Cleveland Road North & South Planning Proposal

Traffic Impact Assessment

Newquest Property Pty Ltd

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RESPONSE SCHEDULE

North Precinct Comments

The development needs to be considered in the context of the draft S7.11 Plan and draft West Dapto Structure Plan

Response: Please refer to Section 2.1

The road layout of the proposed Rezoning Plan and Neighbourhood Plan for the southern side of Cleveland Road do not appear to be consistent with the proposed rezoning and Neighbourhood Plan to the north of Cleveland Road (same consultants). This would result in offset intersections and increased vehicular friction. To address this issue consideration should be given to how the subject proposal integrates with the wider Stage 3 development area, and Neighbourhood plans on both sides of Cleveland Road should be aligned.

Response: Please refer to Section 3

Future road NR46/NR47 does not carry through from Brooks Reach as proposed in the draft S7 .11 Plan (on exhibition).

Response: Please refer to Section 4.1

The future road leading to intersection IN37 with Cleveland Road does not line up with the road layout to the south of Cleveland Road (refer above general comments about integration with other sites). This road and intersection need to align as per the draft S7.11 Plan. It should be noted that the design for Cleveland Road is 50% complete.

Response: Please refer to Section 4.1

The type of intersection controls would need to be justified through transport studies and in consultation with Council for any S7.11 funded roads (Cleveland Road). As an example, near to the proposed Fowlers Village centre, pedestrian demands may require signals at 4 way intersections.

Response: Please refer to Sections 4.6 and 4.7

The proposed road hierarchy must be shown on the plans.

Response: Please refer to Section 4.1

Indicative bus stop locations need to be shown on the plans in accordance with NSW bus operator guidelines for bus stop spacing, showing development accessibility to the stops (ie within 400m of a bus stop)

Response: Please refer to Section 6

The Rezoning Plan and Neighbourhood Plan must show riparian cycleway routes as per the layouts in the S7.11 plan

Response: Please refer to Section 5

The transmission easements could be used for convenient pedestrian/ cycle connections to/ from riparian cycleway links.

Response: Please refer to Section 5

It is noted that there are some lots shown which would result in the creation of back fences which are not supported, as these areas have very little passive surveillance and could attract antisocial behaviour.

Response: Please refer to Section 3

Should the rezoning be approved; DA's would need to be submitted with further detailed assessments of traffic impacts, car parking, site servicing/ manoeuvring etc.

Response: Future development applications will be prepared in accordance with relevant documents in Council's DCP, Australian Standards, Austroads Guides and relevant TfNSW Guidelines.

The proponent should consider the structure plan & planning principles contained within the West Dapto Vision Document and the S7.11 Plan.

Response: Please refer to Section 2.1

South Precinct Comments

Why is there proposed development directly underneath the eastern electricity transmission line easement but not under the west one? I note the pre-lodge info for north Cleveland Rd PP allows for only open space under this easement [we note that you are proposing to underground the electricity lines in eastern easement]

Response: Please refer to Section 3

The road layout of the proposed Rezoning Plan and Neighbourhood Plan for the southern side of Cleveland Road do not appear to be consistent with the proposed rezoning and Neighbourhood Plan to the north of Cleveland Road (same consultants). This would result in offset intersections and increased vehicular friction. To address this issue consideration should be given to how the subject proposal integrates with the wider Stage 3 development area, and Neighbourhood plans on both sides of Cleveland Road should be aligned.

Response: Please refer to Section 3

The proposed Fowlers Village Centre depicted on the 141 Cleveland Rd plan would require signals on Cleveland Rd - however the two PPs are showing offset intersections here – not ideal.

Response: Please refer to Section 4.2

The small section of development proposed south of Daisybank Dr - how does this mesh with ultimate plans for north-south link road (NR13) here? Will it be cul-de-sac'ed? It would seem a waste of money to build a minor collector to then have it severed by the new northsouth link.

Response: Please refer to Section 4.6

The significant extent of higher density housing facing Cleveland Rd should include pedestrian/cyclist 'cut-throughs' to allow better accessibility to bus stops, Cleveland Rd and northern areas. This is in line with the West Dapto principles (Active Transport 2.11). As an example, the proposed central section is 750m long with no access into the residential subdivision.

Response: Please refer to Section 5.1

Future road NR46 does not carry through as proposed in the Contributions Plan. It is supposed to be a collector road but it stops either side of a few residential blocks, so the Neighbourhood Plan will need to change to accommodate the collector road.

Response: Please refer to Section 4.1

The western connection of future road NR46 and Cleveland Rd puts it right in alignment with the top of the hill north of Cleveland Rd as it will connect through to Brooks Reach. This is an undesirable outcome. This road was anticipated to be located further east so it could run around the east side of the hill. This would mean it would be required to connect to Cleveland Rd within the subject site extents.

Response: Please refer to Section 4.1

The alignment of NR46 has changed with the new Structure Plan - it will connect further west of Huntley Rd and therefore the alignment will likely be further south than that shown on the PP plan. The whole development should be considered in the context of the new Structure Plan.

Response: Please refer to Section 4.1

The plan shows proposed roundabouts at major intersections along Cleveland Rd. The intersection treatments should be considered in the context of the ultimate traffic demand, likely pedestrian/cycle demand and road connections to the Cleveland Rd (north) development. The type of intersection controls would need to be justified through transport studies and in consultation with Council for any S94 funded roads (Cleveland Road). As an example, near to the proposed Fowlers Village centre, pedestrian demands may require signals at 4 way intersections.

Response: Please refer to Sections 4.6 and 4.7

The development needs to be considered in the context of the S94 Plan and draft West Dapto Structure Plan.

Response: Please refer to Section 2

Future road NRll to the north of Cleveland Road does not line up with the road layout to the south of Cleveland Road (refer above general comments about integration with other sites).

Response: Please refer to Section 4.1

The proposed road hierarchy should be shown on the plans.

Response: Please refer to Section 4.1

Indicative bus stop locations need to be shown on the plans in accordance with NSW bus operator guidelines for bus stop spacing, showing development accessibility to the stops (ie within 400m of a bus stop)

Response: Please refer to Section 6

The Rezoning Plan and Neighbourhood Plan must show riparian cycleway routes as per the layouts in the s94 plan

Response: Please refer to Section 5

The transmission easements could be used for convenient pedestrian/cycle connections to/from riparian cycleway links.

Response: Please refer to Section 5

It is noted that there are some lots shown which would result in the creation of back fences which are not supported, as these areas have very little passive surveillance and could attract anti-social behaviour.

Response: Please refer to Section 3

Should the rezoning be approved; DA's would need to be submitted with further detailed assessments of traffic impacts, car parking, site servicing/manoeuvring etc.

Response: Future development applications will be prepared in accordance with relevant documents in Council's DCP, Australian Standards, Austroads Guides and relevant TfNSW Guidelines.

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1. INTRODUCTION

1.1 Background

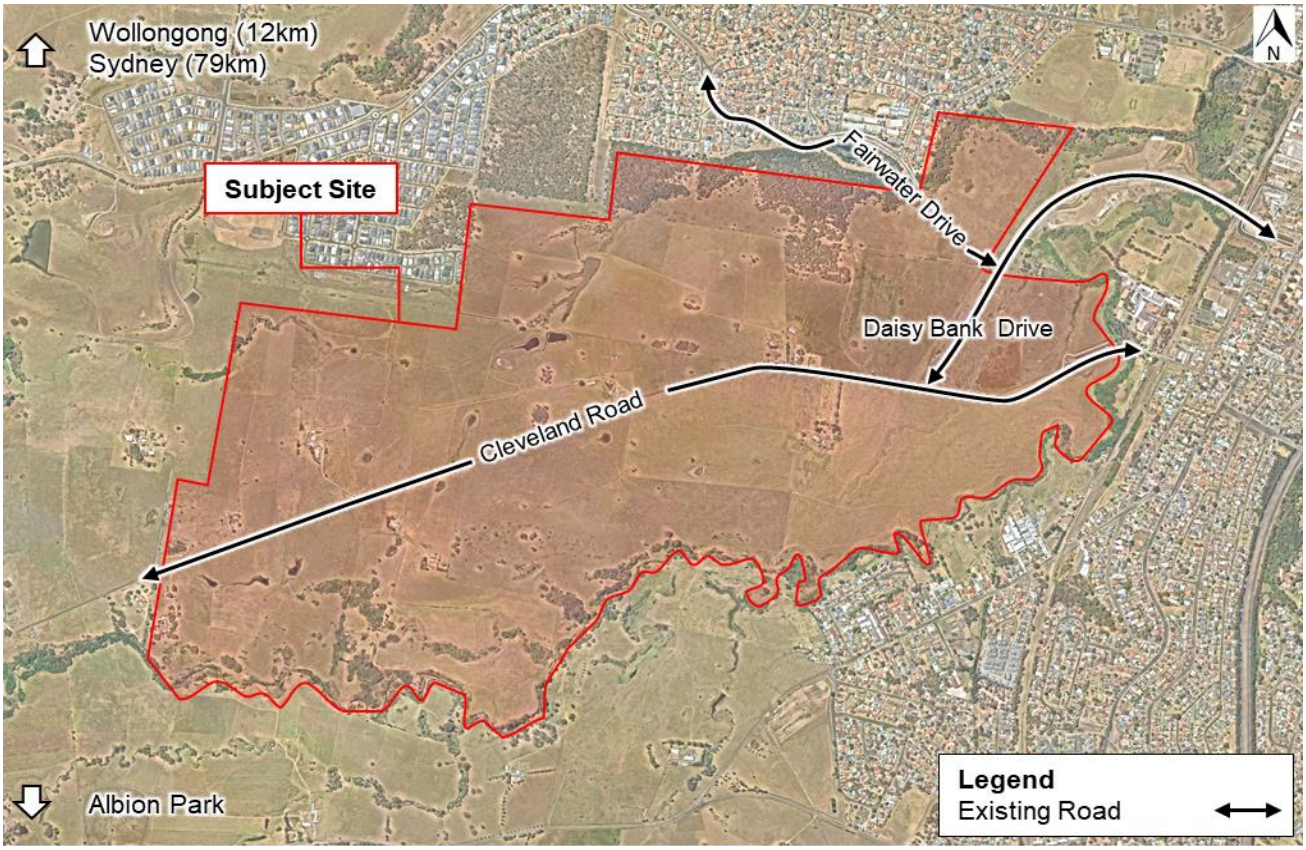
Bitzios Consulting (Bitzios) has been commissioned by Newquest Property Pty Ltd (applicant) to prepare a traffic impact assessment (TIA) for a residential subdivision planning proposal, located at 144-353 Cleveland Road, Cleveland (subject site). The subject site is formally described as the following:

- Lot A on DP156446
- Lot 1 on DP1126171, DP741423, DP194419, DP156208, DP532391 & DP999485
- Lots 1 & 2 on DP730326
- Lot 59 on DP1125379
- Lot 100 on DP1086479
- Lots 310, 312 & 313 on DP1188000
- Lots 200 & 201 on DP803810
- Lot 401 on DP1254873
- Lot 402 on DP1254874.

The subject site is located within the West Dapto Release Area.

1.2 Study Area

The location of the subject site is shown in Figure 1.1.



SOURCE: Google Maps

Figure 1.1: Subject Site Location

1.3 Scope

The scope of assessment for this planning proposal is outlined as follows:

- Review of all documentation relevant to the planning proposal and the development of the subject development. This includes but is not limited to:
  - West Dapto Vision 2018
  - Draft West Dapto Development Contributions Plan 2020
  - Development Control Plan Chapter D16: West Dapto Release Area
  - Development Control Plan Chapter B2: Residential Subdivision
- Development of the proposed neighbourhood plan, including forecast traffic volumes, road layout and the expected yields generated by lot developments
- Review of the road typology and intersection arrangement, including road hierarchy, intersection layouts and intersection capacity for forecast traffic volumes
- Review of active transport arrangements, including pedestrian and cycle path placement and forecast volumes
- Review of public transport arrangements, including development of optimal bus routes and bus stop locations.

1.4 Abbreviations

The below provides a list of abbreviations that are used throughout this report.

Abbreviation	Description
WCC	Wollongong City Council
WDRA	West Dapto Release Area
RMS	Roads and Maritime Services
TfNSW	Transport for New South Wales
DPE	Department of Planning and Environment
DCP	Development Control Plan
WOLSH	Wollongong-Shellharbour

2. RELEVANT PLANNING DOCUMENTATION

2.1 West Dapto Vision 2018

This document details the structure plan for the West Dapto area and is a revision of the 2008 structure plan. It outlines strategic transport planning principles, which are used to guide planning outcomes and the overall vision for the area. These principles are separated into the main categories of road network, public transport and active transport. Each principle comprises specific objectives to assist in reaching the overall vision. Furthermore, each relevant objective will need to be addressed at the planning stage.

Importantly, this document outlines how key traffic items should be addressed and what elements a development proposal in the West Dapto area should consider. This includes items such as *'establish a 15% transport mode shift target for road network requirements'* and *'ensure the West Dapto cycleway network integrates with the surrounding regional cycle routes'.*

2.2 Draft West Dapto Development Contributions Plan 2020

This document details the required contributions in accordance with *Section 7.11 Development Contributions Plan* for proposed developments within the WDRA. It provides road and intersection staging guidelines for all five (5) stages of the West Dapto Staging Plan, including Stage 3 (i.e. where the subject site is situated).

The document also details the relevant roads and intersections within the WDRA that require contributions to be provided and details expected lane configurations for new and existing roads, as well as intersection layouts for planned infrastructure elements. Roads and intersections that are not mentioned in the plan, do not require contributions to be provided upon completion. As such, this document guides the layout of the majority of main roads and intersections within the subject site.

For example, Cleveland Road (C3, C4 & C5) and intersections IN36 and IN38 will provide contributions upon completion and is expected to have a 2/4 lane configuration with 'large signals' treatments.

2.3 Development Control Plan Chapter D16: West Dapto Release Area

This document provides more specific details on how to apply the strategic planning principles, as previously discussed in Section 2.1. It also provides additional details on different land uses within the structure plan and specific details for each stage of the staging plan. Moreover, this document advises on the necessary requirements/objectives for the proposed development to meet each planning principle. This includes objectives such as *'bus stops should generally be located within 400 metres walking distance for the majority (90%) of residences'*. Sections 4, 5 and 6 of this report have been shaped by the principles outlined in the DCP Chapter D16: West Dapto Release Area.

2.4 Development Control Plan Chapter B2: Residential Subdivision

This document provides detailed requirements for residential subdivisions located within residential and mixed-use zoning areas, including lot size, road hierarchy and servicing arrangements. This document will mainly guide the design and hierarchy of the development's roads.

3. PROPOSED NEIGHBOURHOOD PLAN

3.1 Proposed Development

The proposed development is a residential subdivision consisting of residential lots, village centre area, sporting field area and a road network providing access to each lot. Table 3.1 outlines the specific details of the development.

Table 3.1: Proposed Development Details

Development Component	Zone ID	Quantity
Low-density Residential	R2	2,725 lots (193.50ha)
Medium-density Residential	R3	265 lots (15.20ha)
Local Centre	B2	7.46ha
Enterprise Corridor	B6	4.67ha
Public Recreation	RE1	66.39ha

Note: Quantities based on Craig and Rhodes' Drawing No. 164-19P L01 [06]

The development component locations of the subject site are shown in the development plans provided in **Appendix A** for reference.

4. ROAD NETWORK

4.1 Road Typology Assessment

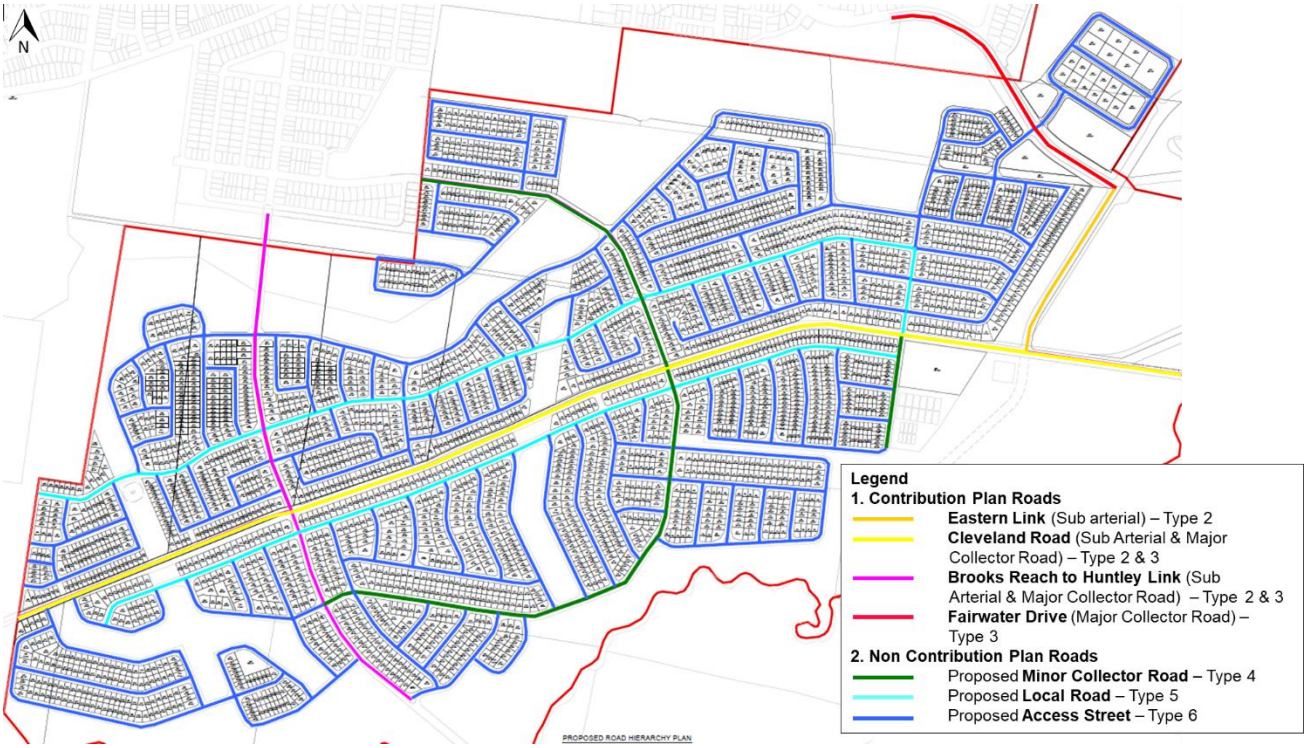
Table 4.1 details the roads within the development that form part of the road network as outlined in the Draft West Dapto Development Contributions Plan 2020.

Table 4.1: Proposed Development Roads in the Contributions Plan

Proposed Road Section	Road Section	Street Type
NR45 – NR46	Brooks Reach to Huntley Link	Type 2 (Two Lanes)
NR47 – NR48	Brooks Reach to Huntley Link	Type 3 (Two Lanes)
NR50 – NR51	Eastern Link Road (Fairwater Drive to Avondale Road)	Type 2* (Four Lanes)
NR52	Eastern Link Road (Fairwater Drive to Avondale Road)	Type 3 (Two Lanes)
C1 – C2	Cleveland Road	Type 3 (Two Lanes)
C3 – C4	Cleveland Road	Type 2 (Four Lanes)
C5 – C6	Cleveland Road	Type 3 (Two Lanes)
F2 – F3	Fairwater Drive	Type 3 (Two Lanes)

Note: NR50-NR51 shown in as Type 4 in Chapter B2

Proposed roads excluded from the Contributions Plan 2020 predominantly form the local network and range from sub-arterial roads to access streets. The location of the development roads outlined in the Draft West Dapto Development Contributions Plan 2020 and proposed roads not defined are shown in Figure 4.1.



SOURCE: Drawing No. 164-19P L01 [06]

Figure 4.1: Proposed Development Roads in the Contributions Plan 2020

A detailed plan of all roads within the subject site is included in **Appendix A**.

The proposed minor collector roads, local roads and access streets shown in Figure 4.1 that are excluded from the Contributions Plan 2020 are provided in accordance with Council's DCP Chapter B2. The relevant street types are described in Table 4.2.

It is noted that residential lots with frontages along Brooks Reach to Huntley Link (NR47) are proposed with direct access. While NR47 is a Type 3 road which does not permit direct access, this arrangement is not expected to have any adverse traffic impacts due to the traffic volumes along this road section projected within the TRACKS model, and as it is only for a limited number of lots.

Table 4.2: Typical Road Types

Street Type	Access	Traffic Capacity (vpd)	Target Speed (km/h)	Cross Section	Footpath Provision
Type 2: Sub-arterial Road	No Access	15,000 – 20,000	60	**Total: 22.9m** Verge: 4.75m Carriageway: 13.4m Verge: 4.75m	2.5m shared path on both sides
Type 3: Major Collector Road	No Access	3,000 – 15,000	60	**Total: 21.9m** Verge: 4.75m Carriageway: 12.4m Verge: 4.75m	2.5m shared path on both sides
Type 4: Minor Collector Road	Access	3,000 – 9,000	50	**Total: 20.95m** Verge: 5.25m Carriageway: 11.2m Verge: 4.5m	3.0m shared path 1.5m footpath
Type 5: Local Road	Access	1,000 – 3,000	40	**Total: 18.8m** Verge: 4.5m Carriageway: 9.8m Verge: 4.5m	3.0m footpath
Type 6: Access Street	Access	300 – 1,000	25	**Total: 17.1m** Verge: 4.5m Carriageway: 8.1m Verge: 4.5m	3.0m footpath

4.2 Traffic Calming

The traffic calming measures proposed for the development aim to ensure traffic management flow and safety throughout. Council's DCP Chapter B2: Residential Subdivisions recommends traffic calming devices to be designed in accordance with the relevant requirements of Austroads, RMS guidelines and Australian Standards. Traffic calming devices applicable to the proposed development are thresholds, slow points, speed humps, chicanes, and splitter islands.

The provision of traffic calming devices is to consider required design vehicles, speed controls, sight distance requirements and streetscape requirements.

4.3 Intersection Spacing

The spacing of intersections and roundabouts within proposed development road network are required to demonstrate sufficient spacing between each intersection. Minimum spacing between intersections within residential streets are required in accordance with Council's DCP Chapter B2: Residential Subdivisions and detailed in Table 4.3.

Table 4.3: Spacing of Intersections Along Residential Streets

Scenario	Spacing Between Intersections	
	Access Road	Minor Collector Roads
On same side of through street	60m	120m
On opposite sides of through streets	40m	100m

All minor collector road, local street and access road intersections within the proposed subdivision have been reviewed and the recommended intersection spacings are supported and comply with Table 4.3.

The spacing of signalised intersections along major collector and sub-arterials roads of the proposed development are to be generally spaced a minimum of 400m apart in accordance with Council's DCP Chapter B2: Residential Subdivisions. The signalised intersection spacing along the major collector and sub-arterial roads of the proposed development generally comply, with exception of the Cleveland Road / Proposed Road intersection (Node 10462) and Fairwater Drive / Proposed Road intersection (Node 10390). The subject intersections could be proposed as roundabouts, however the purpose of providing signalised intersection is to increase pedestrian safety and facilitate pedestrian movements between the residential and non-residential land uses. The SIDRA intersection assessment detailed in Section 4.7 indicates the 95th percentile back-of-queue lengths are not expected to exceed the approach distances of the intersections. On that basis, the intersection spacing proposed for the development is deemed acceptable.

4.4 Cul-de-sacs

The design of cul-de-sacs is to be undertaken in accordance with Council's DCP Chapter B2: Residential Subdivisions. The use of a cul-de-sac is applicable to service a maximum 30 dwellings and the minimum kerb radius is to be 10.5m. To ensure adequate accessibility to public transport facilities as well as arrangements for service and waste vehicles, the maximum length of a cul-de-sac is to be 80m.

The proposed cul-de-sacs comply with the maximum length and dwelling requirements and are to comply to a minimum kerb radius of 10.5m during the detailed design stages of the development proposal.

4.5 Corner Truncations

As per Council DCP Chapter B2, all intersections shall be provided with a minimum 4.25m splay or as required by Council's Infrastructure Division.

4.6 Intersection Assessment

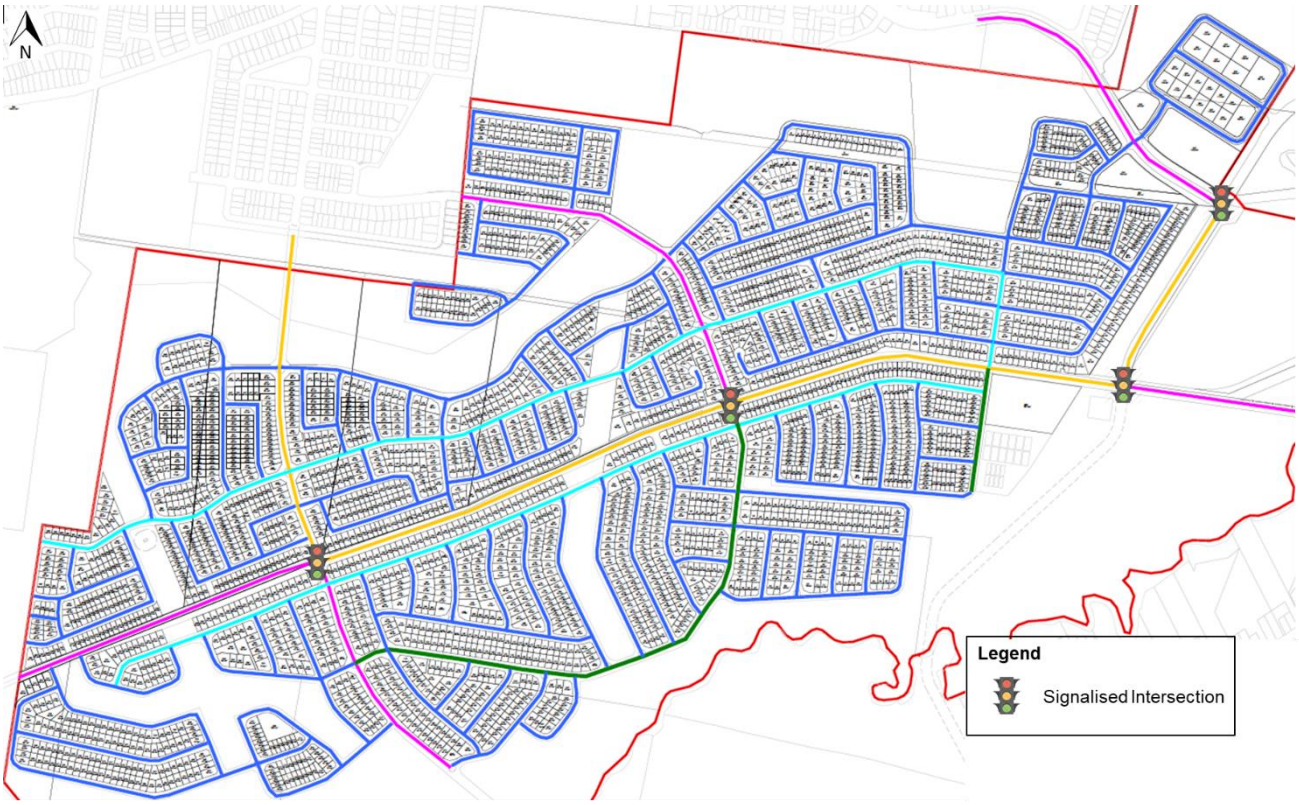
4.6.1 Intersections in Draft West Dapto Development Contributions Plan (2020)

Stage 3 of the *Draft West Dapto Development Contributions Plan* (2020) details the road and intersection guidelines for the subject development. Table 4.4 details the intersections shown within the relevant documentation.

Table 4.4: Contributions Plan Established Intersections

Intersection Number / Node Number	Intersection Layout	Existing Road	New Road
IN38 / 10081	Signalised	Cleveland Road	Brooks Reach to Huntley Link
IN37 / 7424	Signalised	Cleveland Road	Wholahan Avenue (Brooks Road East)
IN36 / 7466	Signalised	Cleveland Road / Daisy Bank Drive	Eastern Link Road
IN32 / 7469	Signalised	Daisy Bank Drive / Fairwater Drive	Fowlers Road Extension

The location of proposed signalised intersections outlined in the Draft West Dapto Development Contributions Plan 2020 are shown in Figure 4.2



SOURCE: Drawing No. 164-19P L01 [06]

Figure 4.2: Proposed Signalised Intersections in the Contributions Plan 2020

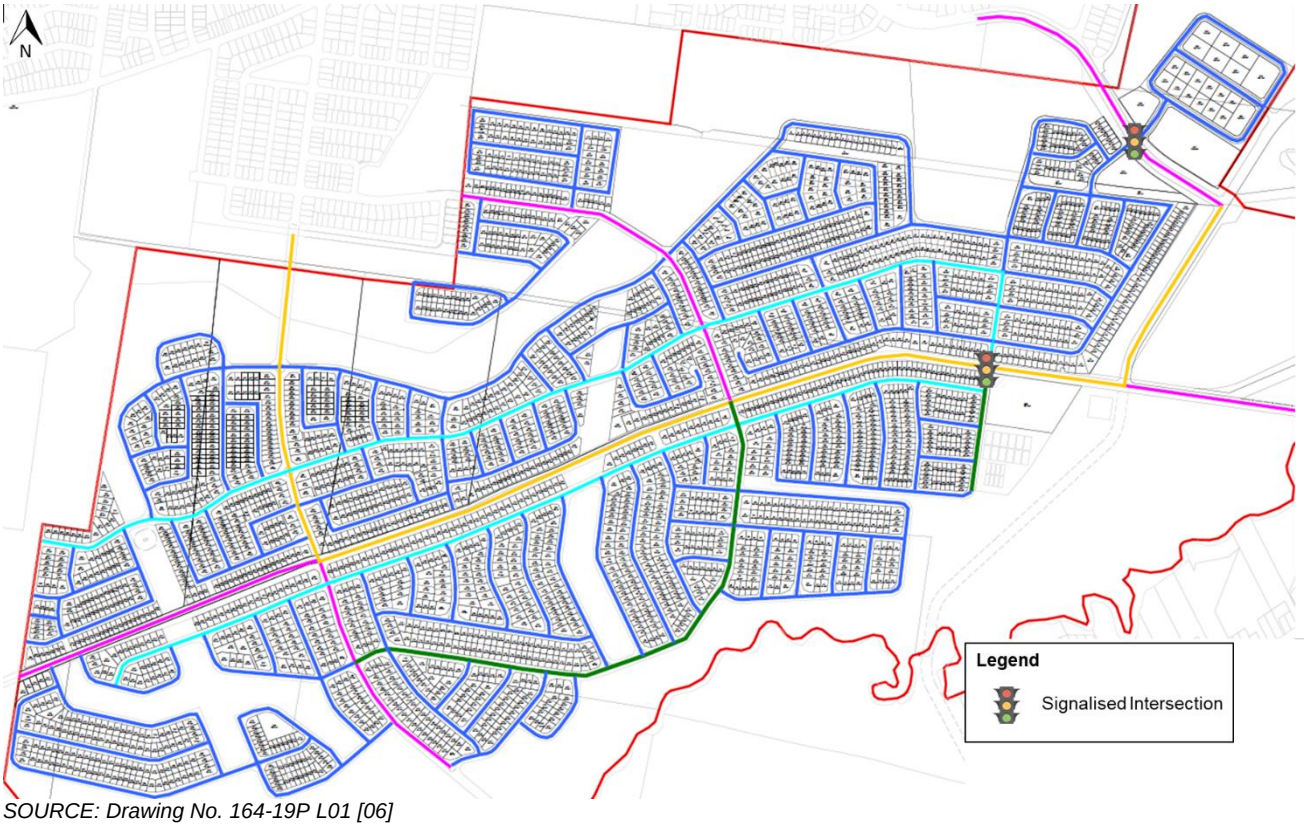
4.6.2 Other Key Intersections

The following intersections shown in Table 4.5 are not described within Stage 3 of the *Draft West Dapto Development Contributions Plan* (2020).

Table 4.5: Other Intersections

Node Number	Intersection Layout	Existing Road	New Road
10696	Priority-Controlled	Cleveland Road	Unidentified
10971	Priority-Controlled	Cleveland Road	Unidentified
10414	Roundabout	Brooks Reach to Huntley Link	Unidentified
10462	Signalised	Cleveland Road	Unidentified
10627	Roundabout	N/A	Eastern Link Road / Unidentified
10390	Signalised	Fairwater Road	Unidentified

The location of proposed signalised intersections not outlined in the Draft West Dapto Development Contributions Plan 2020 are shown in Figure 4.3.



SOURCE: Drawing No. 164-19P L01 [06]

Figure 4.3: Other Proposed Signalised Intersections

4.6.3 TRACKS Development & Assumptions

Wollongong City Council and Shellharbour Council jointly developed a macroscopic traffic forecast model (commonly known as WOLSH model) with TRACKS modelling package. This WOLSH model was updated by Bitzios to incorporate the subject development and analyse the performance of the transportation network. The following describes the updates to the WOLSH TRACKS modelling:

- The internal road network was updated to reflect the latest revised road layout
- Minor adjustments were made to various centroid locations and connectors to spread the traffic and to reflect the revised road layout

- The zone attributes including number of households and number of jobs were calculated based on the proposed plans and updated in the revised model.

A technical note (Bitzios Reference: *P4466.001T TRACKS Modelling Technical Note, dated 12/10/2020*) detailing the procedure and assumptions involved in updating the WOLSH TRACKS model is provided in **Appendix B**.

The primary purpose of the intersection modelling is to analyse traffic conditions in the medium to long-term – year 2036. Traffic volumes for AM and PM scenarios were extracted from the updated WOLSH TRACKS model.

Intersection layouts and data within the TRACKS model are applied directly into the SIDRA (Version 8) assessment and therefore these variables are assumed to be in accordance with the proposed design of the development. The TRACKS variables include the following:

- Number of approach lanes
- Number of link lanes
- Length (m) of lanes from intersection to intersection
- Application of turn and through movements at an intersection
- Overall Intersection layout (i.e. Signalised, roundabout, priority)
- Posted speed of 50km/h along all internal roads within the development area.

The following variables are not present in the TRACKS model and are assumed for the process of modelling each intersection via SIDRA:

- Heavy vehicle percentage of 5%
- Median layout between opposing traffic lanes along roundabout and priority intersections of Cleveland Road.

4.7 SIDRA Intersection Assessment

4.7.1 SIDRA Capacity Mechanisms

It is necessary to define intersection capacity and over-capacity mechanisms in order to inform the intersection upgrades required. Intersection modelling is undertaken under Roads and Maritime Services' *Traffic Modelling Guidelines* (2013). Intersection capacity outputs for continuous lanes and sign-controlled are to be consistent with the following conditions:

- Maximum practical Degree of Saturation (DOS) of signalised intersections is 0.90
- Maximum practical DOS of sign-controlled intersections is 0.85
- Maximum practical DOS of sign-controlled intersections is 0.80
- Maximum practical DOS of continuous lanes is 0.98

Table 4.6 is extracted from RMS' *Traffic Modelling Guidelines* (2013) and indicates the control delay for vehicle Level of Service (LOS) calculations.

Table 4.6: Control Delay for Vehicle LOS Calculations

LOS	Control delay per vehicle in seconds (d) (including geometric delay)
	All Intersection Types
A	d < 14
B	d < 15 to 28
C	d < 29 to 42
D	d < 43 to 56
E	d < 57 to 70
F	d > 70

4.7.2 Results Summary

A summary of the intersection assessment is provided in Table 4.7, with green boxes indicating the intersection is within capacity, yellow boxes indicating is at capacity, and red boxes indicating the intersection is over-capacity.

Table 4.7: Results Summary

Intersection	Year 2036 Model Peak Hour	
	AM	PM
Node 10390	Under	Under
IN32 Node 7469	Under	Under
IN36 Node 7466	Under	Under
Node 10627	Under	Under
Node 10462	Under	Under
IN37 Node 7424	Under	Under
IN38 Node 10081	Under	Under
Node 10414	Under	Under
Node 10971	Under	Under
Node 10696	Under	Under

The summary of results from the SIDRA assessment is provided at **Appendix C** and detailed SIDRA outputs are provided at **Appendix D**.

4.8 Road Network Principles Summary

A summary of the relevant road network principles detailed in Council's West Dapto Vision 2018 and the corresponding outcomes for the proposed development are provided in Table 4.8.

Table 4.8: Road Network Principles

Principle	Outcome
Principle 2: A safe, connected and legible road network for all users	
2.1 Provide a road network based on the modified grid layout to maximise accessibility and efficiency	The proposed development provides a road network in a modified grid layout as shown in Figure 4.1.
2.2 Implement a clear hierarchy of road types that responds to relevant transport requirements and road function, creating a highly legible road network for all users	The proposed road types have been selected to cater for the expected traffic volumes and relevant transport requirements as shown in Figure 4.1 and Table 4.2.
2.3 Implement intersection designs appropriate to the road types, surrounding land uses and environments	The proposed intersections are designed to suit the road types and meet acceptable thresholds of intersection performance (i.e. DOS, LOS and delays) as demonstrated in Section 4.14.2 and Section 4.6.
2.4 Ensure the structural road network supports the town and village centres hierarchy within West Dapto	The proposed local centre is located adjacent to a higher density residential zone with a Type 2 road frontage and direct access to a shared path. A bus stop is located at the frontage of the zone.
2.5 Ensure the integrated road system, caters for all road users including private cars, freight, public transport (buses), pedestrians and cyclists	The proposed road types are designed to allow bus routes to service maximum catchments and include suitable active transport connections to attractors. The road types have also been designed with adequate capacity to support expected private car traffic.
2.6 Implement driveway access restrictions and manage on-road parking on the higher order roads (access-denied roads) to improve traffic efficiency and pedestrian/cyclist safety and amenity	Driveway access is restricted from road types 2 and 3 as per Council's DCP Chapter B2 as demonstrated in Table 4.2. It is noted some lots are accessed via a Type 3 road; however, this is not expected to have an adverse impact on efficiency or safety due to the low number of occurrences.
2.7 Ensure built form controls on adjacent properties to roads deliver active frontages to maximise passive surveillance and personal safety in the road environment. For example, road layouts that include lanes, service roads and so on to ensure houses front the primary road	Properties fronting roads are to include appropriate built form controls as part of future development applications.
2.8 Ensure roads and intersections are designed to meet the requirements of the DCP Chapter B2: Residential Subdivision, Austroads and Australian Standards	Roads and intersections are designed to meet all relevant requirements as discussed in Sections 4.1 to 4.5.
Principle 5: Road network to support sustainable transport outcomes	
5.1 Staging of additional car-based infrastructure to encourage public/active transport and maximise use of existing infrastructure	The provision of additional car-based infrastructure (e.g. off-street car parks) is to be considered during future development applications.
5.2 Use an established 15% transport mode shift target when planning for road network requirements within West Dapto, to encourage a shift towards reduced car dependence	Providing the public transport network in the preliminary stages of the development is expected to encourage potential residents of the proposed subdivision into utilising the public transport network and reduce car dependency. The timing of the delivery of public transport services is to be confirmed through liaison with TfNSW and local transport operators as part of future development applications.

Principle	Outcome
5.3 Ensure that roads are designed to provide a high level of safety, access and amenity for pedestrians, cyclists and public transport (bus services)	As shown in Figure 6.1 and Figure 6.2, public transport nodes are provided within safe walking distance along pedestrian infrastructure to all areas of the subject site.

4.9 Recommended Actions

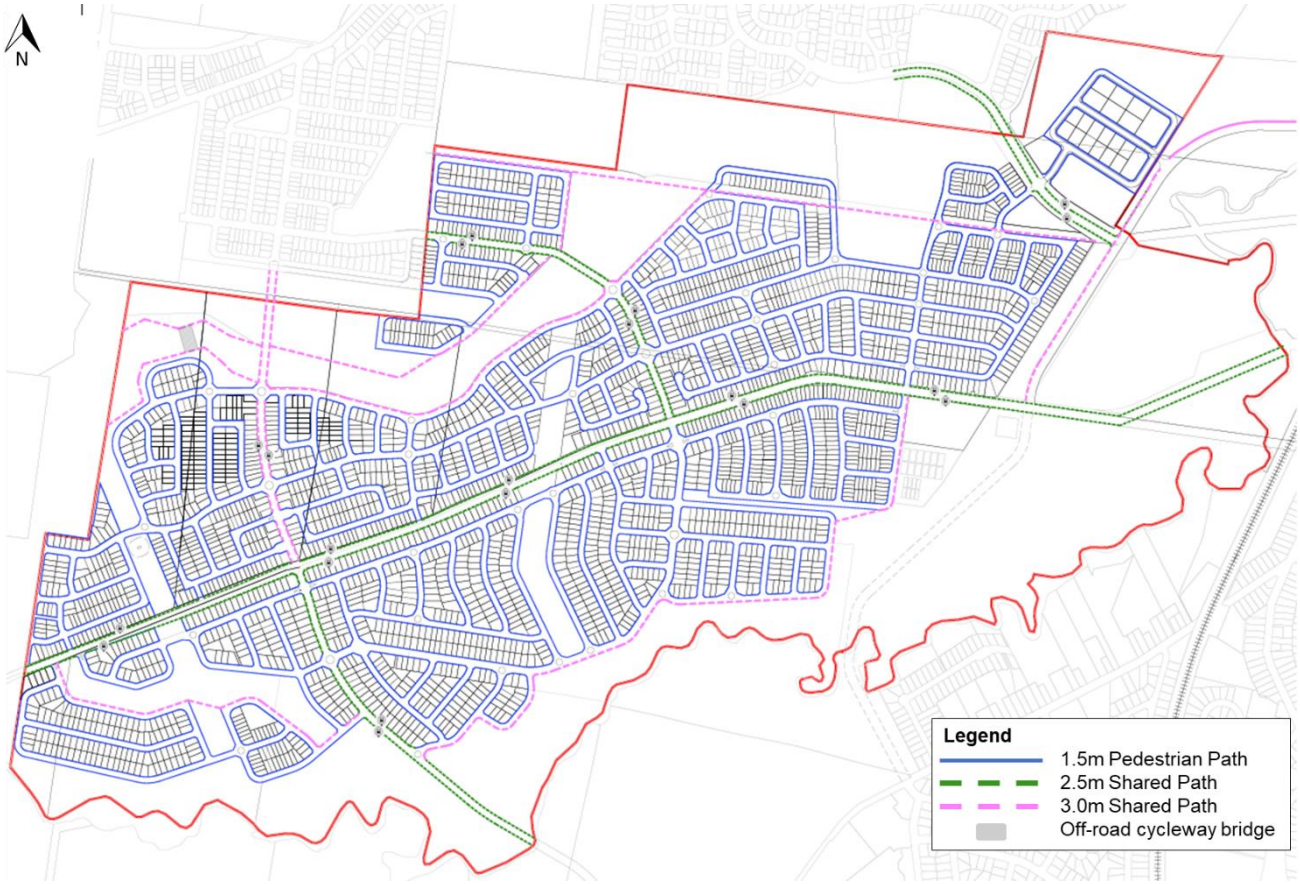
As shown from the SIDRA assessment results summary in Table 4.7, all intersection queuing and saturation capacity values are within or at capacity of the limits stipulated under the RMS *Traffic Modelling Guidelines* (2013).

Sight distance requirements are yet to be assessed within residential 50 km/h zones and roads surrounding Cleveland Road specified by 'New Road' in the West Dapto Development area. It is noted that if inappropriate sight distance for the posted 50km/h is proposed, a safe 40km/h safe speed limit may be required for satisfactory implementation or appropriate traffic calming devices are required, in accordance with AS1742.13: *Local Area Traffic management* and Council DCP *Chapter B2 Residential Subdivision*. Traffic calming devices may include upgrading priority intersections proposing unsatisfactory sight distance requirements into roundabout intersections.

5. ACTIVE TRANSPORT

5.1 Walking and Cycling

Pedestrian pathways are provided 1.5m wide and in accordance with the road hierarchies defined in Council's DCP Chapter 16: West Dapto Release Area. The West Dapto Structure Plan Active Transport Network in Council's DCP Chapter D16: West Dapto Release Area demonstrates the proposed locations for 2.5m shared pathways on both sides of the road section and 3.0m shared pathways on one side of a road section within the proposed development. The proposed pedestrian pathways and shared-use pathways are shown in Figure 5.1.



SOURCE: Drawing No. 164-19P L01 [06]

Figure 5.1: Proposed Pathways

The proposed development provides a comprehensive pedestrian network, connecting residential lots to nearby recreational facilities and the local centre.

The scope of these cycle facilities is shown on the development plans in **Appendix A**.

5.2 Summary

A summary of the relevant active transport principles detailed in Council's West Dapto Vision 2018 and the corresponding outcomes for the proposed development are provided in Table 5.1.

Table 5.1: Active Transport Principles

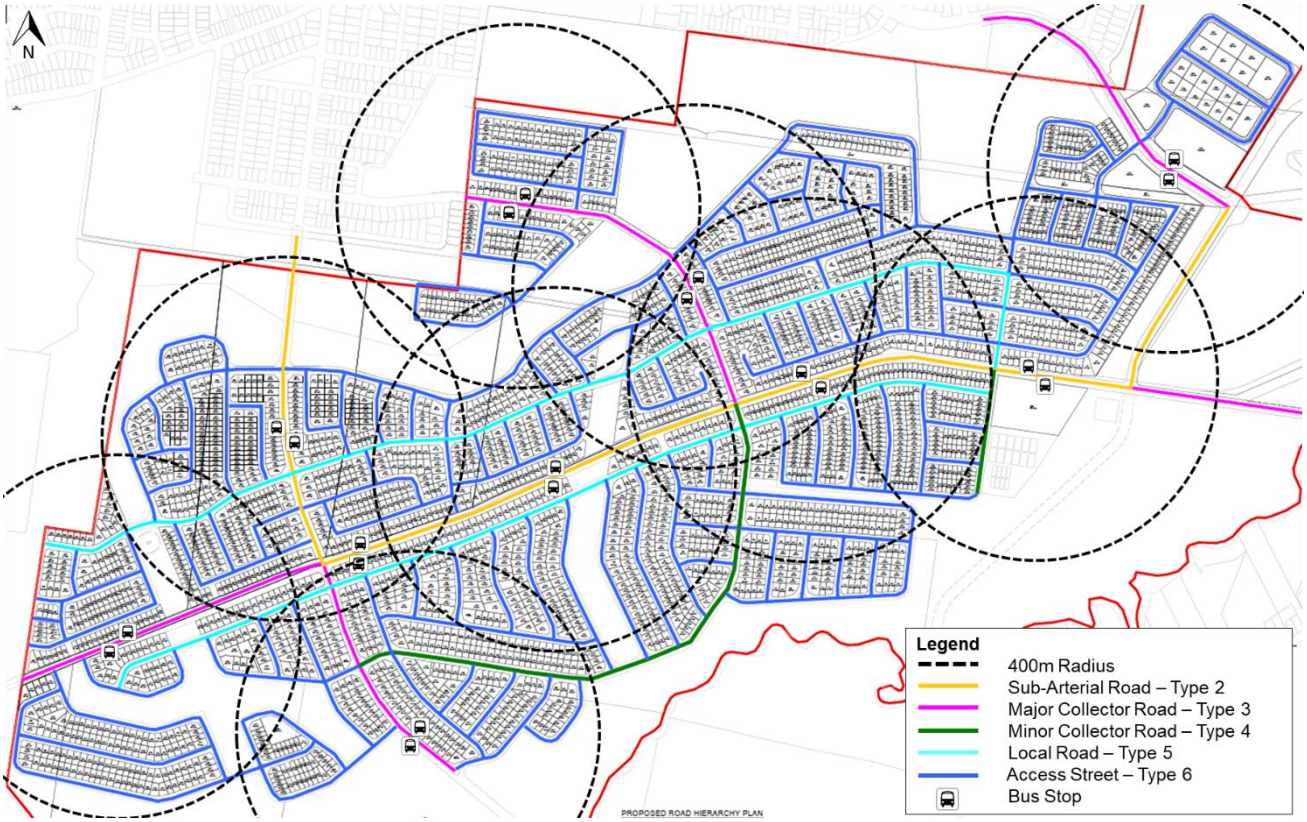
Principle	Outcome
Principle 1: Supportive land use patterns	
1.1 Plan residential land use close to town and village centres and major public transport nodes, with higher residential densities adjacent to these locations to maximise walking and cycling catchments	The proposed development includes 582 residential lots within 400m of the village centre and provides suitable public and active transport connections to all lots as shown in Figure 5.1. Figure 5.1 also demonstrates R3 residential land use is proposed adjacent to B2 and B6 land uses of the development, as well as the proposed RE1 land uses to the south-western extent of the subdivision.
1.2 Promote shared parking across uses in town/village centres to encourage walk trips when undertaking multiple activities in these centres. Avoiding fragmented parking will also improve utilisation of spaces and improve walkability through more compact town centre layouts and fewer driveway crossings	Provision of car parking is to consider shared parking as part of future development applications.
Principle 2: Connected, functional pedestrian & cycle network	
2.1 Provide a convenient and legible movement network for pedestrians (including those with disabilities) and cyclists, ensuring excellent connectivity and directness between residences and attractors such as schools, shops, public transport nodes, sports ovals and employment centres	Each lot within the proposed development can be directly accessed via the active transport network (i.e. footpaths and shared paths) as shown in Figure 5.1.
2.2 Include footpaths/shared paths on all roads in the road types hierarchy except laneways and minor access streets	Footpaths and shared paths are to be provided throughout the entire site as shown in Figure 5.1.
2.3 Take advantage of easements, riparian areas and open space areas to create convenient pedestrian and cycle links (or “short-cuts”) that maximise accessibility between different precincts/land uses	Open areas and areas within easements are utilised by appropriate pedestrian and shared use infrastructure to provide efficient active transport throughout the subdivision shown in Figure 5.1.
2.4 Implement a wayfinding strategy to provide clear and coordinated information for access to facilities and services within the West Dapto Release Area and surrounding areas	Wayfinding strategies are to be implemented within the bus routes and time tables within each public transport node in the subject area.
2.5 Provide safe and secure bicycle parking or storage facilities at key destinations in town & village centres, sports ovals, community facilities, transport interchanges and key open space areas	Safe and secure bicycle parking for the local centre and public recreation land uses are to be considered in accordance with AS2890.3 during future development applications.
2.6 Include bicycle parking and end-of-trip facilities as part of the development of employment sites, business and commercial sites particularly those in town and centre villages	Bicycle parking and end-of-trip facilities for employment sites within the local centre and enterprise zones are to be considered in accordance with AS2890.3 during future development applications.
2.7 Ensure that the West Dapto cycleway network integrates with the wider surrounding regional cycle routes	The proposed development provides 2.5m and 3.0m shared pathways along Cleveland Road, Brooks Reach to Huntley Link, Eastern Link Road and Fairwater Drive which will connect to the broader cycleway network.
Principle 3: Attractive and safe environment	

Principle	Outcome
3.1 Design streets to provide a high level of pedestrian and cyclist amenity and safety, creating public space where people want to be	Pedestrian footpaths are provided within all street networks and shared path infrastructure is provided within all sub-arterial and major collector roads of the subject site.
3.2 Provide convenient and safe road crossing points, traffic calming (where appropriate) and tree planting to enhance the pedestrian and cycle environment	Traffic calming and road crossing points are implemented at each signalised intersection to promote the use of active transport along Cleveland Road.
3.3 In high pedestrian demand areas such as town and village centres, further increase pedestrian amenity and safety through pathway widening, driveway access controls and other site-specific actions to improve pedestrian priority	Areas of the local centre and public recreation where high demand of pedestrians is expected is to consider actions to improve pedestrian safety as part of future development applications.
3.4 Incorporate Crime Prevention Through Environmental Design (CPTED) principles in the planning of walking and cycling facilities	CPTED principles are to be considered at locations of the proposed active transport infrastructure as part of future development applications.
3.5 Consider innovative technologies for lighting key off-road paths, including solar lighting and luminescent pathway materials, etc.	Key off-road pedestrian and shared pathways are to consider innovative lighting as part of future development applications.
3.6 Construct pedestrian and cycle infrastructure according to AustRoads and Australian Standards, with attractive & durable materials and well-designed landscaping treatments	Attractive and durable materials for construction of the proposed active transport infrastructure for the development is to be considered as part of future development applications.
3.7 Incorporate supporting infrastructure such as seats, bike rails, shade structures, bubblers and viewing/rest areas into the active transport network where appropriate	Prescribed supporting infrastructure are to be included along the proposed pedestrian and shared pathway network with further details to be considered as part of future development applications.

6. PUBLIC TRANSPORT

6.1 Bus

Public transport is a major focus for the West Dapto Release Area strategy, which aims to reduce the reliance on private vehicle trips. The proposed development provides 20 bus stops and five (5) roads suitable for buses as shown in Figure 6.1.

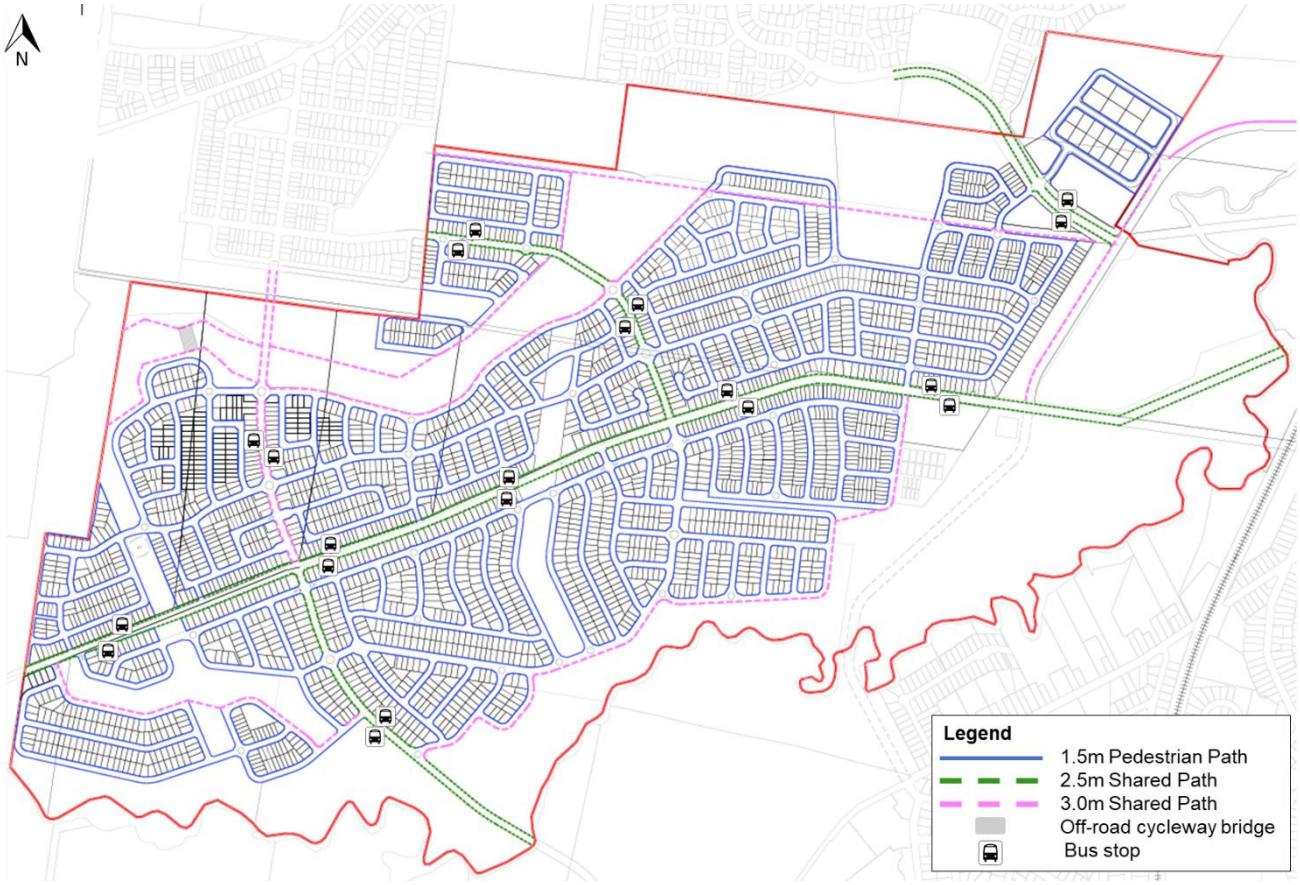


SOURCE: Drawing No. 164-19P L01 [06]

Figure 6.1: Proposed Development Public Transport

Indicative bus stop locations shown in Figure 6.1 are in accordance with NSW bus operator guidelines for bus stop spacing, showing development accessibility to the stops (i.e. within 400m of a bus stop).

The proposed development provides all bus stops with appropriate consideration for active transport infrastructure as shown in Figure 6.2.



SOURCE: Drawing No. 164-19P L01 [06]

Figure 6.2: Proposed Development Bus Stops Along Active Transport Infrastructure

6.2 Summary

A summary of the relevant public transport principles detailed in Council's West Dapto Vision 2018 and the corresponding outcomes for the proposed development are provided in Table 6.1.

Table 6.1: Public Transport Principles

Principle	Outcome
Principle 1: Accessible public transport	
1.1 Major public transport nodes located in town and village centres where the greater residential densities and employment opportunities are centres	Public transport nodes are provided within an appropriate walking distance utilising either shared or pedestrian path infrastructure as shown by Figure 6.1.
1.2 Ensure that major generators of travel are well serviced by public transport	Major generators of travel that attract high traffic volumes are serviced by public transport nodes within an appropriate walking distance is illustrated by Figure 6.1.
1.3 Promote co-location of different destination assets around public transport nodes and in centres, to enable multiple trip purposes	The co-location of different destination assets (e.g. B2 and RE1 land uses) has been incorporated in the proposed design to encourage multiple trip purposes.
Principle 2: Effective bus network, service provision & integration	
2.1 Provide coordinated, frequent & reliable bus services to destinations within and surrounding West Dapto	The sub-arterial, minor collector and major collector roads are well-serviced by public transport nodes, shown by Figure 6.1, and active transport infrastructure, shown by Figure 5.1, within the entire West Dapto area.

Principle	Outcome
2.2 Create an efficient, seamless travel experience through integrated ticketing, minimising transfer times, and intuitive and easily accessible service information	Details of public transport services to be confirmed through liaison with TfNSW and local transport operators as part of future development applications.
2.3 Ensure street networks are interconnected and allow permeability for buses	The greater residential densities and surrounding street networks of Cleveland Road are in 400m walking distance proximity to public transport as shown by Figure 6.1.
2.4 Ensure the bus network is highly accessible and services the majority of residences (with bus stops every 400m), town and village centres, employment areas, sporting facilities and Dapto Station	The bus network is prominent within major and minor collector roads and in 400m walking distance to all residential areas and major travel generators shown by Figure 6.1 .
2.5 Incorporate bus priority measures as necessary to ensure highly efficient, prioritised bus transport	Public transport nodes are provided consistently on both sides of sub-arterial, minor collector and major collector roads.
Principle 3: Quality infrastructure	
3.1 Provide comfortable, attractive, safe and secure buses and bus related infrastructure with clear timetable/service information and cater for all users including disabled/elderly	Details of public transport services to be confirmed through liaison with TfNSW and local transport operators as part of future development applications.
3.2 Ensure pedestrian and cycle links to bus stops are of high standard	As shown by Figure 5.1, pedestrian infrastructure is provided within all street networks and shared path infrastructure provided along sub-arterial, minor collector and major collector roads of the subject site.
3.3 Encourage the use of innovative and efficient public transport technology	All areas of the subject site include public transport nodes within a 400m walking proximity to encourage high use of active and public transport within the West Dapto area.

7. SUMMARY AND CONCLUSIONS

The key findings of this traffic impact assessment for the planning proposal at 144-153 Cleveland Road, Cleveland, are as follows:

- Bitzios has been commissioned by Newquest Property Pty Ltd to prepare a traffic impact assessment for a residential subdivision planning proposal, located at 144-353 Cleveland Road, Cleveland
- The proposed development is for a residential subdivision consisting of residential lots, village centre area, sporting field area and a road network providing access to each lot
- The proposed road typologies for the development were assessed against relevant standards and Council guidelines. Individual cross sections are recommended for the sub-arterial, major collector, minor collector local and access roads
- Particular considerations are outlined for traffic calming, intersection spacing, cul-de-sacs and corner truncations in accordance with relevant Austroads and Council guidelines
- The WOLSH TRACKS model was updated by Bitzios to incorporate the subject development and analyse the performance of the transportation network. Traffic volumes for the year 2036 AM and PM scenarios were extracted from the updated WOLSH TRACKS model
- A SIDRA 8 intersection assessment was undertaken to assess each intersection within the proposed subdivision based on 2036 traffic volumes from the updated WOLSH TRACKS model. The proposed intersection layout is efficient in all scenarios assessed within SIDRA
- A summary of road network principles detailed within Council's West Dapto Vision 2018 has been assessed against the corresponding outcomes for the proposed development. The proposed road network is generally compliant to the summarised principles
- Sight distance requirements are subject to assessment and if inappropriate sight distance for the posted 50km/h is proposed, a safe 40km/h safe speed limit may be required for satisfactory implementation or appropriate traffic calming devices are required, in accordance with AS1742.13: *Local Area Traffic management* and Council DCP *Chapter B2: Residential Subdivisions*
- The development proposal includes 1.5m pedestrian pathways, 2.5m shared-use pathways and 3.0m shared-use pathways throughout the entirety of the development, demonstrating a comprehensive active transport network
- A summary of active transport network principles detailed within Council's West Dapto Vision 2018 has been assessed against the corresponding outcomes for the proposed development. The proposed active transport network is generally compliant to the summarised principles
- The proposed public transport network provides 20 bus stops and five (5) roads suitable for buses. The proposed development provides all bus stops with appropriate consideration for active transport infrastructure and in accordance with NSW bus operator guidelines for bus stop spacing, showing development accessibility to the stops (i.e. within 400m of a bus stop).
- A summary of public transport network principles detailed within Council's West Dapto Vision 2018 has been assessed against the corresponding outcomes for the proposed development. The proposed public transport network is generally compliant to the summarised principles.

Appendix A: Development Plans

A0

Zone

- B1 Neighbourhood Centre
- B2 Local Centre
- B3 Commercial Core
- B4 Mixed Use
- B6 Enterprise Corridor
- B7 Business Park
- E1 National Parks & Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- E4 Environmental Living
- IN1 General Industrial
- IN2 Light Industrial
- IN3 Heavy Industrial
- IN4 Working Waterfront
- R1 General Residential
- R2 Low Density Residential
- R3 Medium Density Residential
- R4 High Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU1 Primary Production
- RU2 Rural Landscape
- RU4 Primary Production Small Lots
- SP1 Special Activities
- SP2 Infrastructure
- SP3 Tourist
- W1 Natural Waterways
- W2 Recreational Waterways
- W3 Working Waterways

LAND ZONING AREAS		
CODE	ZONE	AREA (ha.)
B2	Local Centre	7.46
B6	Enterprise Corridor	4.67
E2	Environmental Conservation	26.85
E3	Environmental Management	52.18
R2	Low Density Residential	193.50
R3	Medium Density Residential	15.20
RE1	Public Recreation	66.39

100 80 60 40 20 0 150

1:3000 @ A0

PROPOSED LAND ZONING PLAN

DIAL 1100 BEFORE YOU DIG

Project:

Principal: CLEVELAND ROAD DEVELOPMENTS

Scale 1:3000 | Date 24/09/2020 | Council Ref.

Datum DHA | L.G.A. WOLLONGONG

Calc's N.F. | Drawn. S.E. | Proj.Man. M.V. | Client Ref.

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Our Ref. 164-19

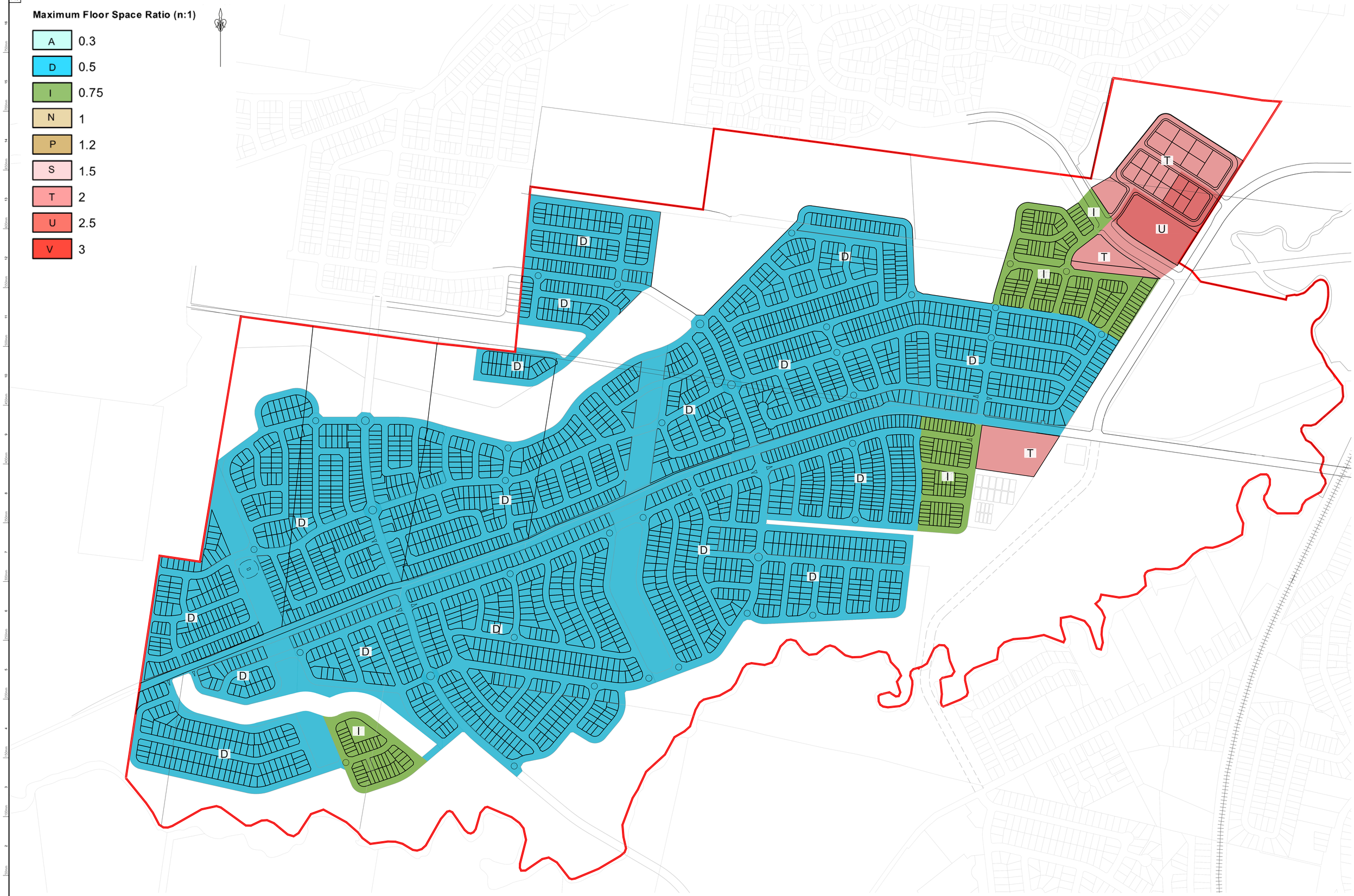
Dwg File Ref. [Rev] - Sheet Ref.

164-19P L01 [06]
- Proposed Land Zoning Plan

A0

Maximum Floor Space Ratio (n:1)

A	0.3
D	0.5
I	0.75
N	1
P	1.2
S	1.5
T	2
U	2.5
V	3



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1:3000 @ A0

PROPOSED FLOOR SPACE RATIO

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Project:

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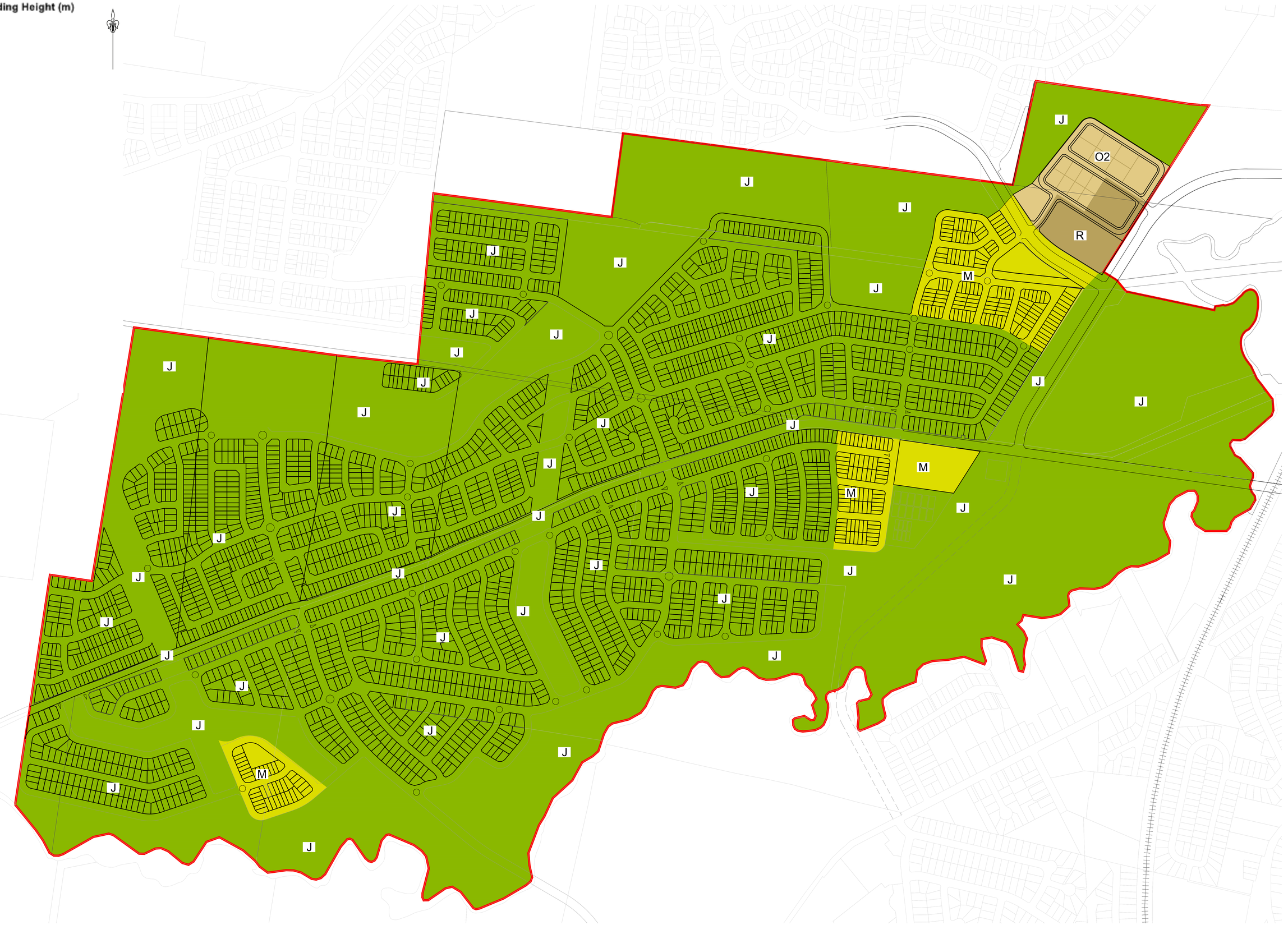
164-19P L01 [06]

- Proposed Floor Space Ratio

A0

Maximum Building Height (m)

A	3
I	8
J	9
L	11
M	12
N	13
O1	15
O2	16
Q	20
R	22
S	24
U1	30
U2	32
X	48
AA1	60
AA2	65
AB	80
AC	120



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PROPOSED HEIGHT OF BUILDING PLAN

DIAL 1100 BEFORE YOU DIG

Project:

Principal: CLEVELAND ROAD DEVELOPMENTS

Scale 1:3000 | Date 24/09/2020 | Datum DHA | Council Ref. | L.G.A. WOLLONGONG

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164-19P L01 [06]

- Proposed Height of Building Plan

PROPOSED LOT SIZE PLAN

Principal: CLEVELAND ROAD DEVELOPMENTS			
Scale 1:2500	Date 24/09/2020	Council Ref.	
	Datum DHA	L.G.A. WOLLONGONG	
Calc's N.F.	Drawn. S.E.	Proj.Man. M.V.	Client Ref:

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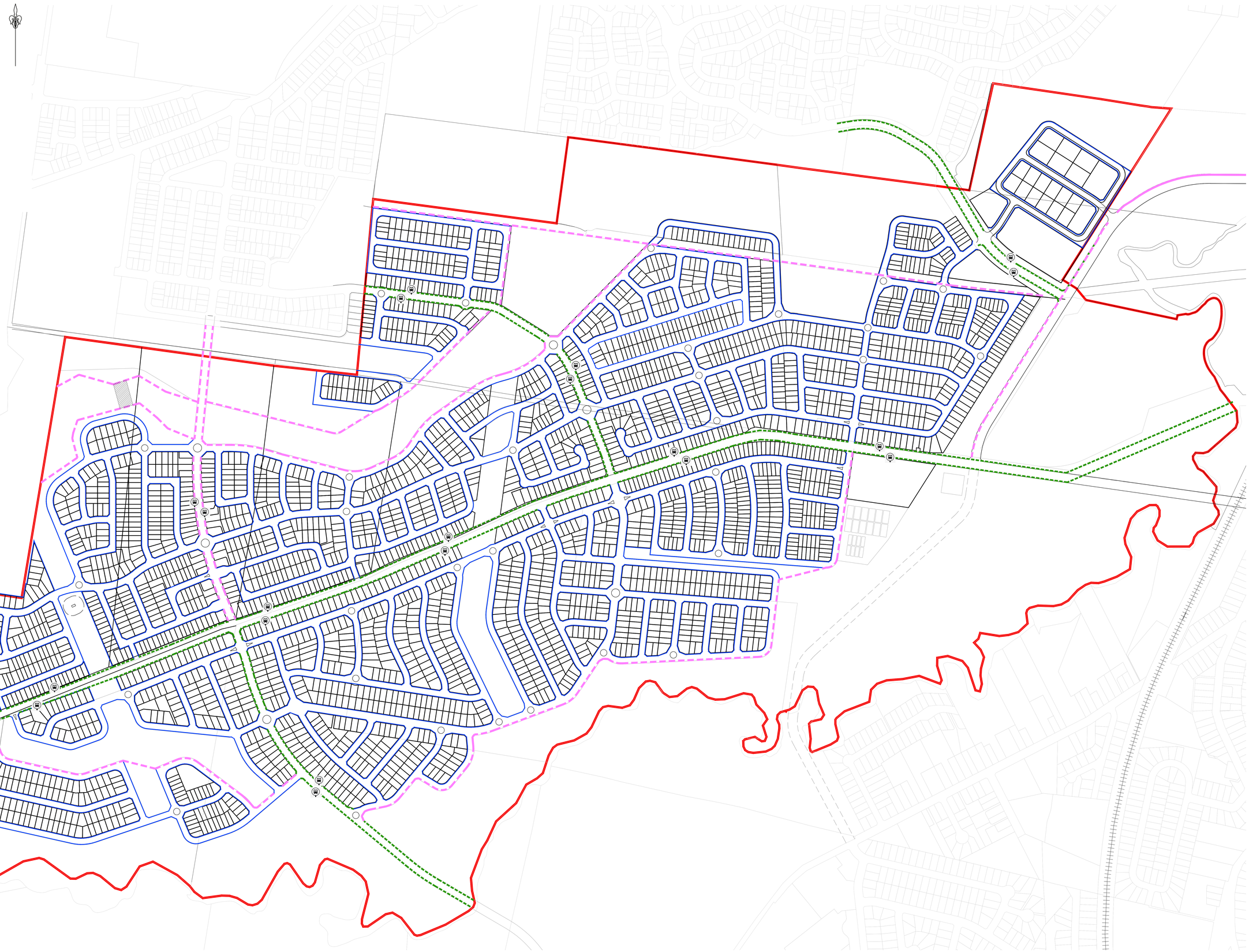
- Proposed Lot Size Plan

A0

LEGEND

- 1.5m PEDESTRIAN FOOTPATH
- 2.5m SHARED PATH
- 3.0m SHARED PATH
- OFF-ROAD CYCLEWAY BRIDGE
- INDICATIVE BUS STOP



PROPOSED CYCLEWAY AND PEDESTRIAN PATH

100 80 60 40 20 0 150

1:3000 @ A0

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Project:

Principal: CLEVELAND ROAD DEVELOPMENTS

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1:3000	24/09/2020	
	Datum DHA	L.G.A. WOLLONGONG
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164-19P L01 [05]
- Proposed Cycleway and Pedestrian Path

A0

LEGEND

- SUB-ARTERIAL ROAD (TYPE 2)
- MAJOR COLLECTOR ROAD (TYPE 3)
- MINOR COLLECTOR ROAD (TYPE 4)
- LOCAL ROAD (TYPE 5)
- ACCESS STREET (TYPE 6)

PROPOSED ROAD HIERARCHY PLAN

100 80 60 40 20 0 50 100
1:2500 @ A0

DIAL 1100 BEFORE YOU DIG

Project:

Principal: CLEVELAND ROAD DEVELOPMENTS

Scale	Date	Council Ref.
1:3000	22/09/2020	
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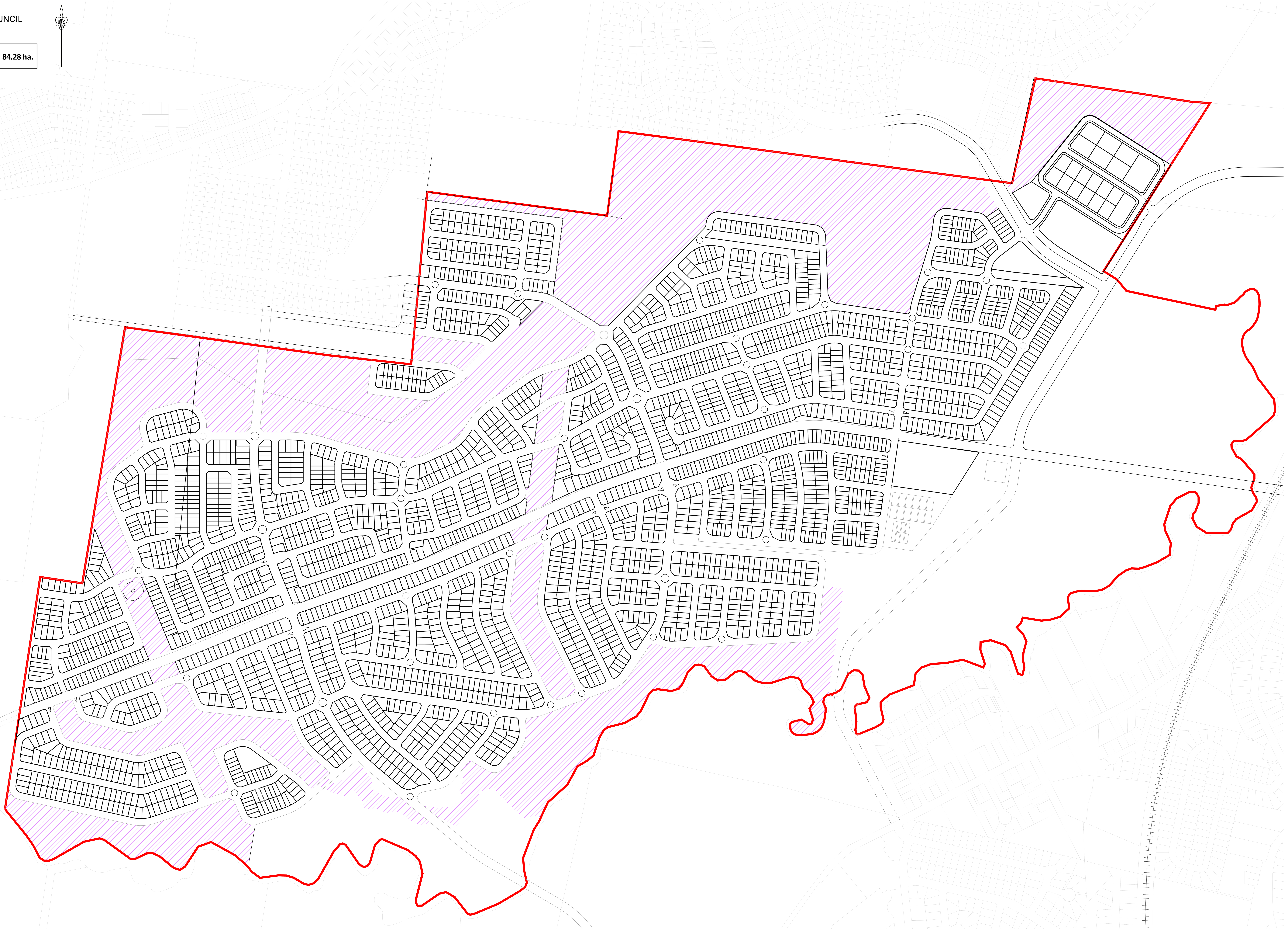
164-19P L01 [05]
- Road Hierarchy Plan

FUTURE COUNCIL OWNERSHIP

FUTURE COUNCIL LAND OWNERSHIP AREA	84.28 ha.



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PROPOSED LAND OWNERSHIP PLAN

Principal: CLEVELAND ROAD DEVELOPMENTS			
Scale 1:3000	Date 24/09/2020	Council Ref.	
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Dwg File Ref. [Rev] - Sheet Ref. 164-19P L01 [06]
- Proposed Land Ownership Plan

A0

PROPOSED LAND ACQUISITION PLAN

Principal:	CLEVELAND ROAD DEVELOPMENTS
Scale	1:3000
Date	24/09/2020
Datum	DHA
Council Ref.	
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Calc's	N.F.
Drawn.	S.E.
Proj.Man.	M.V.
Client Ref:	

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Our Ref. 164-19

Dwg File Ref. [Rev] - Sheet Ref.
164-19P L01 [06]
- Proposed Land Acquisition Plan

Appendix B: P4466.001T TRACKS Modelling Technical Note

Issue History

File Name	Prepared	Reviewed	Issued by	Date	Issued to
P4466.001T TRACKS Modelling Technical Note	M.Hassan	A. Bitzios / L. Johnston	A. Bitzios	13/10/2020	Michael Braithwaite Newquest Property michael@newquestproperty.com.au

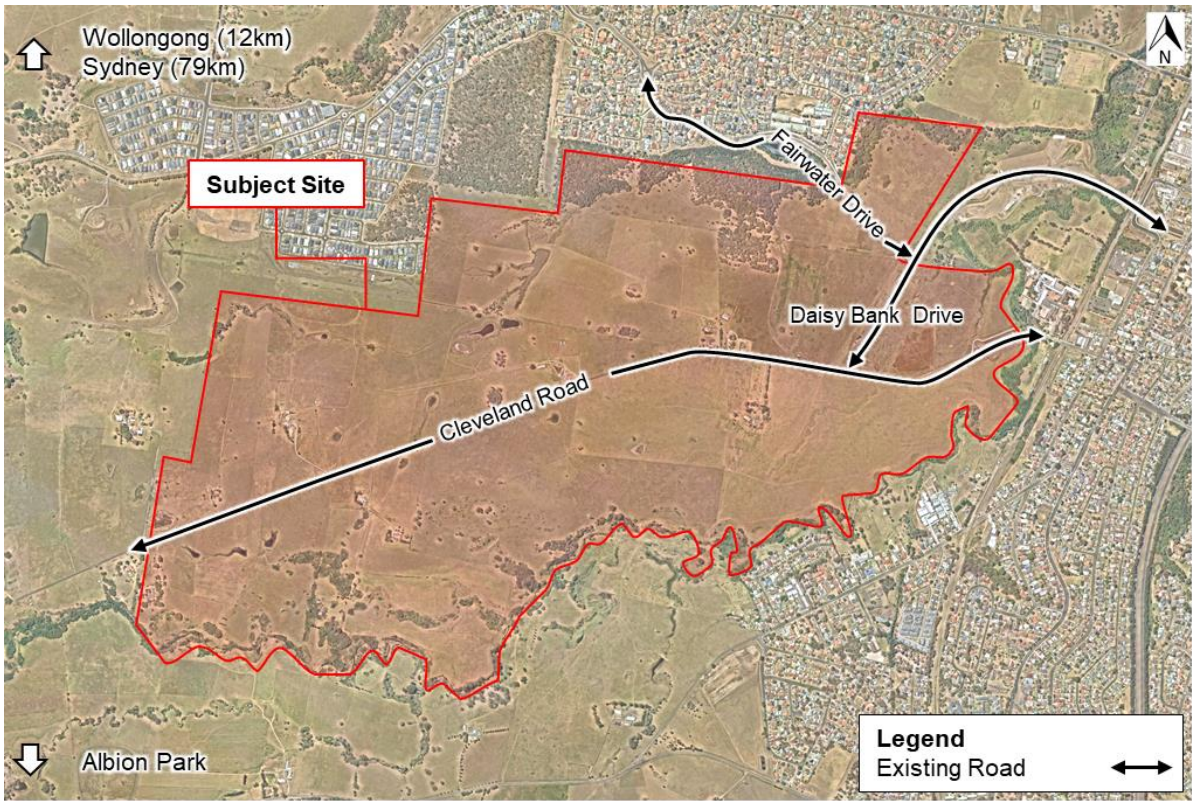
Cleveland Road North & South Neighbourhood Plan

TRACKS Modelling Technical Note

1. Introduction

1.1 Background

Bitzios Consulting has been commissioned by Newquest Property Pty Ltd (applicant) to prepare a traffic impact assessment (TIA) for a residential subdivision planning proposal, located at 144-353 Cleveland Road, Cleveland (subject site). The subject site is located within the West Dapto Release Area. The location of the subject site is shown in Figure 1.1.



SOURCE: Google Maps

Figure 1.1: Subject Site Location

1.2 Purpose of the Technical Note

Wollongong City Council (Council) and Shellharbour City Council jointly developed a macroscopic traffic forecast model (commonly known as WOLSH model) with TRACKS modelling package. This WOLSH model was updated to incorporate the subject development and analyse the performance of the transportation network. This technical note describes these updates of the TRACKS modelling and present the outputs of the revised TRACKS models.

2. TRACKS Model Updates

The TRACKS models were procured from Council. In this assessment, the WOLSH 2036+ AM and PM models were used as these models included the ultimate development scenario.

2.1 Road Network

2.1.1 Roads

Internal road network was updated to reflect the latest road layout. No changes were made to the major roads including Cleveland Road, Daisy Bank Drive and Fairwater Drive. All the internal roads are coded as two lane, two way. Speed limit of all the internal roads were coded as 50km/h. The road network in the TRACKS model is showed in Figure 2.1.

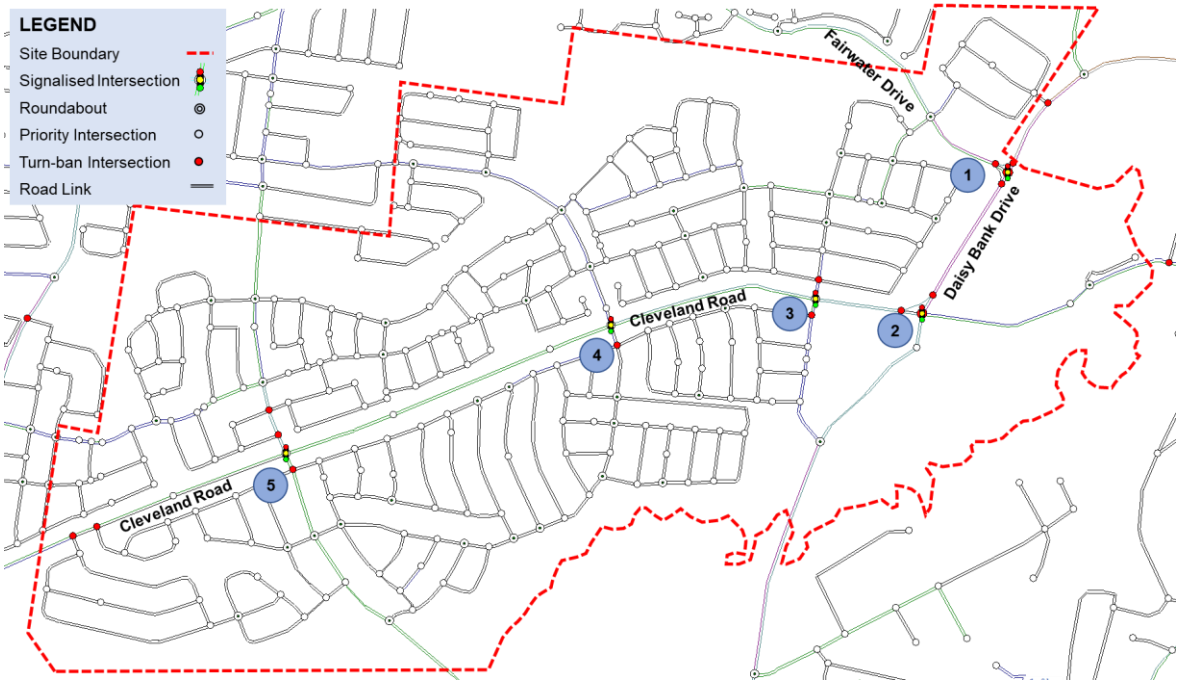


Figure 2.1: Updated Road Network in the TRACKS Model

2.1.2 Intersections

The model has five signalised intersections within the subject development and all these intersections were kept as is. However, one intersection (location 4 in Figure 2.1) must be shifted slightly towards east. No changes were made in the SIDRA file regarding including cycle time, phase time and lane configuration. The internal intersections were coded as roundabouts (where appropriate) and priority.

2.2 Centroids and Connectors

Some centroid locations and connectors were adjusted minimally to disperse the traffic and to reflect the revised road layout. The changes are shown in Figure 2.2

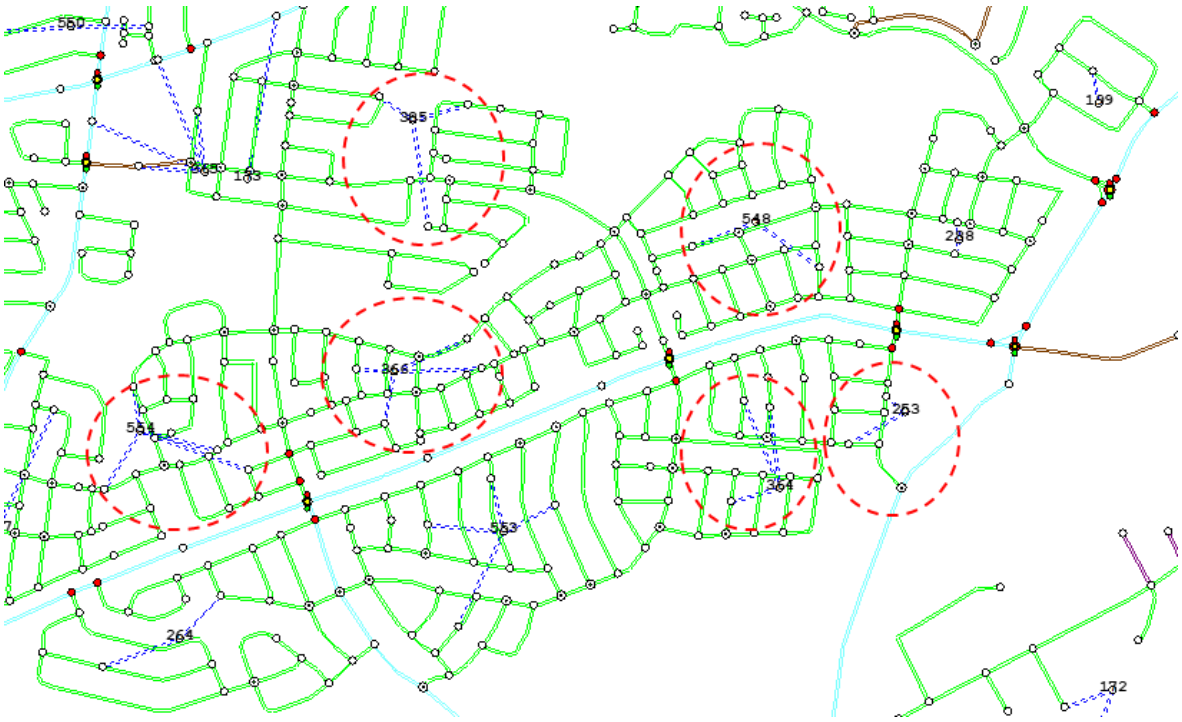


Figure 2.2: Updated Centroid Position and Connections in the TRACKS Model

2.3 Zone Attributes

Zone attributes including number of households and number of jobs were updated in the revised model. The updates are shown in Table 2.1.

Table 2.1: Table Heading (tables should look just like this)

Zone Number	Original TRACKS Model		Updated TRACKS Model	
	HH	Jobs	HH	Jobs
199	74	4	0	1,153
253	0	100	84	284
264	267	16	291	17
288	423	23	223	112
364	587	32	332	19
366	480	28	424	24
548	398	22	356	21
553	621	39	574	33
554	378	184	398	184*
Total	**3,608**	**470**	**3,062**	**1,140**

** 160 educational jobs plus 24 HBB jobs*

Number of households were calculated from the total counts of the residential lots for each zone. The number of jobs were calculated using the following steps:

- First, calculating the existing TRACKS model assumptions for Home Based Business (HBB) jobs which is found as 5.8% of the number of households for the zones of the subject site
- Apply this 5.8% rate to calculate number of HBB jobs for each zone.

- Use the RMS Guide Traffic Generating Developments – Technical Direction (TDT 4A) to calculate the number of jobs for B2, B6 and RE1 land uses. However, rates that are applicable to the site are limited:
  - For B2 land use (local centre), which is similar to a shopping centre, there aren't any employment numbers specified within the Shopping Centre Appendix. We have considered the B2 land use rate from Appendix E Business Parks and Industrial Estates – Site 7 Rutherford, despite these land uses not being a business park / industrial estate. The job generation rate is found as 0.0061 jobs per gross floor area (GFA).
  - For B6 land use (Enterprise Corridor) we consider a split of 25% is considered as office blocks and 75% is considered as business park / industrial estate rate (0.0061 jobs per GFA). For office blocks, rate from Appendix D1 Office Blocks – Site OB10 Wollongong is considered and found to be 0.0294 jobs per gross floor area (GFA).
  - For RE1 (Public Recreation) land use, no employment rate is readily available to calculate the number of jobs for this category. Assuming a sports facility in zone 253, a lumpsum of 40 jobs are assumed.
  - For zone 554, 160 educational jobs are assumed in the TRACKS model. There is no educational land use proposed in the subject site. However, assuming educational institute in the vacant land just beside the western boundary of the subject site, TRACKS model assumption of 160 jobs is retained.

3. TRACKS model Outputs

TRACKS models for AM and PM peak were rerun with all the steps including trip generation, trip distribution, CALM, matrix and assignment.

3.1 Intersection Delay and Level of Service

Key Intersections are shown in Figure 3.1. The intersection delay and level of service (LoS) for these intersections are shown in Table 3.1.

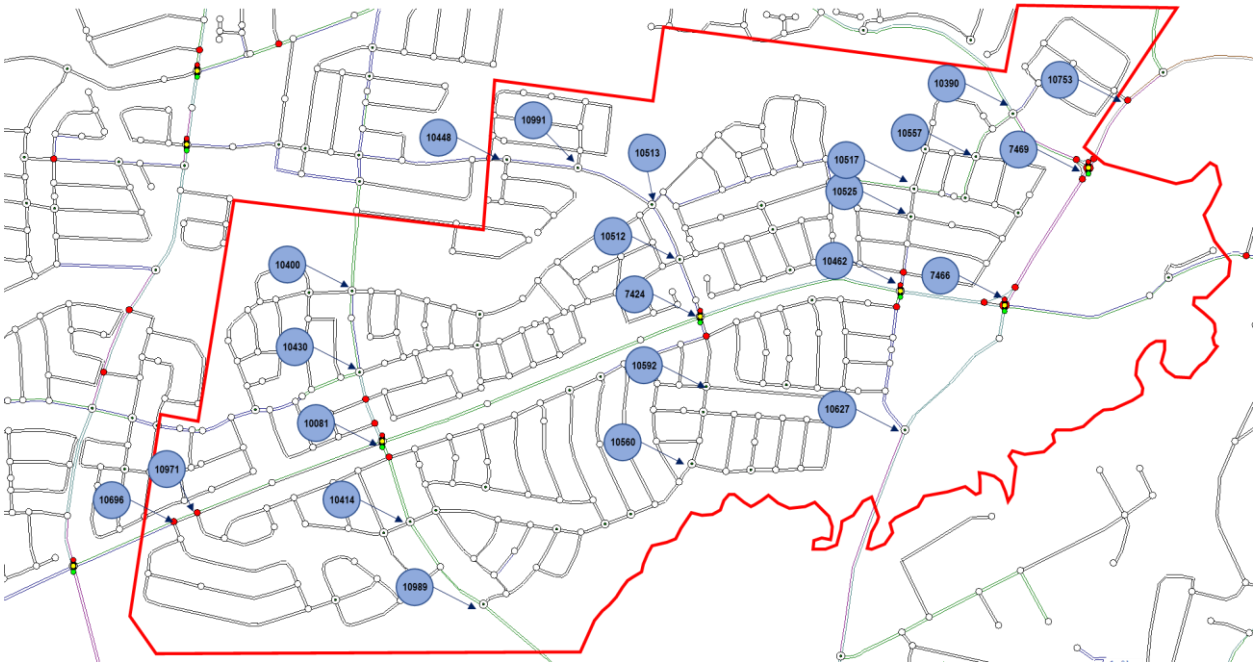


Figure 3.1: Approach Delay Plots for Updated TRACKS Model PM Peak

Table 3.1: Intersection Delay and Level of Service for the Updated TRACKS Model

Intersection Number	Intersection Control	Delay (s)*		Level of Service**	
		AM Peak	PM Peak	AM Peak	PM Peak
10696	Priority	9	10	A	A
10971	Priority	9	10	A	A
10400	Roundabout	13	13	A	A
10430	Roundabout	13	13	A	A
10081	Signal	21	23	B	B
10414	Roundabout	15	15	B	B
10989	Roundabout	13	13	A	A
10448	Roundabout	12	12	A	A
10991	Roundabout	12	12	A	A
10513	Roundabout	13	13	A	A
10512	Roundabout	13	12	A	A
7424	Signal	10	9	A	A
10592	Roundabout	12	12	A	A
10560	Roundabout	11	11	A	A
10627	Roundabout	15	14	B	A
10462	Signal	15	17	B	B
10525	Roundabout	12	12	A	A
10517	Roundabout	13	13	A	A
10557	Roundabout	12	12	A	A
10390	Roundabout	17	15	B	B
10753	Priority	7	8	A	A
7466	Signal	30	37	C	C
7469	Signal	18	16	B	B

**Highest movement delay for the priority intersections and roundabouts are reported. Average delay for the signalised intersections is reported.*

***LoS calculation is based on RMS' Traffic Modelling Guidelines (2013).*

3.2 Link Volume

Link volumes for AM and PM peak models are presented in Figure 3.2 and Figure 3.3 respectively.

3.3 Link Speed

Link speeds for AM and PM peak models are presented in Figure 3.4 and Figure 3.5 respectively.

3.4 Approach Delay

Approach delays for AM and PM peak models are presented in Figure 3.6 and Figure 3.7 respectively.

Figure 3.2: **Link Volume Plots for Updated TRACKS Model AM Peak**

Figure 3.3: Link Volume Plots for Updated TRACKS Model PM Peak

Figure 3.4: Link Speed Plots for Updated TRACKS Model AM Peak

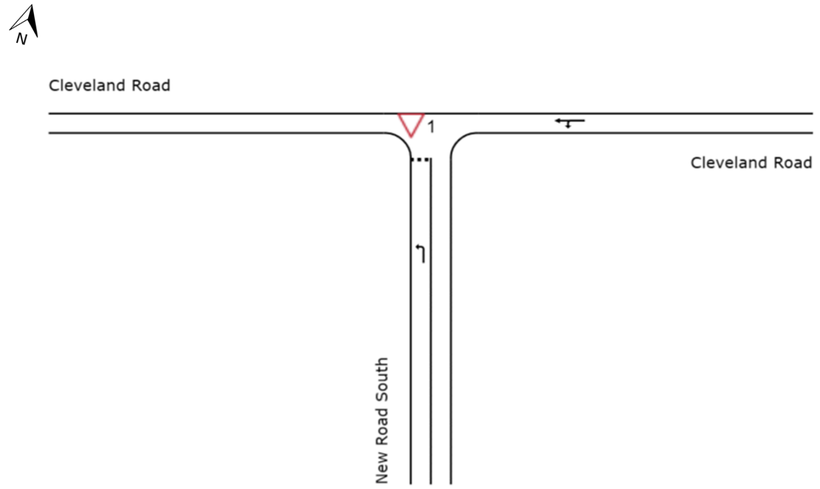
Figure 3.5: Link Speed Plots for Updated TRACKS Model PM Peak

Figure 3.6: Approach Delay Plots for Updated TRACKS Model AM Peak

Figure 3.7: Approach Delay Plots for Updated TRACKS Model PM Peak

Appendix C: SIDRA Results Summary

Node 10696: Cleveland Road / New Road Priority Intersection



Model Development and Assessment Criteria

The future traffic model obtained from the Wollongong-Shellharbour (WOLSH) (Node #10696).
The proposed intersection form was obtained from Wollongong City Council.

Intersection capacity mechanisms are indicated by dark grey shading, and outlined as follows:
- the degree of saturation for a particular movement is between 0.7 and 0.8; and
- the 95th percentile queue length is ±10m the length of the available turn pocket for a short lane.

Intersection over-capacity mechanisms are indicated by dark grey shading and red font, and outlined as follows:
- the degree of saturation for any intersection movement exceeds 0.8; and
-the 95th percentile queue length exceeds 10m beyond the length of the available turn pocket for a short lane, or exceeds 500m for a continuous lane.

Design Year

The design year for this TRACKS model is 2036.

Model Description

The traffic volumes represent the AM and PM peak hour for ultimate intersection performance.

The New Road southern approach is give-way controlled.

Cleveland Road is Westbound one-way traffic.

Key Findings

The intersection remains within Degree of Saturation (DoS) limits in all scenarios.

A Level of Service (LoS) of 'A' is consistent within all scenarios.

Intersection Performance - Ultimate

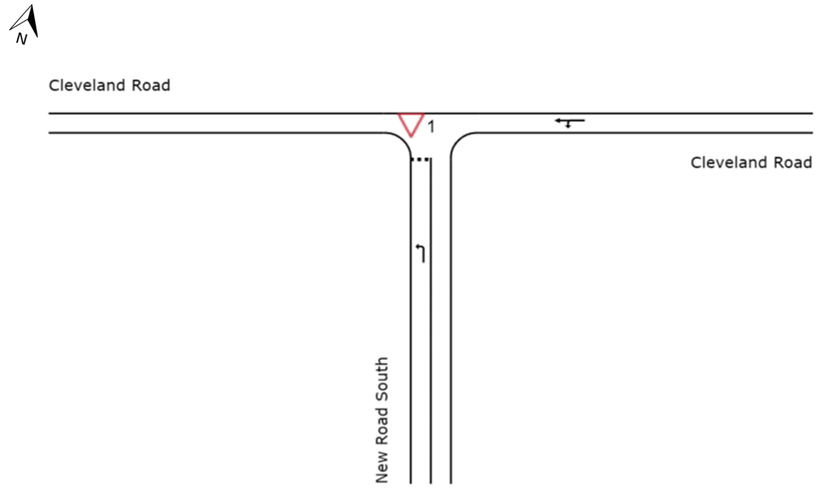
Year 2036 AM Peak Hour

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
New Road (S)	Left	25	0.02	4.2	0.5	A
Cleveland Road (E)	Left	1	0.05	4.6	0	A
	Through	86	0.05	0	0	A
Intersection	**All**	**113**	**0.05**	**1**	**0.5**	**N/A**

Year 2036 AM Peak Hour

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
New Road (S)	Left	31	0.02	4.4	0.6	A
Cleveland Road (E)	Left	1	0.08	4.6	0	A
	Through	149	0.08	0	0	A
Intersection	**All**	**181**	**0.08**	**0.8**	**0.6**	**N/A**

Node 10971: Cleveland Road / New Road Priority Intersection



Model Development and Assessment Criteria

The future traffic model obtained from the Wollongong-Shellharbour (WOLSH) (Node #10971).
The proposed intersection form was obtained from Wollongong City Council.

Intersection capacity mechanisms are indicated by dark grey shading, and outlined as follows:
- the degree of saturation for a particular movement is between 0.7 and 0.8; and
- the 95th percentile queue length is ±10m the length of the available turn pocket for a short lane.

Intersection over-capacity mechanisms are indicated by dark grey shading and red font, and outlined as follows:
- the degree of saturation for any intersection movement exceeds 0.8; and
-the 95th percentile queue length exceeds 10m beyond the length of the available turn pocket for a short lane, or exceeds 500m for a continuous lane.

Design Year

The design year for this TRACKS model is 2036.

Model Description

The traffic volumes represent the AM and PM peak hour for ultimate intersection performance.

The New Road southern approach is give-way controlled.

Cleveland Road is Westbound one-way traffic.

Key Findings

The intersection remains within Degree of Saturation (DoS) limits in all scenarios.

A Level of Service (LoS) of 'A' is consistent within all scenarios.

Intersection Performance - Ultimate

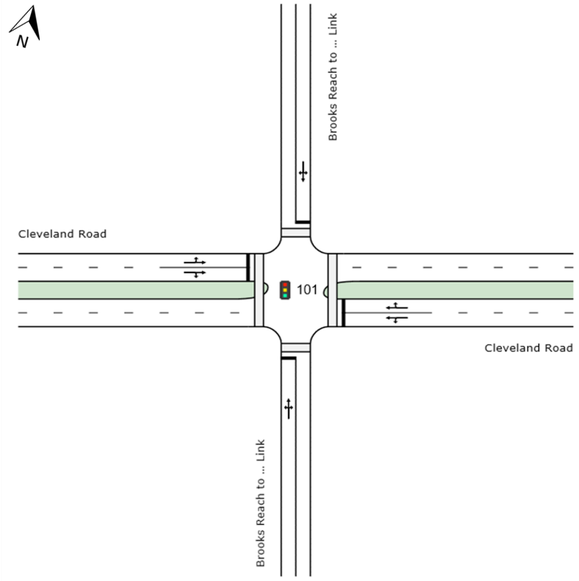
Year 2036 AM Peak Hour

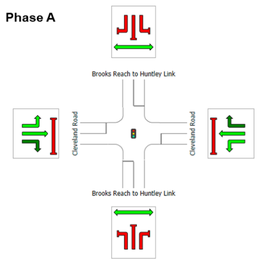
Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
New Road (S)	Left	5	0.00	4.8	0.1	A
Cleveland Road (E)	Left	1	0.04	4.6	0	A
	Through	81	0.04	0	0	A
Intersection	**All**	**87**	**0.04**	**0.3**	**0.1**	**N/A**

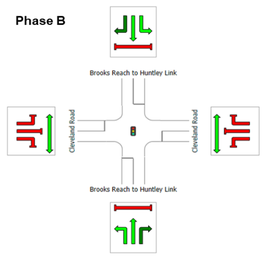
Year 2036 AM Peak Hour

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
New Road (S)	Left	9	0.01	5	0.2	A
Cleveland Road (E)	Left	1	0.08	4.6	0	A
	Through	140	0.08	0	0	A
Intersection	**All**	**151**	**0.075**	**0.4**	**0.2**	**N/A**

IN38: Cleveland Road / Brooks Reach to Huntley Link Signalised Intersection







Model Development and Assessment Criteria

The future traffic model obtained from the Wollongong-Shellharbour (WOLSH) TRACKS model (Node #10081).
The proposed intersection form was obtained from Wollongong City Council.

Intersection capacity mechanisms are indicated by dark grey shading, and outlined as follows:
- the degree of saturation for a particular movement is between 0.90 and 1.00; and
- the 95th percentile queue length is ±10m the length of the available turn pocket for a short lane.

Intersection over-capacity mechanisms are indicated by dark grey shading and red font, and outlined as follows:
- the degree of saturation for any intersection movement exceeds 1.00; and
-the 95th percentile queue length exceeds 10m beyond the length of the available turn pocket for a short lane, or exceeds 500m for a continuous lane.

Design Year

The design year for this TRACKS model is 2036.

Model Description

The traffic volumes represent the ultimate intersection performance for each AM and PM peak hour.

The intersection form is a one lane approach from both northern and southern apporaches of Brooks Reach to Huntley Link. Two lane approach from western and eastern approaches of Cleveland Road.

Key Findings

The intersection remains within Degree of Saturation (DoS) limits in all scenarios.

A Level of Service (LoS) of 'A' and 'B' is consistent within all approaches of the intersection.

Intersection Performance - Ultimate

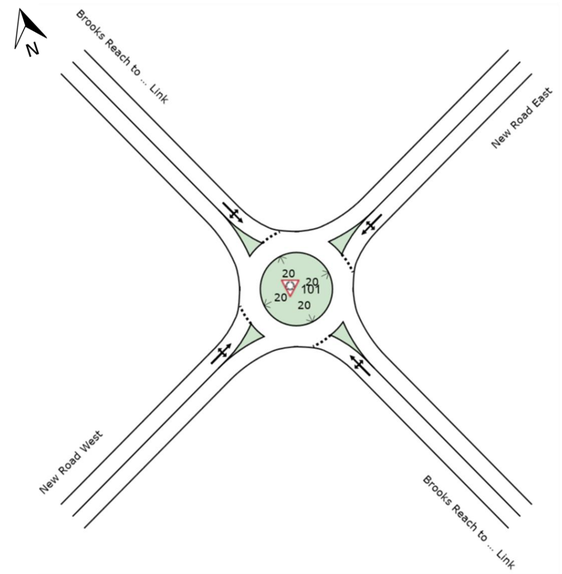
Year 2036 AM Peak Hour — Cycle Time: 30s

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
Brooks Reach to Huntley Link (S)	Left	1	0.55	11.7	30.3	A
	Through	293	0.55	7.9	30.3	A
	Right	53	0.55	11.7	30.3	A
Cleveland Road (E)	Left	31	0.28	16.5	10	B
	Through	72	0.28	11.9	10	A
	Right	123	0.43	18.9	13.4	B
Brooks Reach to Huntley Link (N)	Left	113	0.56	11.5	35.8	A
	Through	286	0.56	7.9	35.8	A
	Right	9	0.56	11.5	35.8	A
Cleveland Road (W)	Left	34	0.43	17	16.3	B
	Through	242	0.43	12.4	16.3	A
	Right	28	0.43	17.1	14.9	B
Intersection	**All**	**1284**	**0.56**	**11.2**	**35.8**	**A**

Year 2036 PM Peak Hour — Cycle Time: 30s

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
Brooks Reach to Huntley Link (S)	Left	1	0.63	13.2	38.7	A
	Through	368	0.63	9.4	38.7	A
	Right	29	0.63	13.2	38.7	A
Cleveland Road (E)	Left	59	0.45	16.1	19.3	B
	Through	136	0.45	11.5	19.3	A
	Right	241	0.68	18.8	27.7	B
Brooks Reach to Huntley Link (N)	Left	78	0.54	12.1	32.9	A
	Through	284	0.54	8.6	32.9	A
	Right	4	0.54	12.1	32.9	A
Cleveland Road (W)	Left	43	0.26	15.5	10.7	B
	Through	129	0.26	11	10.7	A
	Right	34	0.26	15.7	8.8	B
Intersection	**All**	**1407**	**0.68**	**12.1**	**38.7**	**A**

Node 10414: Brooks Reach to Huntley Link / New Road Roundabout



Model Development and Assessment Criteria

The future traffic model obtained from the Wollongong-Shellharbour (WOLSH) TRACKS model (Node #10414).
The proposed intersection form was obtained from Wollongong City Council.

Intersection capacity mechanisms are indicated by dark grey shading, and outlined as follows:
- the degree of saturation for a particular movement is between 0.90 and 1.00; and
- the 95th percentile queue length is ±10m the length of the available turn pocket for a short lane.

Intersection over-capacity mechanisms are indicated by dark grey shading and red font, and outlined as follows:
- the degree of saturation for any intersection movement exceeds 1.00; and
-the 95th percentile queue length exceeds 10m beyond the length of the available turn pocket for a short lane, or exceeds 500m for a continuous lane.

Design Year

The design year for this TRACKS model is 2036.

Model Description

The traffic volumes represent the ultimate intersection performance for each AM and PM peak hour.

The intersection form includes traffic medians on each approach.

The roundabout island geometry layout is the default outputs specified for SIDRA.

Key Findings

The intersection queuing and saturation capacity in the ultimate intersection performance remains within the acceptable limits.

Intersection Performance - Ultimate

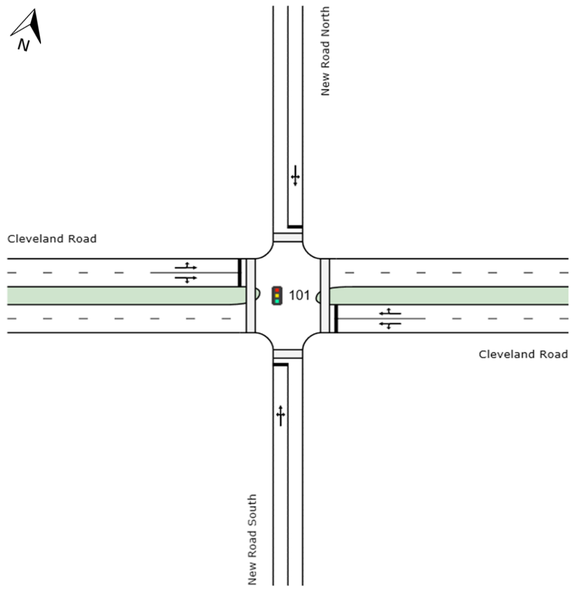
Year 2036 AM Peak Hour — Cycle Time: 30s

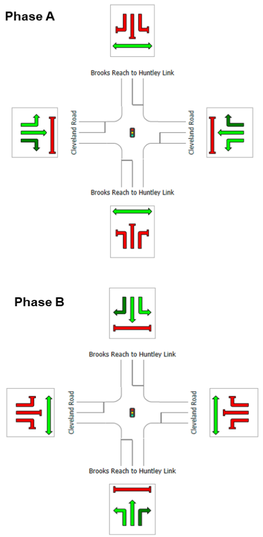
Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
Brooks Reach to Huntley Link (SE)	Left	33	0.20	3.4	8.4	A
	Through	231	0.20	3.4	8.4	A
	Right	1	0.20	7.8	8.4	A
New Road East (NE)	Left	1	0.05	4.3	1.7	A
	Through	7	0.05	4.3	1.7	A
	Right	43	0.05	8.8	1.7	A
Brooks Reach to Huntley Link (NW)	Left	1	0.20	3	8.9	A
	Through	240	0.20	3	8.9	A
	Right	55	0.20	7.5	8.9	A
New Road West (SW)	Left	1	0.03	3.7	1.2	A
	Through	3	0.03	3.7	1.2	A
	Right	33	0.03	8.1	1.2	A
Intersection	**All**	**648**	**0.20**	**4.2**	**8.9**	**A**

Year 2036 PM Peak Hour — Cycle Time: 30s

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
Brooks Reach to Huntley Link (SE)	Left	33	0.20	3.4	8.4	A
	Through	231	0.20	3.4	8.4	A
	Right	1	0.20	7.8	8.4	A
New Road East (NE)	Left	1	0.05	4.3	1.7	A
	Through	7	0.05	4.3	1.7	A
	Right	43	0.05	8.8	1.7	A
Brooks Reach to Huntley Link (NW)	Left	1	0.20	3	8.9	A
	Through	240	0.20	3	8.9	A
	Right	55	0.20	7.5	8.9	A
New Road West (SW)	Left	1	0.03	3.7	1.2	A
	Through	3	0.03	3.7	1.2	A
	Right	33	0.03	8.1	1.2	A
Intersection	**All**	**648**	**0.20**	**4.2**	**8.9**	**A**

IN37: Cleveland Road / New Road Signalised Intersection





Model Development and Assessment Criteria

The future traffic model obtained from the Wollongong-Shellharbour (WOLSH) TRACKS model (Node #7424).
The proposed intersection form was obtained from Wollongong City Council.

Intersection capacity mechanisms are indicated by dark grey shading, and outlined as follows:
- the degree of saturation for a particular movement is between 0.90 and 1.00; and
- the 95th percentile queue length is ±10m the length of the available turn pocket for a short lane.

Intersection over-capacity mechanisms are indicated by dark grey shading and red font, and outlined as follows:
- the degree of saturation for any intersection movement exceeds 1.00; and
-the 95th percentile queue length exceeds 10m beyond the length of the available turn pocket for a short lane, or exceeds 500m for a continuous lane.

Design Year

The design year for this TRACKS model is 2036.

Model Description

The traffic volumes represent the ultimate intersection performance for each AM and PM peak hour.

The intersection form is a one lane approach from both northern and southern apporaches of the New Roads. Two lane approach from western and eastern approaches of Cleveland Road.

Key Findings

The intersection remains within Degree of Saturation (DoS) limits in all scenarios.

A Level of Service (LoS) of 'A' and 'B' is consistent within all approaches of the intersection.

Intersection Performance - Ultimate

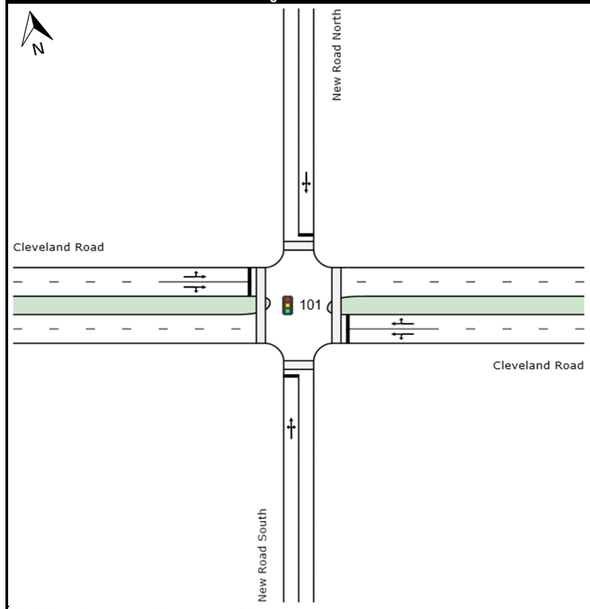
Year 2036 AM Peak Hour — Cycle Time: 30s

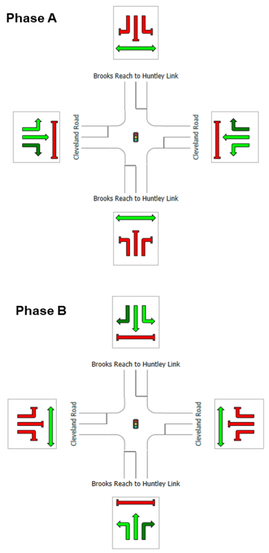
Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
New Road (S)	Left	6	0.32	14.5	12.5	A
	Through	17	0.32	10.3	12.5	A
	Right	112	0.32	14.5	12.5	B
Cleveland Road (E)	Left	56	0.34	13.2	18.1	A
	Through	209	0.34	8.8	18.1	A
	Right	95	0.34	14.2	13.4	A
New Road (N)	Left	29	0.17	13.2	6.8	A
	Through	39	0.17	9.7	6.8	A
	Right	9	0.17	13.2	6.8	A
Cleveland Road (W)	Left	8	0.33	13.1	17.5	A
	Through	392	0.33	8.5	17.5	A
	Right	7	0.33	13.2	17	A
Intersection	**All**	**980**	**0.34**	**10.5**	**18.1**	**A**

Year 2036 PM Peak Hour — Cycle Time: 30s

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
New Road (S)	Left	7	0.27	16.2	8.7	B
	Through	19	0.27	12	8.7	A
	Right	61	0.27	16.2	8.7	B
Cleveland Road (E)	Left	113	0.50	12.3	31.7	A
	Through	416	0.50	7.7	31.7	A
	Right	145	0.50	12.4	25.8	A
New Road (N)	Left	22	0.27	15.4	9.1	B
	Through	57	0.27	11.9	9.1	A
	Right	14	0.27	15.4	9.1	B
Cleveland Road (W)	Left	11	0.16	11.1	8.8	A
	Through	218	0.16	6.5	8.8	A
	Right	8	0.16	11.1	8.1	A
Intersection	**All**	**1091**	**0.502**	**9.7**	**31.7**	**A**

Node 10462: Cleveland Road / New Road Signalised Intersection





Model Development and Assessment Criteria

The future traffic model obtained from the Wollongong-Shellharbour (WOLSH) TRACKS model (Node #10462).
The proposed intersection form was obtained from Wollongong City Council.

Intersection capacity mechanisms are indicated by dark grey shading, and outlined as follows:
- the degree of saturation for a particular movement is between 0.90 and 1.00; and
- the 95th percentile queue length is ±10m the length of the available turn pocket for a short lane.

Intersection over-capacity mechanisms are indicated by dark grey shading and red font, and outlined as follows:
- the degree of saturation for any intersection movement exceeds 1.00; and
-the 95th percentile queue length exceeds 10m beyond the length of the available turn pocket for a short lane, or exceeds 500m for a continuous lane.

Design Year

The design year for this TRACKS model is 2036.

Model Description

The traffic volumes represent the ultimate intersection performance for each AM and PM peak hour.

The intersection form is a one lane approach from both northern and southern approaches of the New Roads. Two lane approach from western and eastern approaches of Cleveland Road.

Key Findings

The intersection remains within Degree of Saturation (DoS) limits in all scenarios.

A Level of Service (LoS) of 'A' and 'B' is consistent within all approaches of the intersection.

Intersection Performance - Ultimate

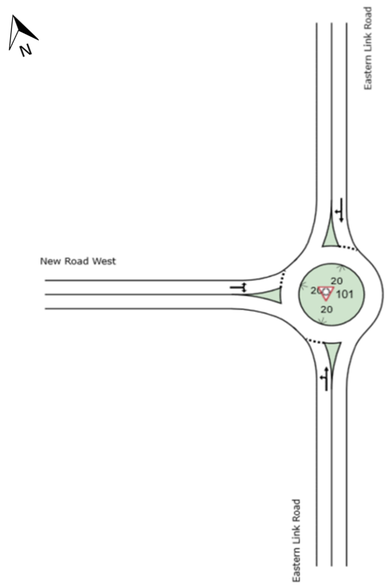
Year 2036 AM Peak Hour — Cycle Time: 30s

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
New Road (S)	Left	12	0.49	13.8	21.6	A
	Through	93	0.49	10.1	21.6	A
	Right	122	0.49	13.8	21.6	A
Cleveland Road (E)	Left	65	0.50	14.6	26.5	B
	Through	342	0.50	10.3	26.5	A
	Right	79	0.50	15.6	20.3	B
New Road (N)	Left	8	0.23	12.7	10.8	A
	Through	112	0.23	9	10.8	A
	Right	6	0.23	12.7	10.8	A
Cleveland Road (W)	Left	8	0.48	14.5	25.4	A
	Through	512	0.48	9.9	25.4	A
	Right	12	0.48	14.5	24.4	B
Intersection	**All**	**1371**	**0.50**	**11**	**26.5**	**A**

Year 2036 PM Peak Hour — Cycle Time: 30s

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
New Road (S)	Left	19	0.49	16.5	16.2	B
	Through	82	0.49	12.8	16.2	A
	Right	53	0.49	16.5	16.2	B
Cleveland Road (E)	Left	101	0.65	13.5	46.1	A
	Through	648	0.65	9	46.1	A
	Right	131	0.65	13.8	38.7	A
New Road (N)	Left	4	0.40	15.9	14.7	B
	Through	133	0.40	12.3	14.7	A
	Right	7	0.40	15.9	14.7	B
Cleveland Road (W)	Left	6	0.21	11.2	11.5	A
	Through	287	0.21	6.6	11.5	A
	Right	8	0.21	11.3	10.6	A
Intersection	**All**	**1480**	**0.65**	**10.2**	**46.1**	**A**

Node 10627: Eastern Link Road / New Road Roundabout



Model Development and Assessment Criteria

The future traffic model obtained from the Wollongong-Shellharbour (WOLSH) TRACKS model (Node #10627).
The proposed intersection form was obtained from Wollongong City Council.

Intersection capacity mechanisms are indicated by dark grey shading, and outlined as follows:
- the degree of saturation for a particular movement is between 0.85 and 1.00; and
- the 95th percentile queue length is ±10m the length of the available turn pocket for a short lane.

Intersection over-capacity mechanisms are indicated by dark grey shading and red font, and outlined as follows:
- the degree of saturation for any intersection movement exceeds 1.00; and
-the 95th percentile queue length exceeds 10m beyond the length of the available turn pocket for a short lane, or exceeds 500m for a continuous lane.

Design Year

The design year for this TRACKS model is 2036.

Model Description

The traffic volumes represent the ultimate intersection performance for each AM and PM peak hour.

The intersection form includes traffic medians on each approach.

The roundabout island geometry layout is the default outputs specified for SIDRA.

Key Findings

The intersection remains within Degree of Saturation (DoS) limits in all scenarios.

A Level of Service (LoS) of 'A is consistent within all approaches of the intersection.

Intersection Performance - Ultimate

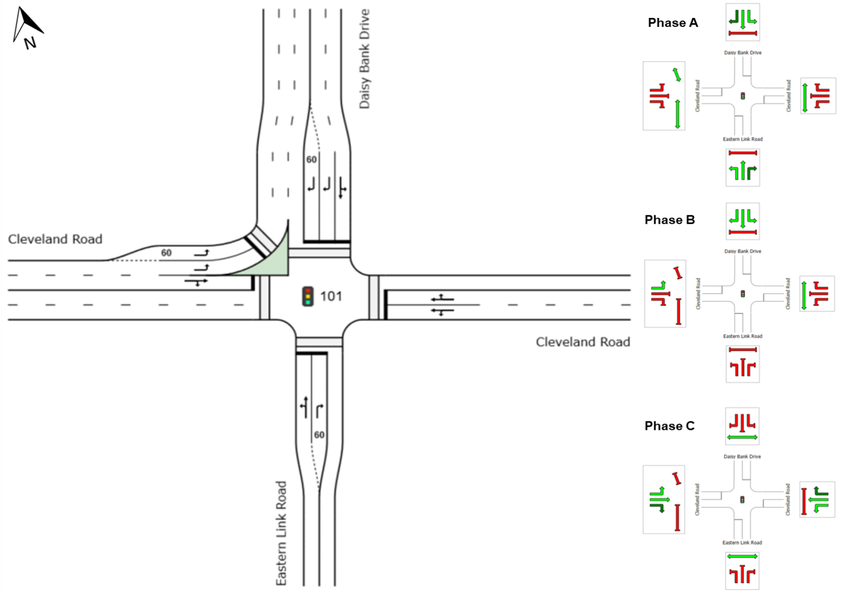
Year 2036 AM Peak Hour — Cycle Time: 30s

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
Eastern Link Road (S)	Left	195	0.39	2.9	23	A
	Through	471	0.39	2.8	23	A
Eastern Link Road (N)	Through	453	0.39	4.1	20.3	A
	Right	1	0.39	8.6	20.3	A
New Road (W)	Left	6	0.21	5.7	8.5	A
	Right	194	0.21	10.1	8.5	A
Intersection	**All**	**1319**	**0.39**	**4.3**	**23**	**A**

Year 2036 PM Peak Hour — Cycle Time: 30s

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
Eastern Link Road (S)	Left	139	0.26	2.9	13.7	A
	Through	307	0.26	2.8	13.7	A
Eastern Link Road (N)	Through	563	0.50	4.6	28.4	A
	Right	1	0.50	9.1	28.4	A
New Road (W)	Left	11	0.23	4.7	9.3	A
	Right	238	0.23	9.1	9.3	A
Intersection	**All**	**1259**	**0.50**	**4.8**	**28.4**	**A**

IN36: Cleveland Road / Daisy Bank Road / Eastern Link Road Signalised Intersection



Model Development and Assessment Criteria

The future traffic model obtained from the Wollongong-Shellharbour (WOLSH) TRACKS model (Node #7466).
The proposed intersection form was obtained from Wollongong City Council.

Intersection capacity mechanisms are indicated by dark grey shading, and outlined as follows:
- the degree of saturation for a particular movement is between 0.90 and 1.00; and
- the 95th percentile queue length is ±10m the length of the available turn pocket for a short lane.

Intersection over-capacity mechanisms are indicated by dark grey shading and red font, and outlined as follows:
- the degree of saturation for any intersection movement exceeds 1.00; and
- the 95th percentile queue length exceeds 10m beyond the length of the available turn pocket for a short lane, or exceeds 500m for a continuous lane.

Design Year

The design year for this TRACKS model is 2036.

Model Description

The traffic volumes represent the ultimate intersection performance for each AM and PM peak hour.

The intersection form is a two lane approach and right turn pocket on the Daisy Bank Drive northern approach. One lane approach and right turn pocket on the Daisy Bank Drive southern approach. Two lane approach including a through / right turn shared lane on the Cleveland Road eastern approach. One lane approach including a through / right turn shared lane on the Cleveland Road western approach.

A two lane left turn pocket controlled by signals for pedestrian use is implemented on the western Cleveland Road approach.

Key Findings

The intersection remains within Degree of Saturation (DoS) limits in all scenarios.

A Level of Service (LoS) of 'A'to 'C' is consistent within all approaches of the intersection.

Intersection Performance - Ultimate

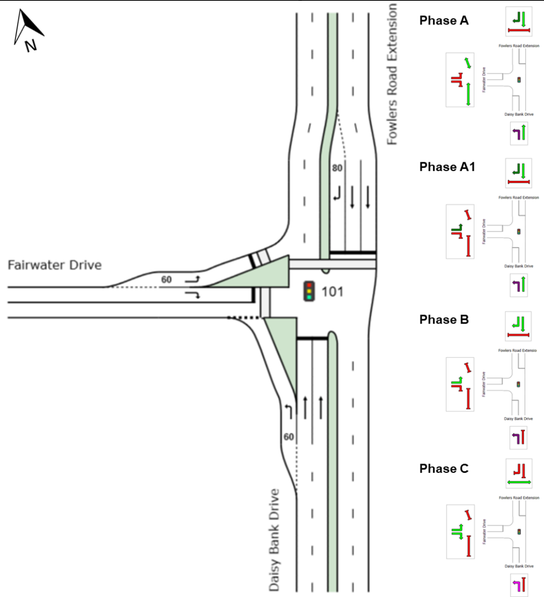
Year 2036 AM Peak Hour — Cycle Time: 40s

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
Eastern Link Road (S)	Left	14	0.88	29.4	77	C
	Through	402	0.88	24.8	77	B
	Right	76	0.32	22.5	10.6	B
Cleveland Road (E)	Left	59	0.47	22.9	18.7	B
	Through	137	0.47	18.4	18.7	B
	Right	52	0.47	23.1	16.7	B
Daisy Bank Drive (N)	Left	8	0.39	10.3	33.5	A
	Through	394	0.39	5.7	33.5	A
	Right	348	0.40	16.1	19.3	B
Cleveland Road (W)	Left	579	0.36	12.4	27.9	A
	Through	63	0.26	17.6	9.5	B
	Right	6	0.26	22.2	9.5	B
Intersection	**All**	**2138**	**0.88**	**15.7**	**77**	**B**

Year 2036 PM Peak Hour — Cycle Time: 36s

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
Eastern Link Road (S)	Left	1	0.88	28.2	45.6	B
	Through	275	0.88	23.6	45.6	B
	Right	42	0.20	22.8	5.5	B
Cleveland Road (E)	Left	57	0.29	19.9	10.6	B
	Through	107	0.29	15.4	10.6	B
	Right	7	0.29	20	10.4	B
Daisy Bank Drive (N)	Left	2	0.54	11.5	46.2	A
	Through	506	0.54	6.9	46.2	A
	Right	773	0.75	17.1	41.7	B
Cleveland Road (W)	Left	300	0.17	9.8	10.8	A
	Through	44	0.15	14.8	5.3	B
	Right	1	0.15	19.4	5.3	B
Intersection	**All**	**2116**	**0.88**	**14.5**	**46.2**	**B**

IN32: Daisy Bank Drive / Folwers Road Extension / Fairwater Drive Signalised Intersection



Model Development and Assessment Criteria

The future traffic model obtained from the Wollongong-Shellharbour (WOLSH) TRACKS model (Node #7469).
The proposed intersection form was obtained from Wollongong City Council.

Intersection capacity mechanisms are indicated by dark grey shading, and outlined as follows:
- the degree of saturation for a particular movement is between 0.90 and 1.00; and
- the 95th percentile queue length is ±10m the length of the available turn pocket for a short lane.

Intersection over-capacity mechanisms are indicated by dark grey shading and red font, and outlined as follows:
- the degree of saturation for any intersection movement exceeds 1.00; and
-the 95th percentile queue length exceeds 10m beyond the length of the available turn pocket for a short lane, or exceeds 500m for a continuous lane.

Design Year

The design year for this TRACKS model is 2036.

Model Description

The traffic volumes represent the ultimate intersection performance for each AM and PM peak hour.

The intersection form is a two lane approach and right turn pocket on the Fowlers Road Extension northern approach. Two lane approach on the Daisy Bank Drive southern approach. One lane approach on the Fairwater Drive approach.

A one lane left turn pocket controlled by signals for pedestrian use is implemented on the western Fairwater Drive approach. A one lane left turn pocket controlled by give way signage and linemarking is implemented on the Daisy Bank Drive southern approach.

Key Findings

The intersection remains within Degree of Saturation (DoS) limits in all scenarios.

A Level of Service (LoS) of 'A' and 'B' is consistent within all approaches of the intersection.

Intersection Performance - Ultimate

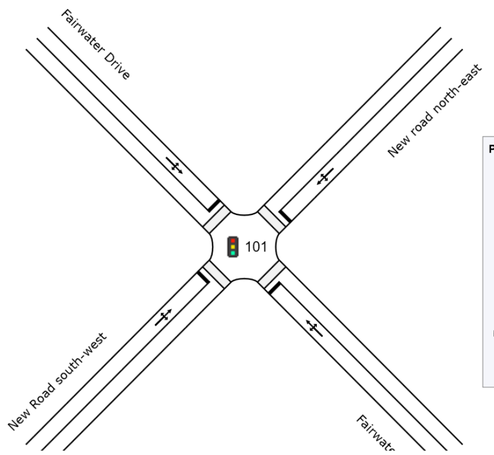
Year 2036 AM Peak Hour — Cycle Time: 45s

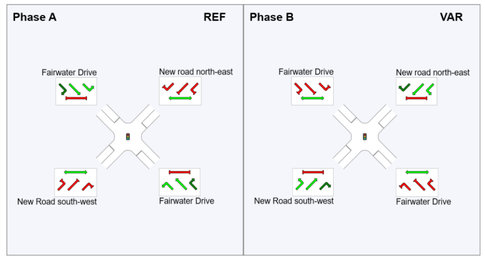
Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
Daisy Bank Drive (S)	Left	44	0.04	6.7	1.8	A
	Through	988	0.79	18.4	83.8	B
Fowlers Road Extension (N)	Through	721	0.32	4.9	28.9	A
	Right	262	0.62	18.4	35.6	B
Fairwater Drive (W)	Left	609	0.66	11.6	51.8	A
	Right	28	0.12	24.4	4.3	B
Intersection	**All**	**2654**	**0.79**	**13**	**83.8**	**A**

Year 2036 AM Peak Hour — Cycle Time: 45s

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
Daisy Bank Drive (S)	Left	86	0.11	9	5.5	A
	Through	497	0.42	13.8	32.9	A
Fowlers Road Extension (N)	Through	1268	0.56	5.9	62.3	A
	Right	467	0.83	22.7	74.8	B
Fairwater Drive (W)	Left	408	0.40	8.4	28.6	A
	Right	14	0.06	24.1	2	B
Intersection	**All**	**2741**	**0.83**	**10.8**	**74.8**	**A**

Node 10390: Fairwater Drive / New Road Priority Intersection





Model Development and Assessment Criteria

The future traffic model obtained from the Wollongong-Shellharbour (WOLSH) TRACKS model (Nodes #10390).
The proposed intersection form was obtained from Wollongong City Council.

Intersection capacity mechanisms are indicated by dark grey shading, and outlined as follows:
- the degree of saturation for a particular movement is between 0.7 and 0.8; and
- the 95th percentile queue length is ±10m the length of the available turn pocket for a short lane.

Intersection over-capacity mechanisms are indicated by dark grey shading and red font, and outlined as follows:
- the degree of saturation for any intersection movement exceeds 0.8; and
-the 95th percentile queue length exceeds 10m beyond the length of the available turn pocket for a short lane, or exceeds 500m for a continuous lane.

Design Year

The design year for this TRACKS model is 2036.

Model Description

The traffic volumes represent the ultimate intersection performance for each AM and PM peak hour.

The intersection form includes one lane approaches along Fairwater Drive and both new roads of the intersection.

Key Findings

The intersection remains within Degree of Saturation (DoS) limits in all scenarios.

A Level of Service (LoS) of 'A' and 'B' is consistent within all approaches of the intersection.

Intersection Performance - Ultimate

Year 2036 AM Peak Hour — Cycle Time: 30s

Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
Fairwater Drive (SE)	Left	6	0.41	17	13.8	B
	Through	17	0.41	12.4	13.8	A
	Right	112	0.41	17	13.8	B
New Road (NE)	Left	56	0.63	14.3	35.6	A
	Through	209	0.63	9.7	35.6	A
	Right	95	0.63	14.3	35.6	A
Fairwater Drive (NW)	Left	29	0.22	16.4	7.6	B
	Through	39	0.22	11.8	7.6	A
	Right	9	0.22	16.4	7.6	B
New Road (SW)	Left	8	0.55	12.4	35.4	A
	Through	392	0.55	7.9	35.4	A
	Right	7	0.55	12.4	35.4	A
Intersection	**All**	**980**	**0.63**	**11**	**35.6**	**A**

Year 2036 PM Peak Hour — Cycle Time: 40s

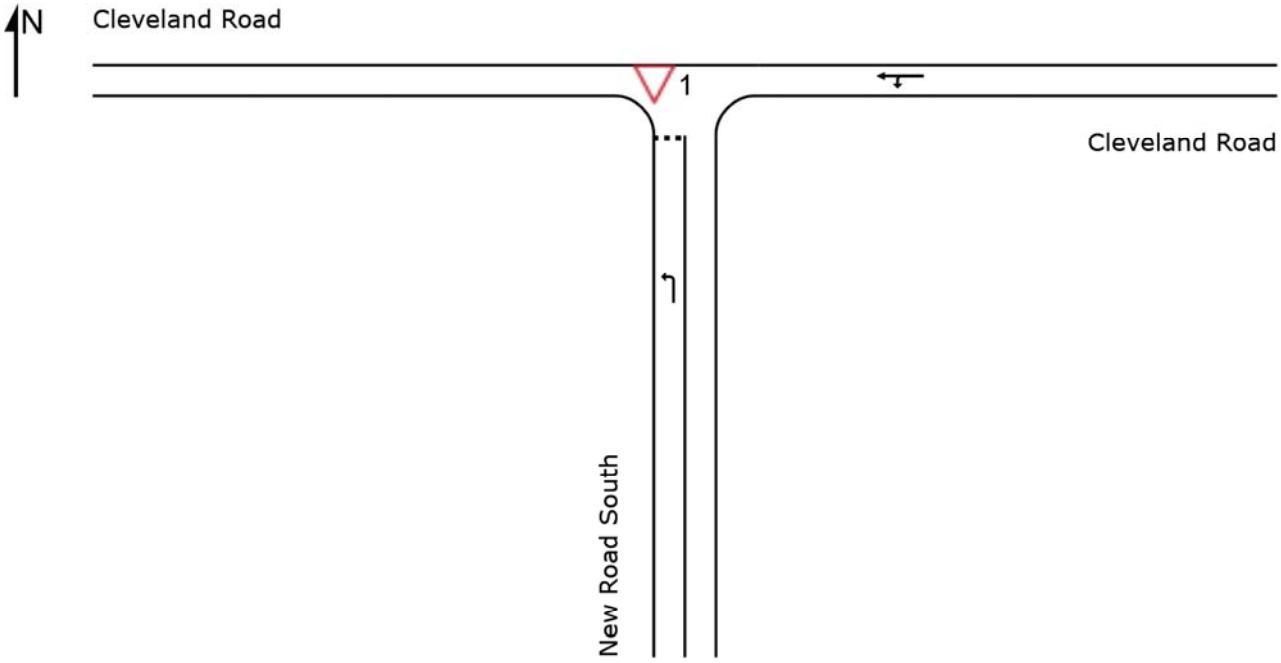
Approach	Movement	Demand (veh/h)	Degree of Saturation (v/c)	Delay (s)	95%ile Queue (m)	Level of Service
Fairwater Drive (SE)	Left	52	0.65	23.4	28.6	B
	Through	25	0.65	18.8	28.6	B
	Right	115	0.65	23.4	28.6	B
New Road (NE)	Left	49	0.58	11.8	55.4	A
	Through	485	0.58	7.2	55.4	A
	Right	18	0.58	11.8	55.4	A
Fairwater Drive (NW)	Left	1	0.07	20.5	2.5	B
	Through	4	0.07	15.9	2.5	B
	Right	15	0.07	20.5	2.5	B
New Road (SW)	Left	41	0.63	13.6	50.2	A
	Through	306	0.63	9.1	50.2	B
	Right	97	0.63	13.6	50.2	B
Intersection	**All**	**1208**	**0.65**	**11.3**	**55.4**	**A**

Appendix D: Detailed SIDRA Results

SITE LAYOUT

Site: 1 [Node 10696 AM]

Cleveland Road Priority Intersection
Site Category: (None)
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

Site: 1 [Node 10696 AM]

Cleveland Road Priority Intersection
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: New Road South												
1	L2	25	5.0	0.017	4.2	LOS A	0.1	0.5	0.18	0.49	0.18	41.1
Approach		25	5.0	0.017	4.2	LOS A	0.1	0.5	0.18	0.49	0.18	41.1
East: Cleveland Road												
4	L2	1	5.0	0.046	4.6	LOS A	0.0	0.0	0.00	0.01	0.00	41.7
5	T1	86	5.0	0.046	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	49.9
Approach		87	5.0	0.046	0.1	NA	0.0	0.0	0.00	0.01	0.00	49.8
All Vehicles		113	5.0	0.046	1.0	NA	0.1	0.5	0.04	0.11	0.04	47.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [Node 10696 PM]

Cleveland Road Priority Intersection
Site Category: (None)
Giveway / Yield (Two-Way)

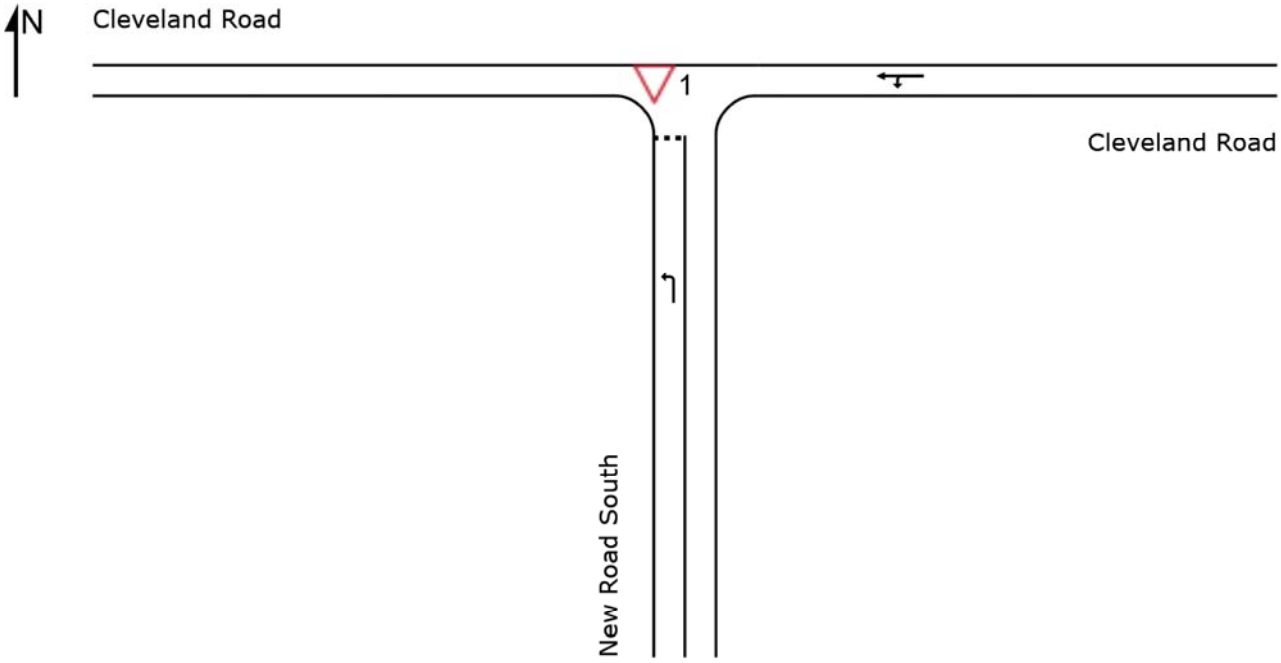
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: New Road South												
1	L2	31	5.0	0.022	4.4	LOS A	0.1	0.6	0.24	0.50	0.24	40.8
Approach		31	5.0	0.022	4.4	LOS A	0.1	0.6	0.24	0.50	0.24	40.8
East: Cleveland Road												
4	L2	1	5.0	0.080	4.6	LOS A	0.0	0.0	0.00	0.00	0.00	41.8
5	T1	149	5.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
Approach		151	5.0	0.080	0.0	NA	0.0	0.0	0.00	0.00	0.00	49.9
All Vehicles		181	5.0	0.080	0.8	NA	0.1	0.6	0.04	0.09	0.04	48.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [Node 10971 AM]

Cleveland Road Priority Intersection
Site Category: (None)
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

Site: 1 [Node 10971 AM]

Cleveland Road Priority Intersection
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: New Road South												
1	L2	5	5.0	0.004	4.8	LOS A	0.0	0.1	0.17	0.49	0.17	33.8
Approach		5	5.0	0.004	4.8	LOS A	0.0	0.1	0.17	0.49	0.17	33.8
East: Cleveland Road												
4	L2	1	5.0	0.044	4.6	LOS A	0.0	0.0	0.00	0.01	0.00	48.0
5	T1	81	5.0	0.044	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	49.9
Approach		82	5.0	0.044	0.1	NA	0.0	0.0	0.00	0.01	0.00	49.8
All Vehicles		87	5.0	0.044	0.3	NA	0.0	0.1	0.01	0.04	0.01	49.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [Node 10971 PM]

Cleveland Road Priority Intersection
Site Category: (None)
Giveway / Yield (Two-Way)

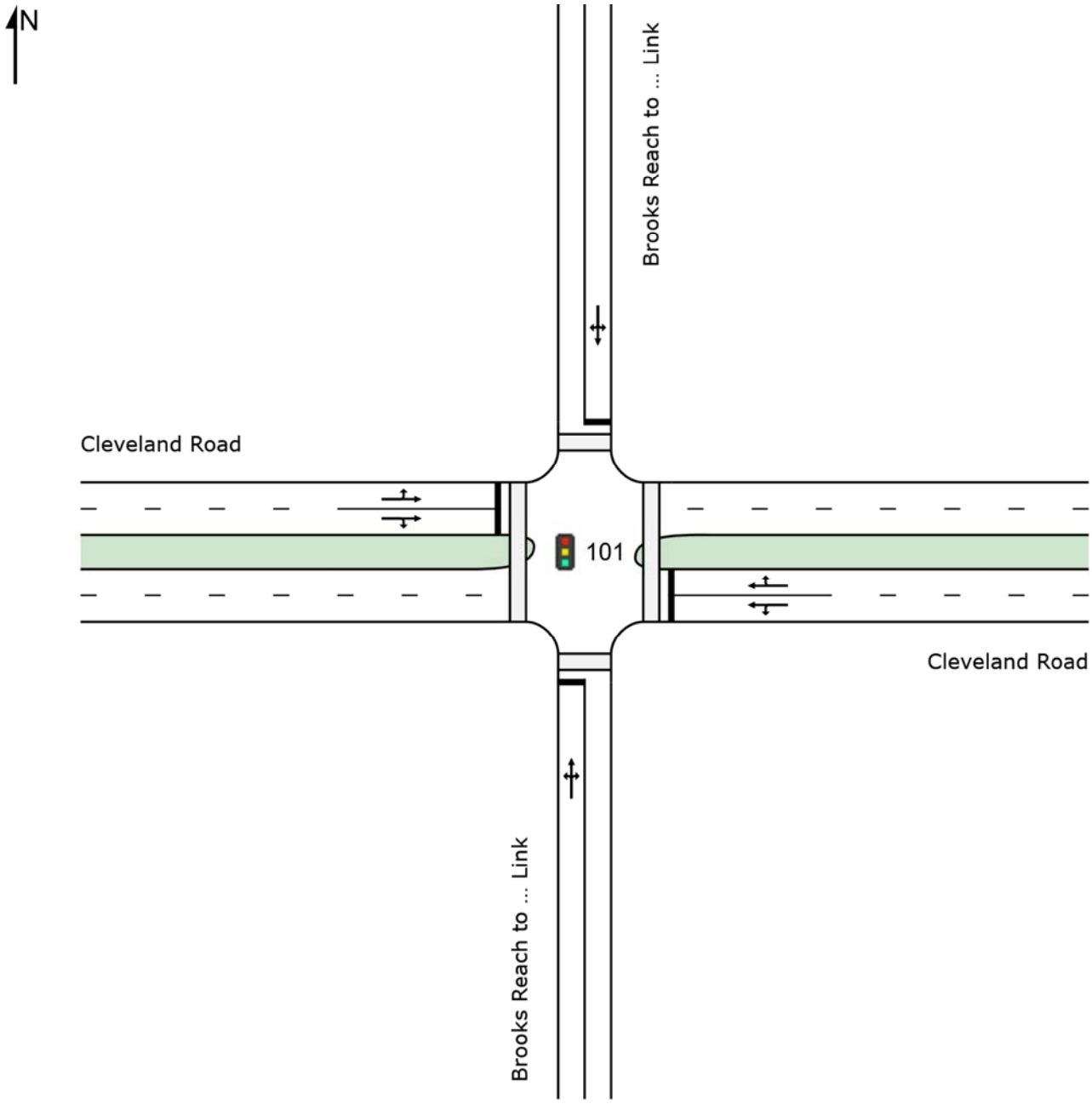
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: New Road South												
1	L2	9	5.0	0.007	5.0	LOS A	0.0	0.2	0.23	0.49	0.23	33.4
Approach		9	5.0	0.007	5.0	LOS A	0.0	0.2	0.23	0.49	0.23	33.4
East: Cleveland Road												
4	L2	1	5.0	0.075	4.6	LOS A	0.0	0.0	0.00	0.00	0.00	48.1
5	T1	140	5.0	0.075	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
Approach		141	5.0	0.075	0.0	NA	0.0	0.0	0.00	0.00	0.00	49.9
All Vehicles		151	5.0	0.075	0.4	NA	0.0	0.2	0.01	0.03	0.01	48.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [IN38 Node 10081 AM]

IN38: Cleveland Road / Brooks Reach to Huntley Link Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [IN38 Node 10081 AM]

IN38: Cleveland Road / Brooks Reach to Huntley Link Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Brooks Reach to Huntley Link												
1	L2	1	5.0	0.545	11.7	LOS A	4.2	30.3	0.81	0.71	0.81	37.6
2	T1	293	5.0	0.545	7.9	LOS A	4.2	30.3	0.81	0.71	0.81	23.8
3	R2	53	5.0	0.545	11.7	LOS A	4.2	30.3	0.81	0.71	0.81	40.0
Approach		346	5.0	0.545	8.5	LOS A	4.2	30.3	0.81	0.71	0.81	29.5
East: Cleveland Road												
4	L2	31	5.0	0.275	16.5	LOS B	1.4	10.0	0.88	0.70	0.88	35.9
5	T1	72	5.0	0.275	11.9	LOS A	1.4	10.0	0.88	0.70	0.88	40.8
6	R2	123	5.0	0.431	18.9	LOS B	1.8	13.4	0.96	0.76	0.96	32.4
Approach		225	5.0	0.431	16.3	LOS B	1.8	13.4	0.92	0.73	0.92	35.9
North: Brooks Reach to Huntley Link												
7	L2	113	5.0	0.561	11.5	LOS A	4.9	35.8	0.82	0.73	0.82	39.8
8	T1	286	5.0	0.561	7.9	LOS A	4.9	35.8	0.82	0.73	0.82	23.2
9	R2	9	5.0	0.561	11.5	LOS A	4.9	35.8	0.82	0.73	0.82	36.6
Approach		408	5.0	0.561	9.0	LOS A	4.9	35.8	0.82	0.73	0.82	32.2
West: Cleveland Road												
10	L2	34	5.0	0.426	17.0	LOS B	2.2	16.3	0.92	0.74	0.92	17.9
11	T1	242	5.0	0.426	12.4	LOS A	2.2	16.3	0.92	0.74	0.92	40.7
12	R2	28	5.0	0.426	17.1	LOS B	2.0	14.9	0.92	0.74	0.92	32.3
Approach		304	5.0	0.426	13.3	LOS A	2.2	16.3	0.92	0.74	0.92	37.5
All Vehicles		1284	5.0	0.561	11.2	LOS A	4.9	35.8	0.86	0.73	0.86	34.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P2	East Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P3	North Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P4	West Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
All Pedestrians		211	9.6	LOS A			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [IN38 Node 10081 AM]

IN38: Cleveland Road / Brooks Reach to Huntley Link Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

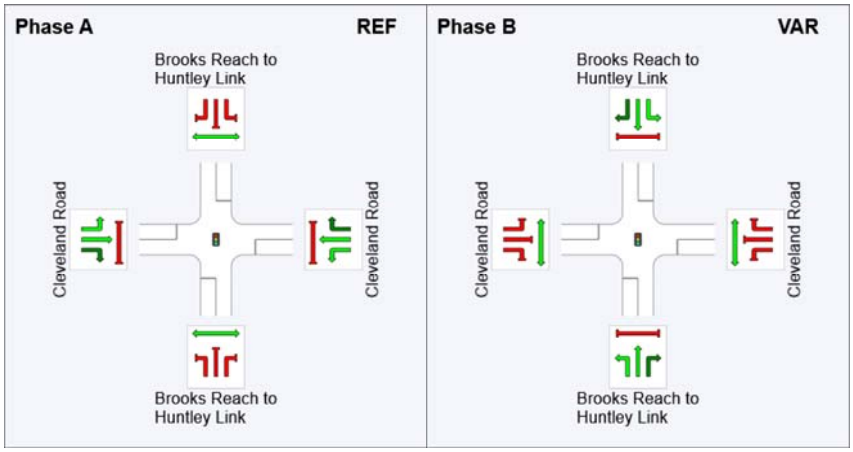
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*
Output Phase Sequence: A, B*
(* Variable Phase)

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	12
Green Time (sec)	6	12
Phase Time (sec)	12	18
Phase Split	40%	60%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

MOVEMENT SUMMARY

Site: 101 [IN38 Node 10081 PM]

IN38: Cleveland Road / Brooks Reach to Huntley Link Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Brooks Reach to Huntley Link												
1	L2	1	5.0	0.626	13.2	LOS A	5.3	38.7	0.87	0.79	0.94	36.4
2	T1	368	5.0	0.626	9.4	LOS A	5.3	38.7	0.87	0.79	0.94	22.2
3	R2	29	5.0	0.626	13.2	LOS A	5.3	38.7	0.87	0.79	0.94	39.1
Approach		399	5.0	0.626	9.7	LOS A	5.3	38.7	0.87	0.79	0.94	25.4
East: Cleveland Road												
4	L2	59	5.0	0.449	16.1	LOS B	2.6	19.3	0.90	0.74	0.90	36.2
5	T1	136	5.0	0.449	11.5	LOS A	2.6	19.3	0.90	0.74	0.90	41.0
6	R2	241	5.0	0.681	18.8	LOS B	3.8	27.7	0.97	0.90	1.19	32.4
Approach		436	5.0	0.681	16.2	LOS B	3.8	27.7	0.94	0.83	1.06	35.9
North: Brooks Reach to Huntley Link												
7	L2	78	5.0	0.543	12.1	LOS A	4.5	32.9	0.84	0.73	0.84	39.5
8	T1	284	5.0	0.543	8.6	LOS A	4.5	32.9	0.84	0.73	0.84	22.7
9	R2	4	5.0	0.543	12.1	LOS A	4.5	32.9	0.84	0.73	0.84	36.3
Approach		366	5.0	0.543	9.4	LOS A	4.5	32.9	0.84	0.73	0.84	30.2
West: Cleveland Road												
10	L2	43	5.0	0.264	15.5	LOS B	1.5	10.7	0.85	0.70	0.85	18.1
11	T1	129	5.0	0.264	11.0	LOS A	1.5	10.7	0.85	0.70	0.85	41.1
12	R2	34	5.0	0.264	15.7	LOS B	1.2	8.8	0.85	0.69	0.85	32.7
Approach		206	5.0	0.264	12.7	LOS A	1.5	10.7	0.85	0.70	0.85	34.8
All Vehicles		1407	5.0	0.681	12.1	LOS A	5.3	38.7	0.88	0.77	0.94	33.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P2	East Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P3	North Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P4	West Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
All Pedestrians		211	9.6	LOS A			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [IN38 Node 10081 PM]

IN38: Cleveland Road / Brooks Reach to Huntley Link Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

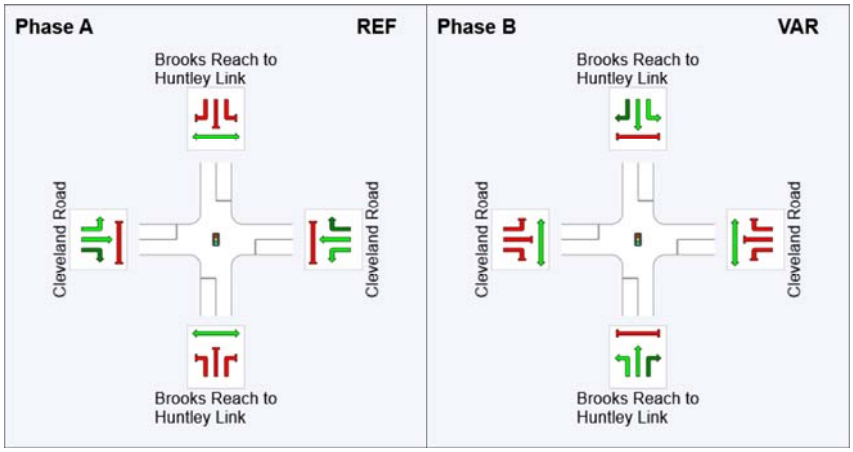
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*
Output Phase Sequence: A, B*
(* Variable Phase)

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	13
Green Time (sec)	7	11
Phase Time (sec)	13	17
Phase Split	43%	57%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



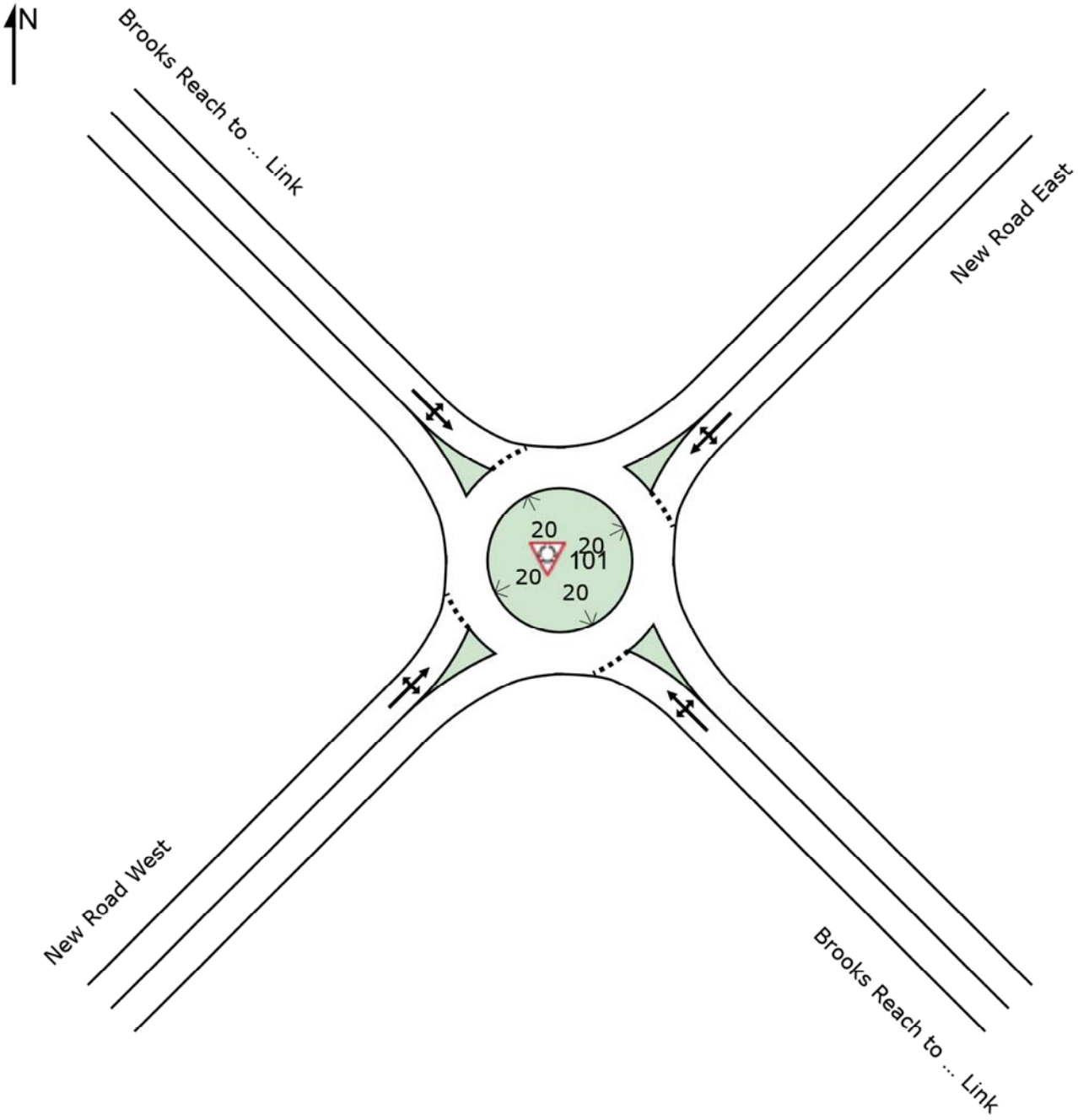
REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

SITE LAYOUT

Site: 101 [Node 10414 AM]

Brooks Reach to Huntley Link Roundabout
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 101 [Node 10414 AM]

Brooks Reach to Huntley Link Roundabout
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Brooks Reach to Huntley Link												
1	L2	33	5.0	0.204	3.4	LOS A	1.1	8.4	0.29	0.38	0.29	31.5
2	T1	231	5.0	0.204	3.4	LOS A	1.1	8.4	0.29	0.38	0.29	44.3
23	R2	1	0.0	0.204	7.8	LOS A	1.1	8.4	0.29	0.38	0.29	35.3
Approach		264	5.0	0.204	3.4	LOS A	1.1	8.4	0.29	0.38	0.29	42.9
NorthEast: New Road East												
24	L2	1	0.0	0.048	4.3	LOS A	0.2	1.7	0.45	0.61	0.45	32.4
25	T1	7	0.0	0.048	4.3	LOS A	0.2	1.7	0.45	0.61	0.45	25.0
26	R2	43	0.0	0.048	8.8	LOS A	0.2	1.7	0.45	0.61	0.45	38.5
Approach		52	0.0	0.048	8.1	LOS A	0.2	1.7	0.45	0.61	0.45	36.5
NorthWest: Brooks Reach to Huntley Link												
27	L2	1	0.0	0.203	3.0	LOS A	1.2	8.9	0.17	0.38	0.17	41.0
8	T1	240	5.0	0.203	3.0	LOS A	1.2	8.9	0.17	0.38	0.17	44.0
9	R2	55	5.0	0.203	7.5	LOS A	1.2	8.9	0.17	0.38	0.17	36.4
Approach		296	5.0	0.203	3.8	LOS A	1.2	8.9	0.17	0.38	0.17	42.5
SouthWest: New Road West												
10	L2	1	5.0	0.034	3.7	LOS A	0.2	1.2	0.42	0.59	0.42	35.5
31	T1	3	0.0	0.034	3.7	LOS A	0.2	1.2	0.42	0.59	0.42	34.1
12	R2	33	5.0	0.034	8.1	LOS A	0.2	1.2	0.42	0.59	0.42	29.9
Approach		37	4.6	0.034	7.6	LOS A	0.2	1.2	0.42	0.59	0.42	30.4
All Vehicles		648	4.6	0.204	4.2	LOS A	1.2	8.9	0.25	0.41	0.25	41.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Node 10414 PM]

Brooks Reach to Huntley Link Roundabout
Site Category: (None)
Roundabout

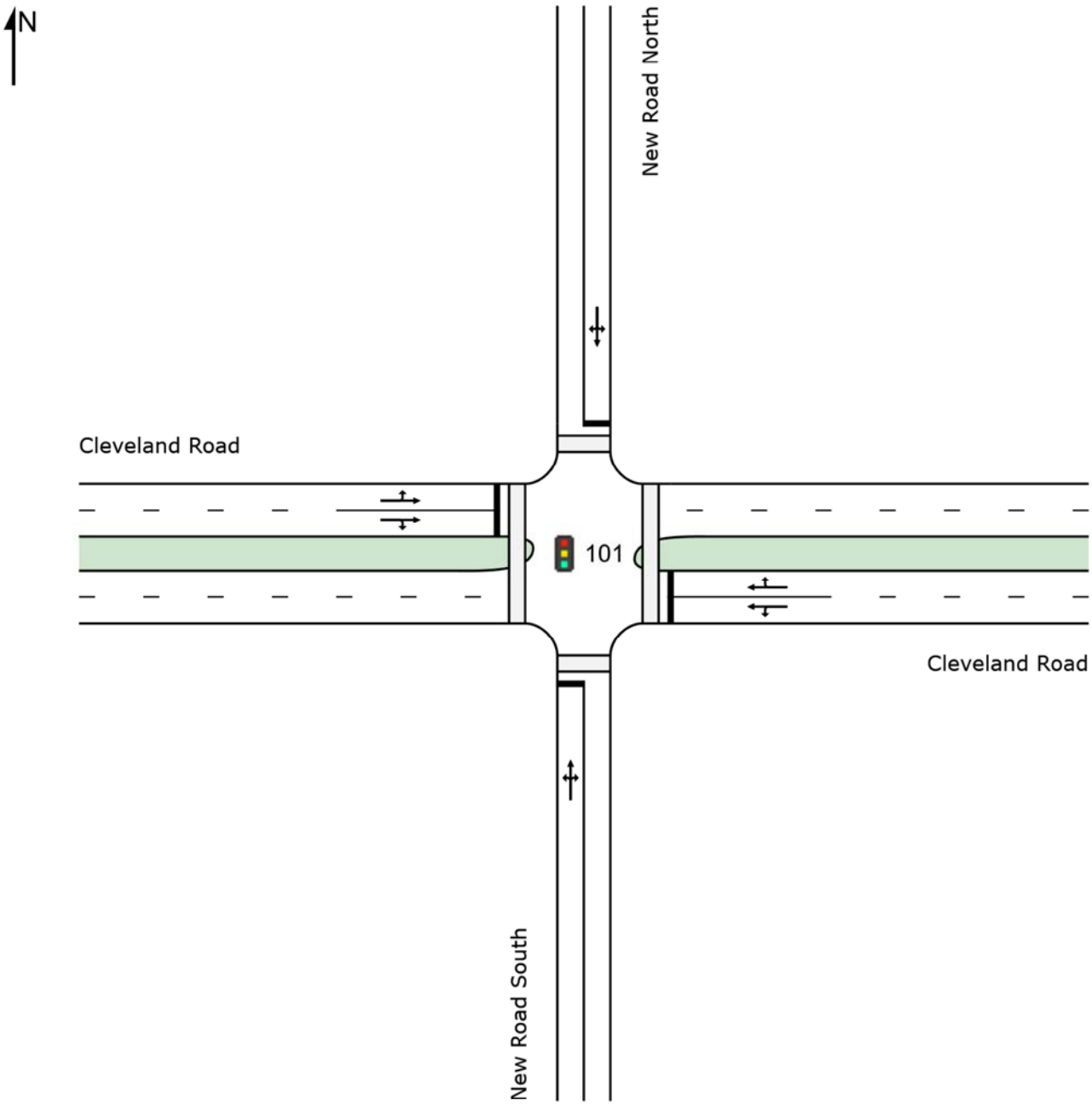
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Brooks Reach to Huntley Link												
1	L2	33	5.0	0.204	3.4	LOS A	1.1	8.4	0.29	0.38	0.29	31.5
2	T1	231	5.0	0.204	3.4	LOS A	1.1	8.4	0.29	0.38	0.29	44.3
23	R2	1	0.0	0.204	7.8	LOS A	1.1	8.4	0.29	0.38	0.29	35.3
Approach		264	5.0	0.204	3.4	LOS A	1.1	8.4	0.29	0.38	0.29	42.9
NorthEast: New Road East												
24	L2	1	0.0	0.048	4.3	LOS A	0.2	1.7	0.45	0.61	0.45	32.4
25	T1	7	0.0	0.048	4.3	LOS A	0.2	1.7	0.45	0.61	0.45	25.0
26	R2	43	0.0	0.048	8.8	LOS A	0.2	1.7	0.45	0.61	0.45	38.5
Approach		52	0.0	0.048	8.1	LOS A	0.2	1.7	0.45	0.61	0.45	36.5
NorthWest: Brooks Reach to Huntley Link												
27	L2	1	0.0	0.203	3.0	LOS A	1.2	8.9	0.17	0.38	0.17	41.0
8	T1	240	5.0	0.203	3.0	LOS A	1.2	8.9	0.17	0.38	0.17	44.0
9	R2	55	5.0	0.203	7.5	LOS A	1.2	8.9	0.17	0.38	0.17	36.4
Approach		296	5.0	0.203	3.8	LOS A	1.2	8.9	0.17	0.38	0.17	42.5
SouthWest: New Road West												
10	L2	1	5.0	0.034	3.7	LOS A	0.2	1.2	0.42	0.59	0.42	35.5
31	T1	3	0.0	0.034	3.7	LOS A	0.2	1.2	0.42	0.59	0.42	34.1
12	R2	33	5.0	0.034	8.1	LOS A	0.2	1.2	0.42	0.59	0.42	29.9
Approach		37	4.6	0.034	7.6	LOS A	0.2	1.2	0.42	0.59	0.42	30.4
All Vehicles		648	4.6	0.204	4.2	LOS A	1.2	8.9	0.25	0.41	0.25	41.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [IN37 Node 7424 AM]

IN37: Cleveland Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [IN37 Node 7424 AM]

IN37: Cleveland Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: New Road South												
1	L2	6	5.0	0.319	14.5	LOS A	1.7	12.5	0.84	0.74	0.84	27.5
2	T1	17	5.0	0.319	10.3	LOS A	1.7	12.5	0.84	0.74	0.84	18.5
3	R2	112	5.0	0.319	14.5	LOS B	1.7	12.5	0.84	0.74	0.84	39.1
Approach		135	5.0	0.319	14.0	LOS A	1.7	12.5	0.84	0.74	0.84	37.9
East: Cleveland Road												
4	L2	56	5.0	0.342	13.2	LOS A	2.5	18.1	0.79	0.68	0.79	41.1
5	T1	209	5.0	0.342	8.8	LOS A	2.5	18.1	0.80	0.69	0.80	42.9
6	R2	95	5.0	0.342	14.2	LOS A	1.8	13.4	0.82	0.72	0.82	39.3
Approach		360	5.0	0.342	10.9	LOS A	2.5	18.1	0.80	0.70	0.80	41.7
North: New Road North												
7	L2	29	5.0	0.166	13.2	LOS A	0.9	6.8	0.80	0.67	0.80	40.6
8	T1	39	5.0	0.166	9.7	LOS A	0.9	6.8	0.80	0.67	0.80	21.1
9	R2	9	5.0	0.166	13.2	LOS A	0.9	6.8	0.80	0.67	0.80	28.8
Approach		78	5.0	0.166	11.4	LOS A	0.9	6.8	0.80	0.67	0.80	34.4
West: Cleveland Road												
10	L2	8	5.0	0.329	13.1	LOS A	2.4	17.5	0.79	0.65	0.79	11.0
11	T1	392	5.0	0.329	8.5	LOS A	2.4	17.5	0.79	0.65	0.79	43.9
12	R2	7	5.0	0.329	13.2	LOS A	2.3	17.0	0.79	0.65	0.79	31.2
Approach		407	5.0	0.329	8.7	LOS A	2.4	17.5	0.79	0.65	0.79	43.1
All Vehicles		980	5.0	0.342	10.5	LOS A	2.5	18.1	0.80	0.68	0.80	41.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Pedestrian Back of Queue ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P2	East Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P3	North Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P4	West Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
All Pedestrians		211	9.6	LOS A			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [IN37 Node 7424 AM]

IN37: Cleveland Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

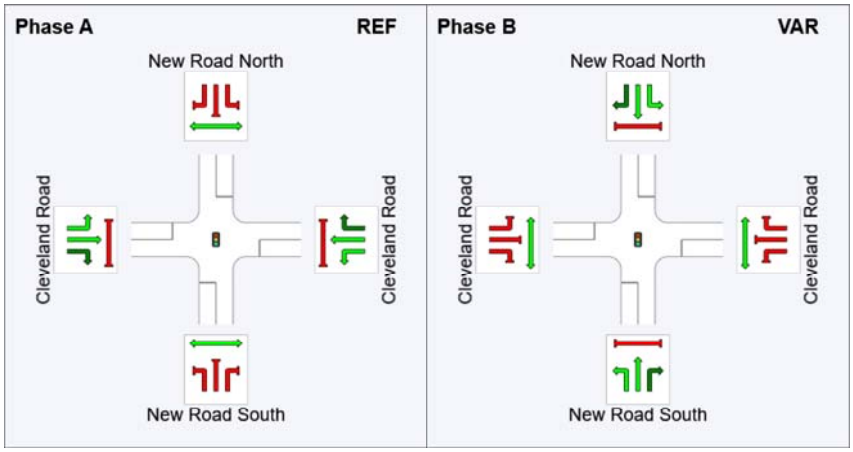
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*
Output Phase Sequence: A, B*
(* Variable Phase)

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	16
Green Time (sec)	10	8
Phase Time (sec)	16	14
Phase Split	53%	47%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

MOVEMENT SUMMARY

Site: 101 [IN37 Node 7424 PM]

IN37: Cleveland Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: New Road South												
1	L2	7	5.0	0.269	16.2	LOS B	1.2	8.7	0.88	0.73	0.88	26.5
2	T1	19	5.0	0.269	12.0	LOS A	1.2	8.7	0.88	0.73	0.88	17.5
3	R2	61	5.0	0.269	16.2	LOS B	1.2	8.7	0.88	0.73	0.88	38.4
Approach		87	5.0	0.269	15.3	LOS B	1.2	8.7	0.88	0.73	0.88	35.9
East: Cleveland Road												
4	L2	113	5.0	0.502	12.3	LOS A	4.3	31.7	0.80	0.71	0.80	41.6
5	T1	416	5.0	0.502	7.7	LOS A	4.3	31.7	0.80	0.72	0.80	43.5
6	R2	145	5.0	0.502	12.4	LOS A	3.5	25.8	0.80	0.73	0.80	40.8
Approach		674	5.0	0.502	9.5	LOS A	4.3	31.7	0.80	0.72	0.80	42.6
North: New Road North												
7	L2	22	5.0	0.266	15.4	LOS B	1.3	9.1	0.88	0.70	0.88	39.5
8	T1	57	5.0	0.266	11.9	LOS A	1.3	9.1	0.88	0.70	0.88	19.3
9	R2	14	5.0	0.266	15.4	LOS B	1.3	9.1	0.88	0.70	0.88	27.1
Approach		93	5.0	0.266	13.3	LOS A	1.3	9.1	0.88	0.70	0.88	29.9
West: Cleveland Road												
10	L2	11	5.0	0.164	11.1	LOS A	1.2	8.8	0.67	0.55	0.67	11.2
11	T1	218	5.0	0.164	6.5	LOS A	1.2	8.8	0.67	0.55	0.67	45.1
12	R2	8	5.0	0.164	11.1	LOS A	1.1	8.1	0.67	0.55	0.67	33.3
Approach		237	5.0	0.164	6.9	LOS A	1.2	8.8	0.67	0.55	0.67	43.3
All Vehicles		1091	5.0	0.502	9.7	LOS A	4.3	31.7	0.78	0.68	0.78	41.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P2	East Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P3	North Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P4	West Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
All Pedestrians		211	9.6	LOS A			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [IN37 Node 7424 PM]

IN37: Cleveland Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

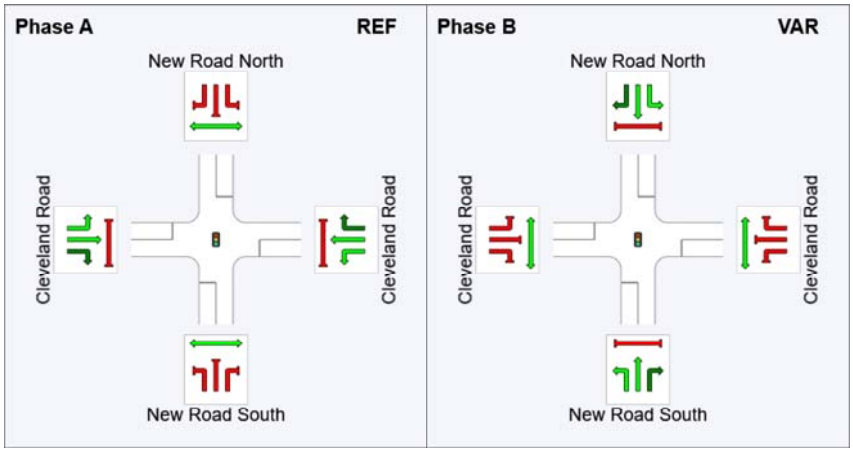
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*
Output Phase Sequence: A, B*
(* Variable Phase)

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	18
Green Time (sec)	12	6
Phase Time (sec)	18	12
Phase Split	60%	40%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



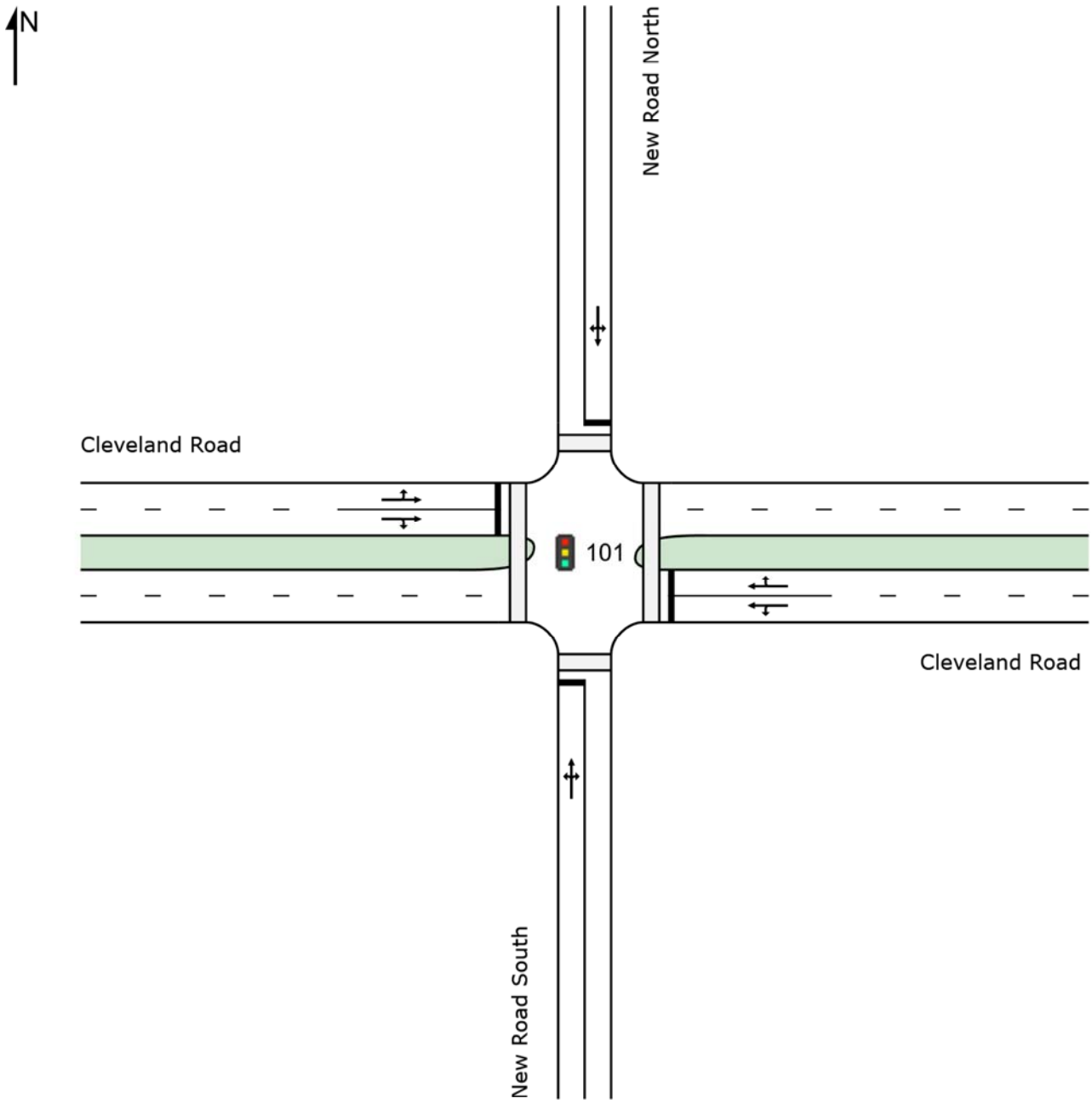
REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

SITE LAYOUT

Site: 101 [Node 10462 AM]

Cleveland Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [Node 10462 AM]

Cleveland Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: New Road South												
1	L2	12	5.0	0.492	13.8	LOS A	3.0	21.6	0.87	0.76	0.87	40.2
2	T1	93	5.0	0.492	10.1	LOS A	3.0	21.6	0.87	0.76	0.87	19.2
3	R2	122	5.0	0.492	13.8	LOS A	3.0	21.6	0.87	0.76	0.87	31.2
Approach		226	5.0	0.492	12.3	LOS A	3.0	21.6	0.87	0.76	0.87	29.0
East: Cleveland Road												
4	L2	65	5.0	0.501	14.6	LOS B	3.6	26.5	0.87	0.74	0.87	31.6
5	T1	342	5.0	0.501	10.3	LOS A	3.6	26.5	0.88	0.74	0.88	42.7
6	R2	79	5.0	0.501	15.6	LOS B	2.8	20.3	0.89	0.75	0.89	30.0
Approach		486	5.0	0.501	11.8	LOS A	3.6	26.5	0.88	0.74	0.88	40.7
North: New Road North												
7	L2	8	5.0	0.231	12.7	LOS A	1.5	10.8	0.79	0.64	0.79	34.2
8	T1	112	5.0	0.231	9.0	LOS A	1.5	10.8	0.79	0.64	0.79	22.6
9	R2	6	5.0	0.231	12.7	LOS A	1.5	10.8	0.79	0.64	0.79	41.7
Approach		126	5.0	0.231	9.5	LOS A	1.5	10.8	0.79	0.64	0.79	26.8
West: Cleveland Road												
10	L2	8	5.0	0.481	14.5	LOS A	3.5	25.4	0.86	0.72	0.86	32.0
11	T1	512	5.0	0.481	9.9	LOS A	3.5	25.4	0.86	0.72	0.86	43.5
12	R2	12	5.0	0.481	14.5	LOS B	3.3	24.4	0.86	0.72	0.86	40.7
Approach		532	5.0	0.481	10.1	LOS A	3.5	25.4	0.86	0.72	0.86	43.3
All Vehicles		1371	5.0	0.501	11.0	LOS A	3.6	26.5	0.86	0.72	0.86	40.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P2	East Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P3	North Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P4	West Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
All Pedestrians		211	9.6	LOS A			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Node 10462 AM]

Cleveland Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

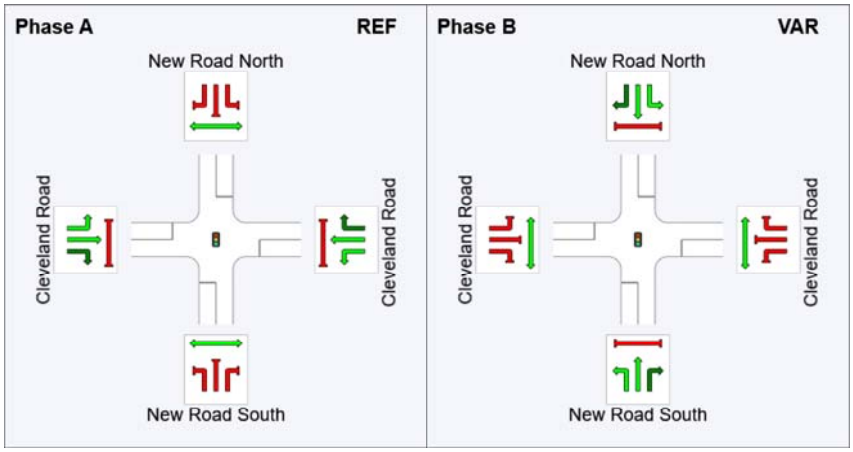
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*
Output Phase Sequence: A, B*
(* Variable Phase)

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	15
Green Time (sec)	9	9
Phase Time (sec)	15	15
Phase Split	50%	50%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

MOVEMENT SUMMARY

Site: 101 [Node 10462 PM]

Cleveland Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: New Road South												
1	L2	19	5.0	0.491	16.5	LOS B	2.2	16.2	0.93	0.76	0.94	38.9
2	T1	82	5.0	0.491	12.8	LOS A	2.2	16.2	0.93	0.76	0.94	17.4
3	R2	53	5.0	0.491	16.5	LOS B	2.2	16.2	0.93	0.76	0.94	29.4
Approach		154	5.0	0.491	14.5	LOS A	2.2	16.2	0.93	0.76	0.94	27.6
East: Cleveland Road												
4	L2	101	5.0	0.648	13.5	LOS A	6.3	46.1	0.86	0.80	0.93	32.7
5	T1	648	5.0	0.648	9.0	LOS A	6.3	46.1	0.86	0.81	0.94	43.5
6	R2	131	5.0	0.648	13.8	LOS A	5.3	38.7	0.86	0.82	0.96	31.7
Approach		880	5.0	0.648	10.2	LOS A	6.3	46.1	0.86	0.81	0.94	41.9
North: New Road North												
7	L2	4	5.0	0.396	15.9	LOS B	2.0	14.7	0.91	0.72	0.91	31.2
8	T1	133	5.0	0.396	12.3	LOS A	2.0	14.7	0.91	0.72	0.91	19.1
9	R2	7	5.0	0.396	15.9	LOS B	2.0	14.7	0.91	0.72	0.91	39.8
Approach		144	5.0	0.396	12.6	LOS A	2.0	14.7	0.91	0.72	0.91	22.7
West: Cleveland Road												
10	L2	6	5.0	0.209	11.2	LOS A	1.6	11.5	0.69	0.56	0.69	33.3
11	T1	287	5.0	0.209	6.6	LOS A	1.6	11.5	0.69	0.56	0.69	45.4
12	R2	8	5.0	0.209	11.3	LOS A	1.5	10.6	0.69	0.56	0.69	42.8
Approach		302	5.0	0.209	6.9	LOS A	1.6	11.5	0.69	0.56	0.69	45.1
All Vehicles		1480	5.0	0.648	10.2	LOS A	6.3	46.1	0.84	0.74	0.89	41.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P2	East Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P3	North Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P4	West Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
All Pedestrians		211	9.6	LOS A			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Node 10462 PM]

Cleveland Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

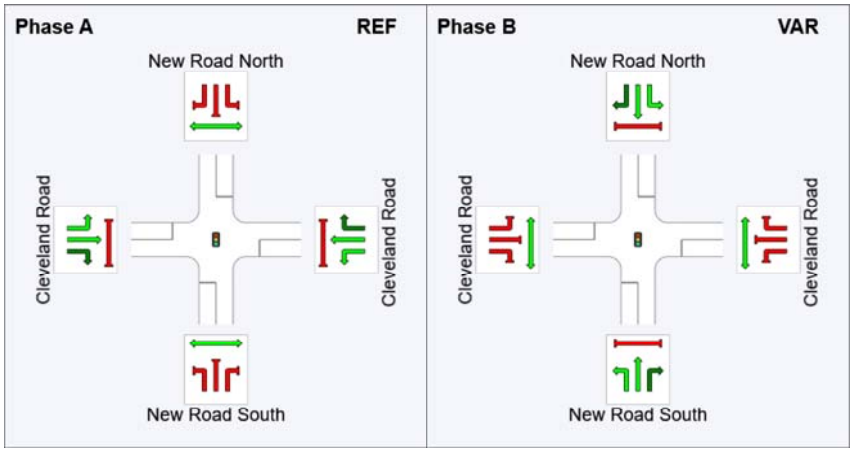
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*
Output Phase Sequence: A, B*
(* Variable Phase)

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	18
Green Time (sec)	12	6
Phase Time (sec)	18	12
Phase Split	60%	40%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



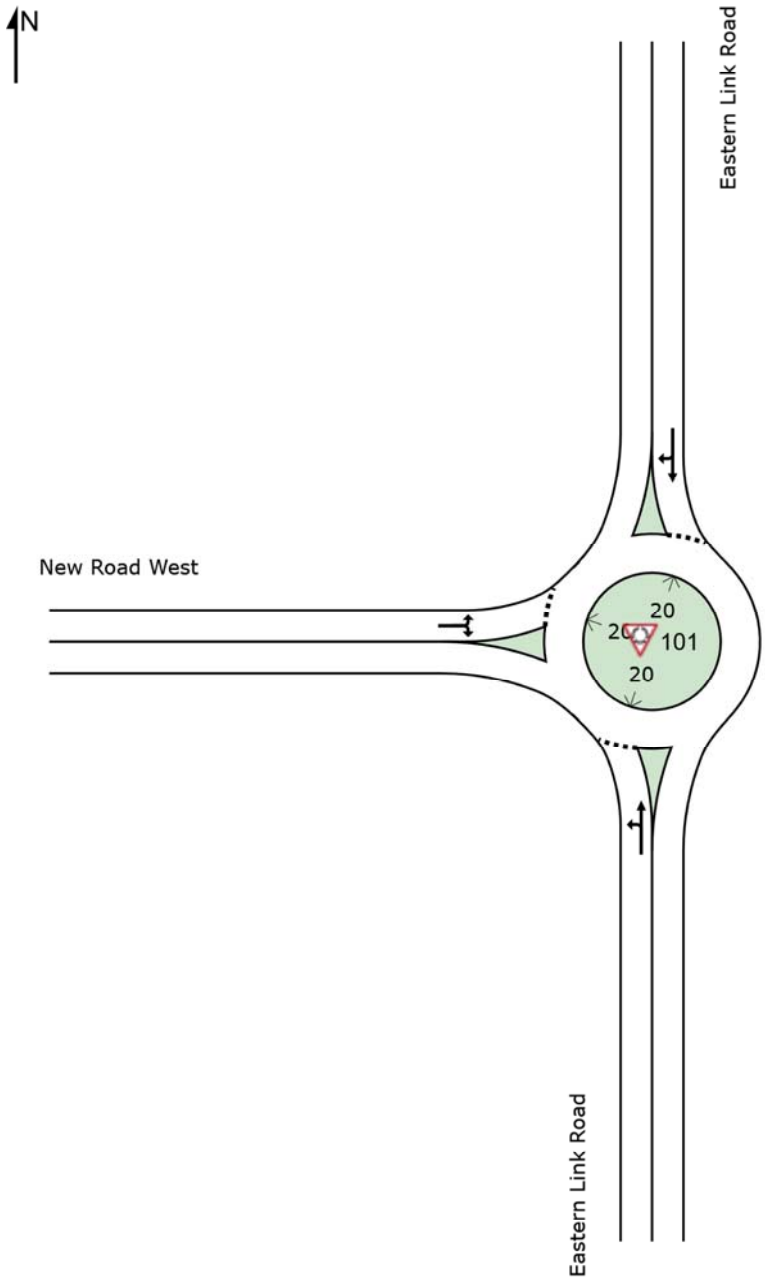
REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

SITE LAYOUT

Site: 101 [Node 10627 AM]

Eastern Link Road Roundabout
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 101 [Node 10627 AM]

Eastern Link Road Roundabout
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Eastern Link Road												
1	L2	195	5.0	0.390	2.9	LOS A	3.2	23.0	0.02	0.34	0.02	47.1
2	T1	471	5.0	0.390	2.8	LOS A	3.2	23.0	0.02	0.34	0.02	49.2
Approach		665	5.0	0.390	2.8	LOS A	3.2	23.0	0.02	0.34	0.02	48.7
North: Eastern Link Road												
8	T1	453	5.0	0.386	4.1	LOS A	2.8	20.3	0.50	0.46	0.50	47.5
9	R2	1	5.0	0.386	8.6	LOS A	2.8	20.3	0.50	0.46	0.50	45.7
Approach		454	5.0	0.386	4.1	LOS A	2.8	20.3	0.50	0.46	0.50	47.5
West: New Road West												
10	L2	6	5.0	0.211	5.7	LOS A	1.2	8.5	0.58	0.72	0.58	40.8
12	R2	194	5.0	0.211	10.1	LOS A	1.2	8.5	0.58	0.72	0.58	43.7
Approach		200	5.0	0.211	10.0	LOS A	1.2	8.5	0.58	0.72	0.58	43.6
All Vehicles		1319	5.0	0.390	4.3	LOS A	3.2	23.0	0.27	0.44	0.27	47.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Node 10627 PM]

Eastern Link Road Roundabout
Site Category: (None)
Roundabout

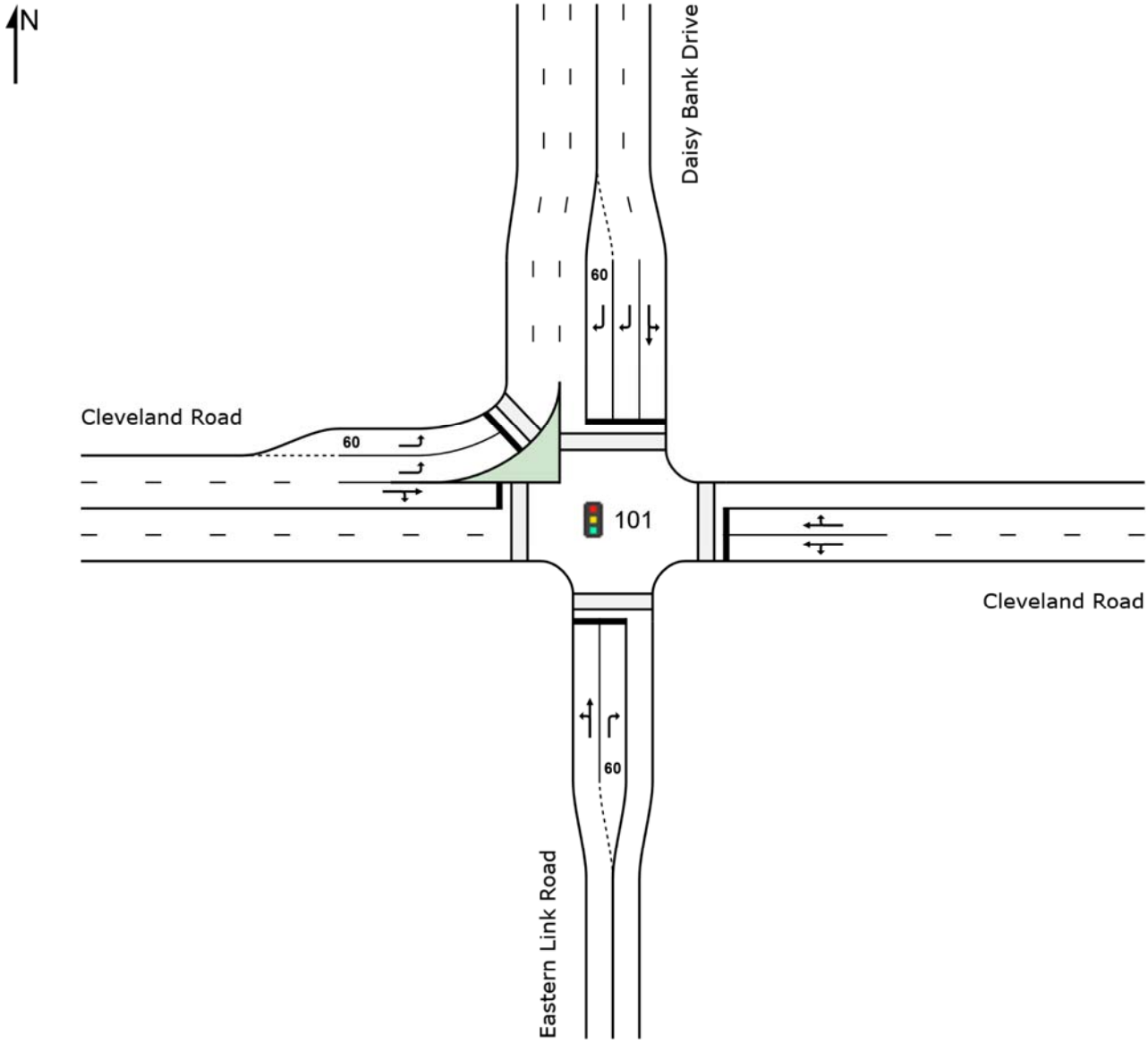
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Eastern Link Road												
1	L2	139	5.0	0.262	2.9	LOS A	1.9	13.7	0.02	0.34	0.02	47.1
2	T1	307	5.0	0.262	2.8	LOS A	1.9	13.7	0.02	0.34	0.02	49.3
Approach		446	5.0	0.262	2.8	LOS A	1.9	13.7	0.02	0.34	0.02	48.7
North: Eastern Link Road												
8	T1	563	5.0	0.496	4.6	LOS A	3.9	28.4	0.60	0.52	0.60	47.2
9	R2	1	5.0	0.496	9.1	LOS A	3.9	28.4	0.60	0.52	0.60	45.2
Approach		564	5.0	0.496	4.6	LOS A	3.9	28.4	0.60	0.52	0.60	47.1
West: New Road West												
10	L2	11	5.0	0.234	4.7	LOS A	1.3	9.3	0.49	0.67	0.49	41.4
12	R2	238	5.0	0.234	9.1	LOS A	1.3	9.3	0.49	0.67	0.49	44.2
Approach		248	5.0	0.234	8.9	LOS A	1.3	9.3	0.49	0.67	0.49	44.1
All Vehicles		1259	5.0	0.496	4.8	LOS A	3.9	28.4	0.37	0.49	0.37	47.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [IN36 Node 7466 AM]

IN36: Cleveland Road / Daisy Bank Road / Eastern Link Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [IN36 Node 7466 AM]

IN36: Cleveland Road / Daisy Bank Road / Eastern Link Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 40 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Eastern Link Road												
1	L2	14	5.0	0.882	29.4	LOS C	10.6	77.0	1.00	1.18	1.60	26.8
2	T1	402	5.0	0.882	24.8	LOS B	10.6	77.0	1.00	1.18	1.60	30.0
3	R2	76	5.0	0.315	22.5	LOS B	1.4	10.6	0.93	0.75	0.93	30.6
Approach		492	5.0	0.882	24.6	LOS B	10.6	77.0	0.99	1.11	1.49	30.0
East: Cleveland Road												
4	L2	59	5.0	0.474	22.9	LOS B	2.6	18.7	0.96	0.76	0.96	32.0
5	T1	137	5.0	0.474	18.4	LOS B	2.6	18.7	0.96	0.76	0.96	36.2
6	R2	52	5.0	0.474	23.1	LOS B	2.3	16.7	0.96	0.76	0.96	37.1
Approach		247	5.0	0.474	20.4	LOS B	2.6	18.7	0.96	0.76	0.96	35.6
North: Daisy Bank Drive												
7	L2	8	5.0	0.388	10.3	LOS A	4.6	33.5	0.61	0.53	0.61	45.1
8	T1	394	5.0	0.388	5.7	LOS A	4.6	33.5	0.61	0.53	0.61	43.4
9	R2	348	5.0	0.403	16.1	LOS B	2.7	19.3	0.89	0.74	0.89	38.3
Approach		751	5.0	0.403	10.5	LOS A	4.6	33.5	0.74	0.63	0.74	40.4
West: Cleveland Road												
10	L2	579	5.0	0.359	12.4	LOS A	3.8	27.9	0.70	0.73	0.70	41.3
11	T1	63	5.0	0.264	17.6	LOS B	1.3	9.5	0.92	0.70	0.92	37.5
12	R2	6	5.0	0.264	22.2	LOS B	1.3	9.5	0.92	0.70	0.92	30.7
Approach		648	5.0	0.359	13.0	LOS A	3.8	27.9	0.72	0.72	0.72	40.8
All Vehicles		2138	5.0	0.882	15.7	LOS B	10.6	77.0	0.82	0.78	0.93	37.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	14.5	LOS B	0.1	0.1	0.85	0.85
P2	East Full Crossing	53	14.5	LOS B	0.1	0.1	0.85	0.85
P3	North Full Crossing	53	14.5	LOS B	0.1	0.1	0.85	0.85
P4	West Full Crossing	53	14.5	LOS B	0.1	0.1	0.85	0.85
P4B	West Slip/Bypass Lane Crossing	53	14.5	LOS B	0.1	0.1	0.85	0.85
All Pedestrians		263	14.5	LOS B			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [IN36 Node 7466 AM]

IN36: Cleveland Road / Daisy Bank Road / Eastern Link Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 40 seconds (Site Optimum Cycle Time - Minimum Delay)

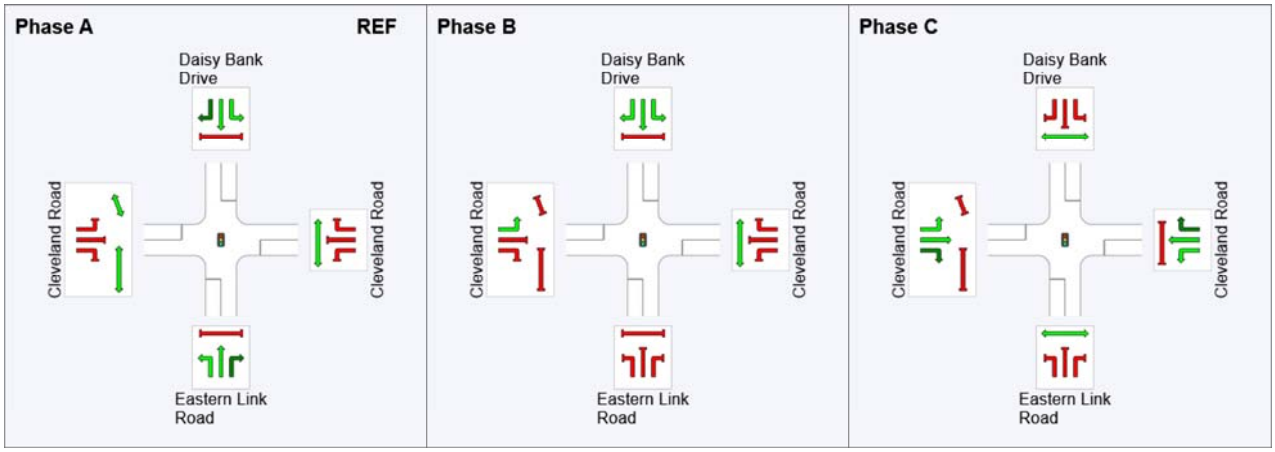
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	16	28
Green Time (sec)	10	6	6
Phase Time (sec)	16	12	12
Phase Split	40%	30%	30%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

MOVEMENT SUMMARY

Site: 101 [IN36 Node 7466 PM]

IN36: Cleveland Road / Daisy Bank Road / Eastern Link Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 36 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Eastern Link Road												
1	L2	1	5.0	0.876	28.2	LOS B	6.3	45.6	1.00	1.14	1.74	27.5
2	T1	275	5.0	0.876	23.6	LOS B	6.3	45.6	1.00	1.14	1.74	30.7
3	R2	42	5.0	0.195	22.8	LOS B	0.8	5.5	0.96	0.71	0.96	30.5
Approach		318	5.0	0.876	23.5	LOS B	6.3	45.6	1.00	1.09	1.63	30.7
East: Cleveland Road												
4	L2	57	5.0	0.285	19.9	LOS B	1.4	10.6	0.91	0.73	0.91	33.1
5	T1	107	5.0	0.285	15.4	LOS B	1.4	10.6	0.91	0.71	0.91	38.3
6	R2	7	5.0	0.285	20.0	LOS B	1.4	10.4	0.91	0.70	0.91	39.4
Approach		172	5.0	0.285	17.1	LOS B	1.4	10.6	0.91	0.72	0.91	36.9
North: Daisy Bank Drive												
7	L2	2	5.0	0.539	11.5	LOS A	6.3	46.2	0.73	0.64	0.73	44.4
8	T1	506	5.0	0.539	6.9	LOS A	6.3	46.2	0.73	0.64	0.73	42.3
9	R2	773	5.0	0.750	17.1	LOS B	5.7	41.7	0.96	0.94	1.29	37.8
Approach		1281	5.0	0.750	13.0	LOS A	6.3	46.2	0.87	0.82	1.07	39.1
West: Cleveland Road												
10	L2	300	5.0	0.167	9.8	LOS A	1.5	10.8	0.57	0.66	0.57	43.0
11	T1	44	5.0	0.146	14.8	LOS B	0.7	5.3	0.89	0.65	0.89	39.2
12	R2	1	5.0	0.146	19.4	LOS B	0.7	5.3	0.89	0.65	0.89	32.8
Approach		345	5.0	0.167	10.5	LOS A	1.5	10.8	0.62	0.66	0.62	42.4
All Vehicles		2116	5.0	0.876	14.5	LOS B	6.3	46.2	0.85	0.83	1.07	38.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	12.5	LOS B	0.0	0.0	0.84	0.84
P2	East Full Crossing	53	12.5	LOS B	0.0	0.0	0.84	0.84
P3	North Full Crossing	53	12.5	LOS B	0.0	0.0	0.84	0.84
P4	West Full Crossing	53	12.5	LOS B	0.0	0.0	0.84	0.84
P4B	West Slip/Bypass Lane Crossing	53	12.5	LOS B	0.0	0.0	0.84	0.84
All Pedestrians		263	12.5	LOS B			0.84	0.84

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [IN36 Node 7466 PM]

IN36: Cleveland Road / Daisy Bank Road / Eastern Link Road Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 36 seconds (Site Optimum Cycle Time - Minimum Delay)

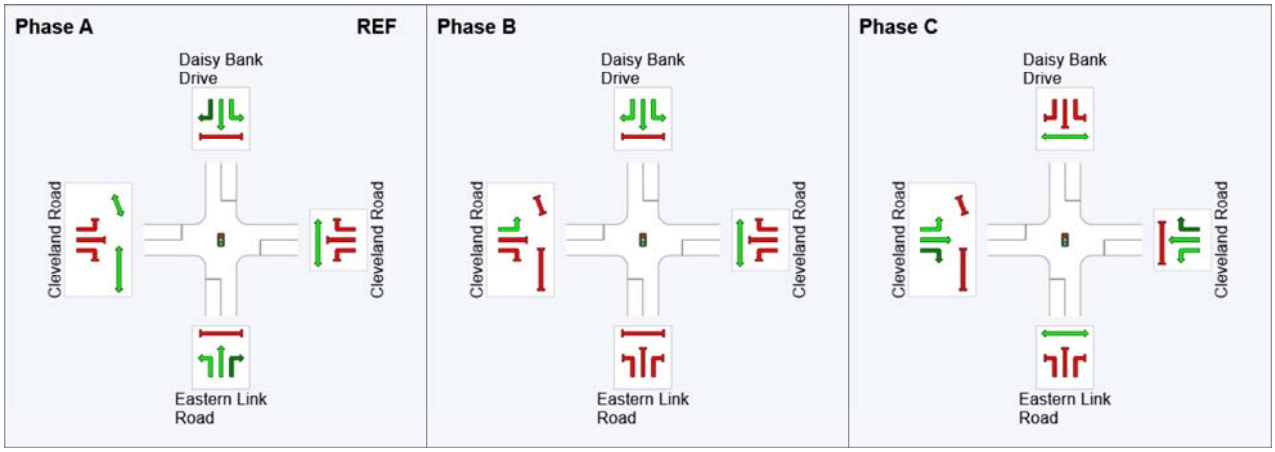
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	12	24
Green Time (sec)	6	6	6
Phase Time (sec)	12	12	12
Phase Split	33%	33%	33%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



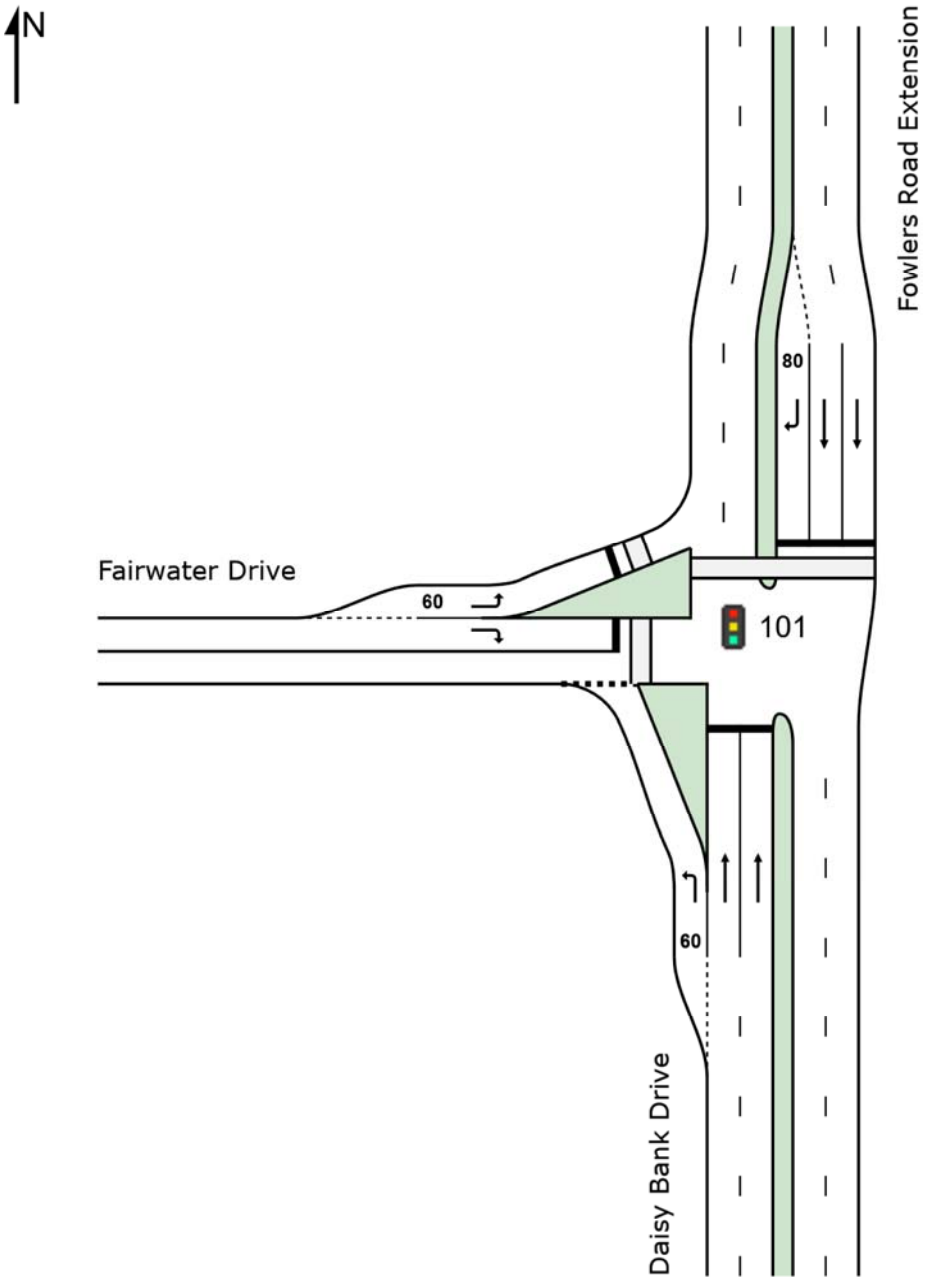
REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

SITE LAYOUT

Site: 101 [IN32 Node 7469 AM]

IN32: Daisy Bank Road / Fairwater Drive / Folwers Road Extension Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [IN32 Node 7469 AM]

IN32: Daisy Bank Road / Fairwater Drive / Folwers Road Extension Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 45 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Daisy Bank Drive												
1	L2	44	5.0	0.040	6.7	LOS A	0.3	1.8	0.43	0.60	0.43	44.5
2	T1	988	5.0	0.785	18.4	LOS B	11.5	83.8	0.96	0.97	1.17	35.6
Approach		1033	5.0	0.785	17.9	LOS B	11.5	83.8	0.94	0.95	1.14	35.9
North: Fowlers Road Extension												
8	T1	721	5.0	0.318	4.9	LOS A	4.0	28.9	0.53	0.45	0.53	45.2
9	R2	262	5.0	0.618	18.4	LOS B	4.9	35.6	0.94	0.83	1.02	34.0
Approach		983	5.0	0.618	8.5	LOS A	4.9	35.6	0.64	0.55	0.66	41.8
West: Fairwater Drive												
10	L2	609	5.0	0.656	11.6	LOS A	7.1	51.8	0.78	0.84	0.90	39.2
12	R2	28	5.0	0.119	24.4	LOS B	0.6	4.3	0.91	0.70	0.91	34.0
Approach		638	5.0	0.656	12.1	LOS A	7.1	51.8	0.78	0.83	0.90	38.8
All Vehicles		2654	5.0	0.785	13.0	LOS A	11.5	83.8	0.79	0.78	0.90	38.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	53	16.9	LOS B	0.1	0.1	0.87	0.87
P4	West Full Crossing	53	16.9	LOS B	0.1	0.1	0.87	0.87
P4B	West Slip/Bypass Lane Crossing	11	16.9	LOS B	0.0	0.0	0.87	0.87
All Pedestrians		116	16.9	LOS B			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [IN32 Node 7469 AM]

IN32: Daisy Bank Road / Fairwater Drive / Folwers Road Extension Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 45 seconds (Site Optimum Cycle Time - Minimum Delay)

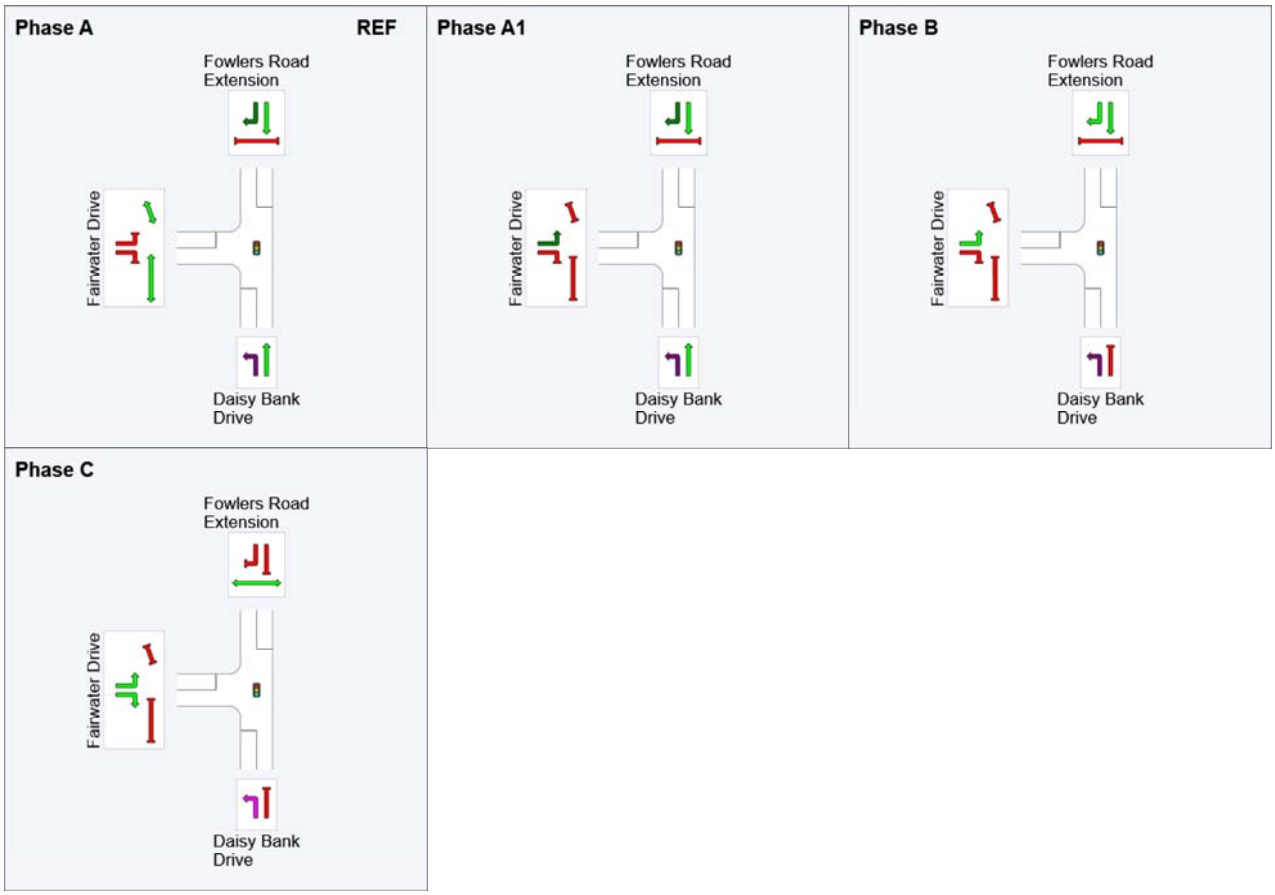
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, A1, B, C
Output Phase Sequence: A, A1, B, C

Phase Timing Summary

Phase	A	A1	B	C
Phase Change Time (sec)	0	8	21	33
Green Time (sec)	2	7	6	6
Phase Time (sec)	8	13	12	12
Phase Split	18%	29%	27%	27%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

MOVEMENT SUMMARY

Site: 101 [IN32 Node 7469 PM]

IN32: Daisy Bank Road / Fairwater Drive / Folwers Road Extension Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 45 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Daisy Bank Drive												
1	L2	86	5.0	0.108	9.0	LOS A	0.8	5.5	0.60	0.66	0.60	42.9
2	T1	497	5.0	0.423	13.8	LOS A	4.5	32.9	0.84	0.70	0.84	38.4
Approach		583	5.0	0.423	13.1	LOS A	4.5	32.9	0.80	0.69	0.80	39.1
North: Fowlers Road Extension												
8	T1	1268	5.0	0.560	5.9	LOS A	8.5	62.3	0.65	0.57	0.65	44.2
9	R2	467	5.0	0.830	22.7	LOS B	10.2	74.8	0.99	1.06	1.43	31.7
Approach		1736	5.0	0.830	10.4	LOS A	10.2	74.8	0.74	0.71	0.86	40.3
West: Fairwater Drive												
10	L2	408	5.0	0.402	8.4	LOS A	3.9	28.6	0.60	0.70	0.60	41.5
12	R2	14	5.0	0.057	24.1	LOS B	0.3	2.0	0.90	0.67	0.90	34.1
Approach		422	5.0	0.402	8.9	LOS A	3.9	28.6	0.61	0.70	0.61	41.1
All Vehicles		2741	5.0	0.830	10.8	LOS A	10.2	74.8	0.73	0.70	0.81	40.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	53	16.9	LOS B	0.1	0.1	0.87	0.87
P4	West Full Crossing	53	16.9	LOS B	0.1	0.1	0.87	0.87
P4B	West Slip/Bypass Lane Crossing	11	16.9	LOS B	0.0	0.0	0.87	0.87
All Pedestrians		116	16.9	LOS B			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [IN32 Node 7469 PM]

IN32: Daisy Bank Road / Fairwater Drive / Folwers Road Extension Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 45 seconds (Site Optimum Cycle Time - Minimum Delay)

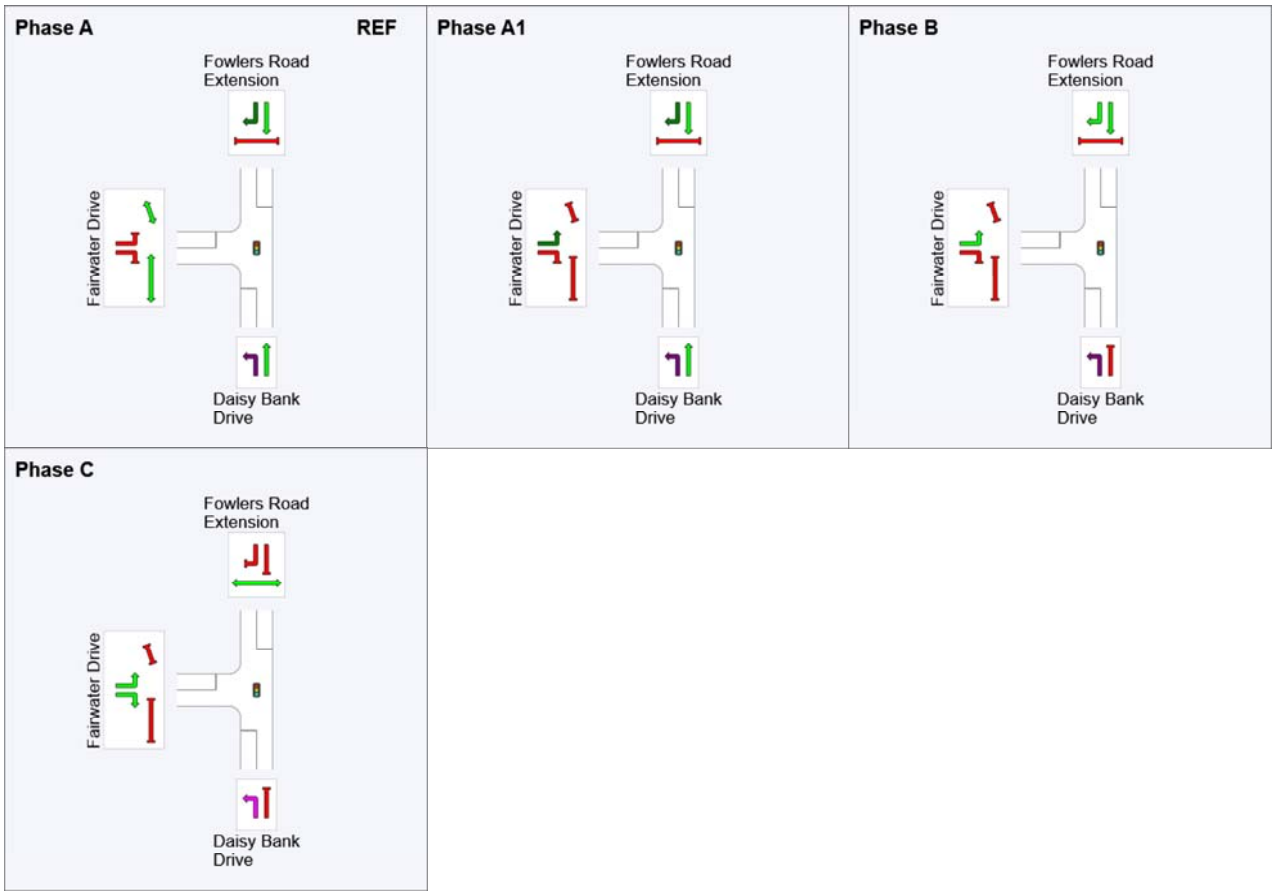
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, A1, B, C
Output Phase Sequence: A, A1, B, C

Phase Timing Summary

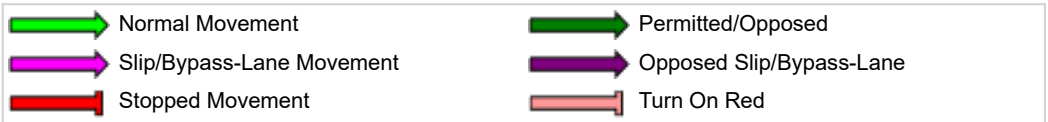
Phase	A	A1	B	C
Phase Change Time (sec)	0	8	20	33
Green Time (sec)	2	6	7	6
Phase Time (sec)	8	12	13	12
Phase Split	18%	27%	29%	27%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



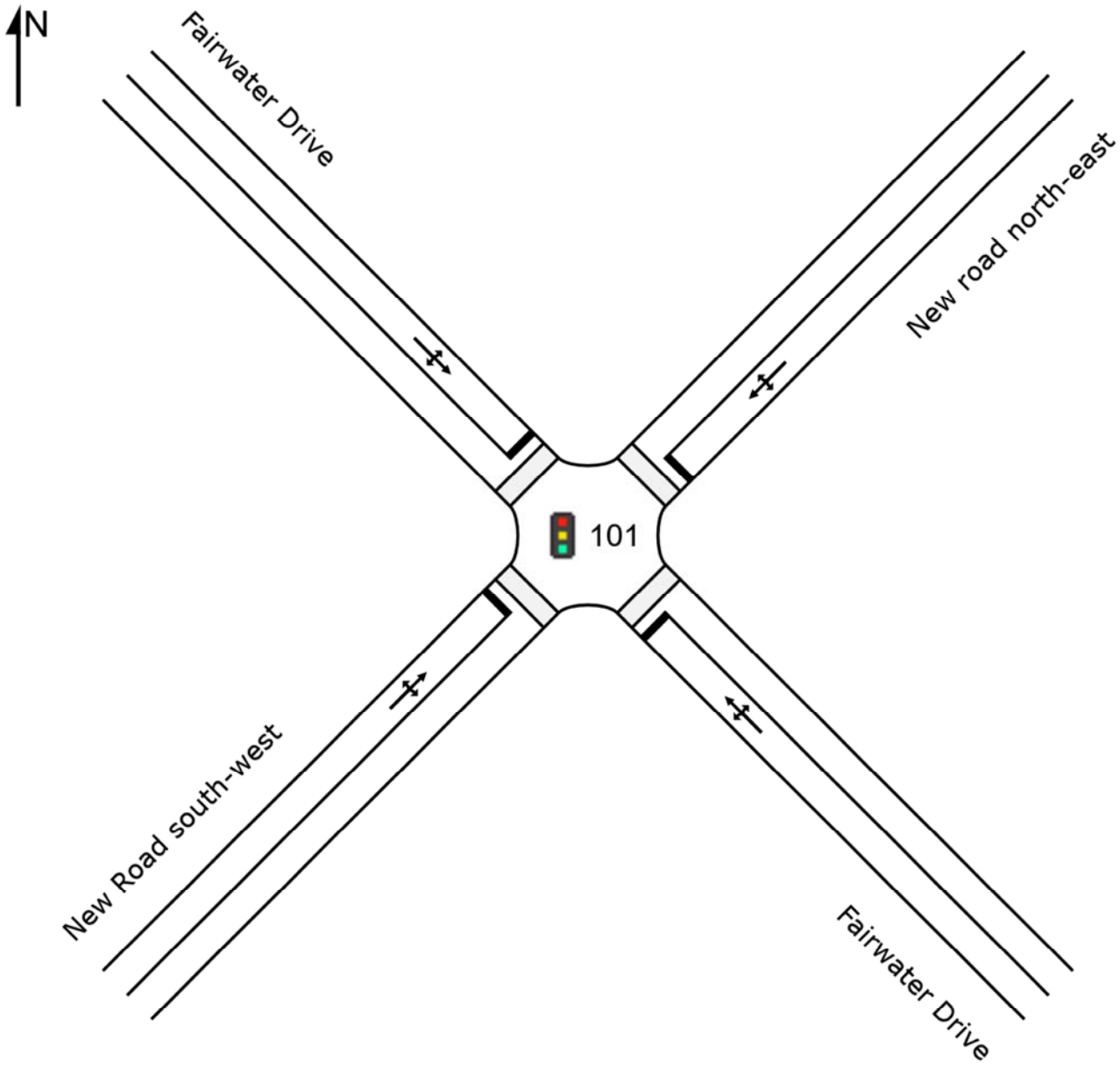
REF: Reference Phase
VAR: Variable Phase



SITE LAYOUT

Site: 101 [Node 10390 AM]

Fairwater Drive Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [Node 10390 AM]

Fairwater Drive Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Fairwater Drive												
1	L2	6	5.0	0.408	17.0	LOS B	1.9	13.8	0.91	0.76	0.91	16.7
2	T1	17	5.0	0.408	12.4	LOS A	1.9	13.8	0.91	0.76	0.91	38.7
3	R2	112	5.0	0.408	17.0	LOS B	1.9	13.8	0.91	0.76	0.91	31.0
Approach		135	5.0	0.408	16.4	LOS B	1.9	13.8	0.91	0.76	0.91	31.3
NorthEast: New road north-east												
4	L2	56	5.0	0.634	14.3	LOS A	4.9	35.6	0.88	0.82	0.97	35.2
5	T1	209	5.0	0.634	9.7	LOS A	4.9	35.6	0.88	0.82	0.97	27.4
6	R2	95	5.0	0.634	14.3	LOS A	4.9	35.6	0.88	0.82	0.97	38.4
Approach		360	5.0	0.634	11.6	LOS A	4.9	35.6	0.88	0.82	0.97	33.3
NorthWest: Fairwater Drive												
7	L2	29	5.0	0.222	16.4	LOS B	1.0	7.6	0.87	0.70	0.87	37.2
8	T1	39	5.0	0.222	11.8	LOS A	1.0	7.6	0.87	0.70	0.87	40.0
9	R2	9	5.0	0.222	16.4	LOS B	1.0	7.6	0.87	0.70	0.87	34.1
Approach		78	5.0	0.222	14.1	LOS A	1.0	7.6	0.87	0.70	0.87	38.4
SouthWest: New Road south-west												
10	L2	8	5.0	0.548	12.4	LOS A	4.8	35.4	0.82	0.70	0.82	41.0
11	T1	392	5.0	0.548	7.9	LOS A	4.8	35.4	0.82	0.70	0.82	31.8
12	R2	7	5.0	0.548	12.4	LOS A	4.8	35.4	0.82	0.70	0.82	36.7
Approach		407	5.0	0.548	8.0	LOS A	4.8	35.4	0.82	0.70	0.82	32.3
All Vehicles		980	5.0	0.634	11.0	LOS A	4.9	35.6	0.86	0.75	0.89	33.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	SouthEast Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P2	NorthEast Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P3	NorthWest Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
P4	SouthWest Full Crossing	53	9.6	LOS A	0.0	0.0	0.80	0.80
All Pedestrians		211	9.6	LOS A			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Node 10390 AM]

Fairwater Drive Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

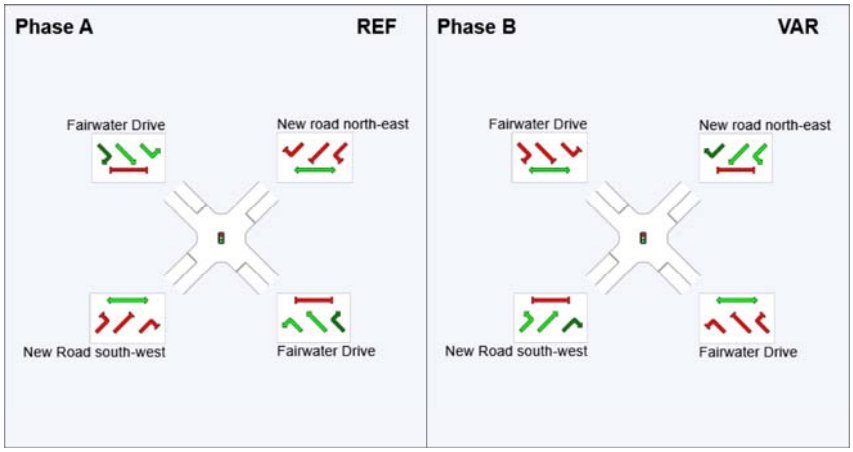
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*
Output Phase Sequence: A, B*
(* Variable Phase)

Phase Timing Summary

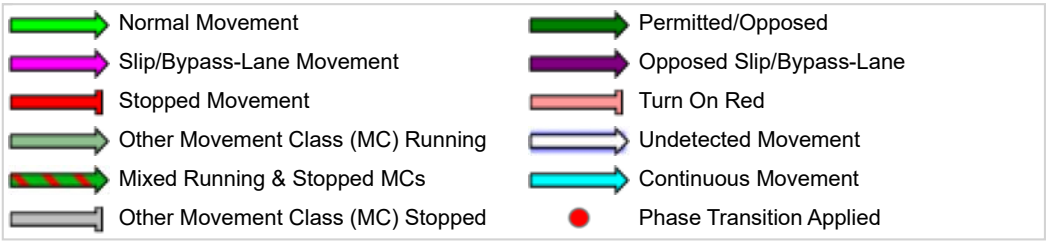
Phase	A	B
Phase Change Time (sec)	0	12
Green Time (sec)	6	12
Phase Time (sec)	12	18
Phase Split	40%	60%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



MOVEMENT SUMMARY

Site: 101 [Node 10390 PM]

Fairwater Drive Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 40 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Fairwater Drive												
1	L2	52	5.0	0.645	23.4	LOS B	3.9	28.6	0.98	0.87	1.12	15.5
2	T1	25	5.0	0.645	18.8	LOS B	3.9	28.6	0.98	0.87	1.12	35.6
3	R2	115	5.0	0.645	23.4	LOS B	3.9	28.6	0.98	0.87	1.12	27.4
Approach		192	5.0	0.645	22.8	LOS B	3.9	28.6	0.98	0.87	1.12	24.5
NorthEast: New road north-east												
4	L2	49	5.0	0.579	11.8	LOS A	7.6	55.4	0.73	0.66	0.73	38.8
5	T1	485	5.0	0.579	7.2	LOS A	7.6	55.4	0.73	0.66	0.73	32.3
6	R2	18	5.0	0.579	11.8	LOS A	7.6	55.4	0.73	0.66	0.73	41.2
Approach		553	5.0	0.579	7.8	LOS A	7.6	55.4	0.73	0.66	0.73	33.8
NorthWest: Fairwater Drive												
7	L2	1	5.0	0.074	20.5	LOS B	0.3	2.5	0.86	0.67	0.86	34.1
8	T1	4	5.0	0.074	15.9	LOS B	0.3	2.5	0.86	0.67	0.86	37.2
9	R2	15	5.0	0.074	20.5	LOS B	0.3	2.5	0.86	0.67	0.86	31.2
Approach		20	5.0	0.074	19.5	LOS B	0.3	2.5	0.86	0.67	0.86	32.8
SouthWest: New Road south-west												
10	L2	41	5.0	0.626	13.6	LOS A	6.9	50.2	0.80	0.74	0.82	39.1
11	T1	306	5.0	0.626	9.1	LOS A	6.9	50.2	0.80	0.74	0.82	28.7
12	R2	97	5.0	0.626	13.6	LOS A	6.9	50.2	0.80	0.74	0.82	34.4
Approach		444	5.0	0.626	10.5	LOS A	6.9	50.2	0.80	0.74	0.82	31.9
All Vehicles		1208	5.0	0.645	11.3	LOS A	7.6	55.4	0.80	0.72	0.83	30.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	SouthEast Full Crossing	53	14.5	LOS B	0.1	0.1	0.85	0.85
P2	NorthEast Full Crossing	53	14.5	LOS B	0.1	0.1	0.85	0.85
P3	NorthWest Full Crossing	53	14.5	LOS B	0.1	0.1	0.85	0.85
P4	SouthWest Full Crossing	53	14.5	LOS B	0.1	0.1	0.85	0.85
All Pedestrians		211	14.5	LOS B			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Node 10390 PM]

Fairwater Drive Signalised Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 40 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

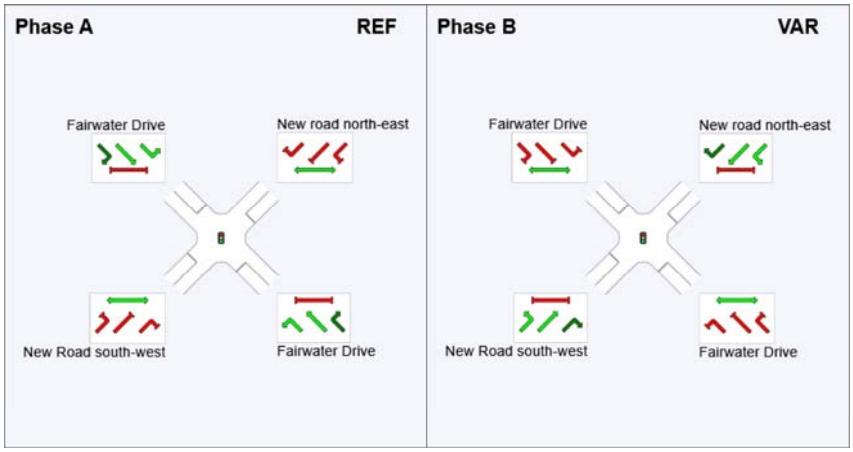
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*
Output Phase Sequence: A, B*
(* Variable Phase)

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	13
Green Time (sec)	7	21
Phase Time (sec)	13	27
Phase Split	33%	68%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase