS A	0.4	3.4	0.25	0.52	0.25	44.9
12u	U	All MCs	1	0.0	1	0.0	0.091	9.1	LOS A	0.4	3.4	0.25	0.52	0.25	44.8
Approach			105	9.0	105	9.0	0.091	5.3	LOS A	0.4	3.4	0.25	0.52	0.25	45.2
All Vehicles			269	19.5	269	19.5	0.091	5.2	LOS A	0.4	3.4	0.21	0.49	0.21	45.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.
Roundabout 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: 201 [McDermott Dr x Howard Blvd - EX_PM (Site Folder: Exisiting Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection: McDermott Drive and Howard Boulevard
Scenario: Exisiting
Period: PM Peak
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: McDermott Drive															
1	L2	All MCs	38	61.1	38	61.1	0.075	4.0	LOS A	0.4	3.7	0.15	0.44	0.15	45.0
2	T1	All MCs	33	64.5	33	64.5	0.075	3.9	LOS A	0.4	3.7	0.15	0.44	0.15	45.7
3u	U	All MCs	8	0.0	8	0.0	0.075	8.9	LOS A	0.4	3.7	0.15	0.44	0.15	45.6
Approach			79	56.0	79	56.0	0.075	4.5	LOS A	0.4	3.7	0.15	0.44	0.15	45.4
North: McDermott Drive															
8	T1	All MCs	33	58.1	33	58.1	0.057	3.9	LOS A	0.3	2.5	0.15	0.51	0.15	44.8
9	R2	All MCs	16	20.0	16	20.0	0.057	7.4	LOS A	0.3	2.5	0.15	0.51	0.15	44.2
9u	U	All MCs	16	6.7	16	6.7	0.057	8.9	LOS A	0.3	2.5	0.15	0.51	0.15	44.6
Approach			64	36.1	64	36.1	0.057	6.0	LOS A	0.3	2.5	0.15	0.51	0.15	44.6
West: Howard Boulevard															
10	L2	All MCs	83	3.8	83	3.8	0.089	3.6	LOS A	0.4	3.4	0.21	0.48	0.21	46.0
12	R2	All MCs	22	52.4	22	52.4	0.089	8.0	LOS A	0.4	3.4	0.21	0.48	0.21	45.0
12u	U	All MCs	1	0.0	1	0.0	0.089	9.0	LOS A	0.4	3.4	0.21	0.48	0.21	45.5
Approach			106	13.9	106	13.9	0.089	4.6	LOS A	0.4	3.4	0.21	0.48	0.21	45.8
All Vehicles			249	32.9	249	32.9	0.089	4.9	LOS A	0.4	3.7	0.18	0.47	0.18	45.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.
Roundabout 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: 301 [Gibson St x Howard Blvd - PRO_AM (Site Folder: Exisiting + Proposed Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection: Gibson Street and Howard Boulevard
Scenario: Existing + Proposed
Period: AM Peak
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Gibson Street															
2	T1	All MCs	8	12.5	8	12.5	0.047	0.0	LOS A	0.2	1.5	0.36	0.52	0.36	45.4
3	R2	All MCs	58	3.6	58	3.6	0.047	5.6	LOS A	0.2	1.5	0.36	0.52	0.36	43.9
Approach			66	4.8	66	4.8	0.047	4.9	NA	0.2	1.5	0.36	0.52	0.36	44.1
East: Howard Boulevard															
4	L2	All MCs	13	8.3	13	8.3	0.095	4.7	LOS A	0.3	2.4	0.14	0.52	0.14	44.1
6	R2	All MCs	92	3.4	92	3.4	0.095	5.4	LOS A	0.3	2.4	0.14	0.52	0.14	44.7
Approach			104	4.0	104	4.0	0.095	5.3	LOS A	0.3	2.4	0.14	0.52	0.14	44.6
North: Gibson Street															
7	L2	All MCs	262	0.8	262	0.8	0.141	4.6	LOS A	0.0	0.0	0.00	0.51	0.00	45.4
8	T1	All MCs	7	14.3	7	14.3	0.141	0.0	LOS A	0.0	0.0	0.00	0.51	0.00	46.1
Approach			269	1.2	269	1.2	0.141	4.5	NA	0.0	0.0	0.00	0.51	0.00	45.4
All Vehicles			440	2.4	440	2.4	0.141	4.7	NA	0.3	2.4	0.09	0.51	0.09	45.1

Site Level of Service (LOS) Method: Delay (RTA NSW). 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: 302 [Gibson St x Howard Blvd - PRO_PM (Site Folder: Exisiting + Proposed Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection: Gibson Street and Howard Boulevard
Scenario: Existing + Proposed
Period: PM Peak
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Gibson Street															
2	T1	All MCs	37	0.0	37	0.0	0.200	0.0	LOS A	0.9	6.4	0.70	0.83	0.70	42.9
3	R2	All MCs	112	0.0	112	0.0	0.200	11.8	LOS A	0.9	6.4	0.70	0.83	0.70	41.7
Approach			148	0.0	148	0.0	0.200	8.9	NA	0.9	6.4	0.70	0.83	0.70	42.0
East: Howard Boulevard															
4	L2	All MCs	20	15.8	20	15.8	0.077	4.8	LOS A	0.3	2.4	0.29	0.51	0.29	42.1
6	R2	All MCs	27	57.7	27	57.7	0.077	11.0	LOS A	0.3	2.4	0.29	0.51	0.29	42.2
Approach			47	40.0	47	40.0	0.077	8.4	LOS A	0.3	2.4	0.29	0.51	0.29	42.2
North: Gibson Street															
7	L2	All MCs	826	0.9	826	0.9	0.452	4.7	LOS A	0.0	0.0	0.00	0.50	0.00	45.3
8	T1	All MCs	38	8.3	38	8.3	0.452	0.2	LOS A	0.0	0.0	0.00	0.50	0.00	46.0
Approach			864	1.2	864	1.2	0.452	4.5	NA	0.0	0.0	0.00	0.50	0.00	45.3
All Vehicles			1060	2.8	1060	2.8	0.452	5.3	NA	0.9	6.4	0.11	0.55	0.11	44.7

Site Level of Service (LOS) Method: Delay (RTA NSW). 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: 401 [McDermott Dr x Howard Blvd - PRO_AM (Site Folder: Exisiting + Proposed Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection: McDermott Drive and Howard Boulevard
Scenario: Exisiting + Proposed
Period: AM Peak
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: McDermott Drive															
1	L2	All MCs	16	13.3	16	13.3	0.062	3.6	LOS A	0.3	2.8	0.19	0.40	0.19	46.1
2	T1	All MCs	49	48.9	49	48.9	0.062	4.0	LOS A	0.3	2.8	0.19	0.40	0.19	46.3
3u	U	All MCs	1	0.0	1	0.0	0.062	8.9	LOS A	0.3	2.8	0.19	0.40	0.19	46.1
Approach			66	39.7	66	39.7	0.062	4.0	LOS A	0.3	2.8	0.19	0.40	0.19	46.2
North: McDermott Drive															
8	T1	All MCs	49	29.8	49	29.8	0.083	3.8	LOS A	0.4	3.3	0.19	0.52	0.19	45.1
9	R2	All MCs	19	11.1	19	11.1	0.083	7.4	LOS A	0.4	3.3	0.19	0.52	0.19	44.3
9u	U	All MCs	32	0.0	32	0.0	0.083	8.9	LOS A	0.4	3.3	0.19	0.52	0.19	44.8
Approach			100	16.8	100	16.8	0.083	6.1	LOS A	0.4	3.3	0.19	0.52	0.19	44.9
West: Howard Boulevard															
10	L2	All MCs	67	6.3	67	6.3	0.099	3.8	LOS A	0.5	3.7	0.25	0.52	0.25	45.3
12	R2	All MCs	48	10.9	48	10.9	0.099	7.7	LOS A	0.5	3.7	0.25	0.52	0.25	44.9
12u	U	All MCs	1	0.0	1	0.0	0.099	9.2	LOS A	0.5	3.7	0.25	0.52	0.25	44.8
Approach			117	8.1	117	8.1	0.099	5.5	LOS A	0.5	3.7	0.25	0.52	0.25	45.1
All Vehicles			283	18.6	283	18.6	0.099	5.3	LOS A	0.5	3.7	0.21	0.49	0.21	45.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.
Roundabout 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: 402 [McDermott Dr x Howard Blvd - PRO_PM (Site Folder: Exisiting + Proposed Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection: McDermott Drive and Howard Boulevard
Scenario: Exisiting + Proposed
Period: PM Peak
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: McDermott Drive															
1	L2	All MCs	47	48.9	47	48.9	0.082	3.9	LOS A	0.4	4.0	0.16	0.44	0.16	45.3
2	T1	All MCs	33	64.5	33	64.5	0.082	4.0	LOS A	0.4	4.0	0.16	0.44	0.16	45.8
3u	U	All MCs	8	0.0	8	0.0	0.082	8.9	LOS A	0.4	4.0	0.16	0.44	0.16	45.8
Approach			88	50.0	88	50.0	0.082	4.4	LOS A	0.4	4.0	0.16	0.44	0.16	45.6
North: McDermott Drive															
8	T1	All MCs	33	58.1	33	58.1	0.059	3.9	LOS A	0.3	2.6	0.16	0.51	0.16	44.8
9	R2	All MCs	18	17.6	18	17.6	0.059	7.4	LOS A	0.3	2.6	0.16	0.51	0.16	44.2
9u	U	All MCs	16	6.7	16	6.7	0.059	9.0	LOS A	0.3	2.6	0.16	0.51	0.16	44.6
Approach			66	34.9	66	34.9	0.059	6.1	LOS A	0.3	2.6	0.16	0.51	0.16	44.6
West: Howard Boulevard															
10	L2	All MCs	83	3.8	83	3.8	0.091	3.6	LOS A	0.4	3.5	0.21	0.48	0.21	46.0
12	R2	All MCs	24	47.8	24	47.8	0.091	8.0	LOS A	0.4	3.5	0.21	0.48	0.21	45.0
12u	U	All MCs	1	0.0	1	0.0	0.091	9.0	LOS A	0.4	3.5	0.21	0.48	0.21	45.4
Approach			108	13.6	108	13.6	0.091	4.6	LOS A	0.4	3.5	0.21	0.48	0.21	45.7
All Vehicles			263	31.2	263	31.2	0.091	4.9	LOS A	0.4	4.0	0.18	0.47	0.18	45.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.
Roundabout 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.