rytenskild
Traffic Engineering

ADDENDUM -

TRAFFIC IMPACT ASSESSMENT

(ADDRESSING COUNCIL INFORMATION REQUEST DATED OCTOBER 2018)

PROPOSED RESIDENTIAL ESTATE

92 NEWMANS ROAD AND 36A BARK HUT ROAD, WOOLGOOLGA

Prepared for

SUNDERPAL SODHI

25 OCTOBER 2018

DOCUMENT REGISTER

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			Name / Position	Signature
1	25 October 2018	DA Submission	Luke Rytenskild Director RPEQ 6293	

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1.0 INTRODUCTION

Rytenskild Traffic Engineering (RTE) has been engaged by Sunderpal Sodhi to review the traffic impacts of its proposed Residential Subdivision at Woolgoolga.

This is an addendum to the Traffic Impact Assessment dated 13th September, 2018 and responds to matters raised by Council. In accordance with Council's request, the traffic analysis presented in this report has been adjusted to allow for:

- the potential traffic generation of other future development along Newmans Road ;
- a more conservative distribution of development traffic along Newmans Road and at the Solitary Islands Way intersection ;
- a higher background traffic growth rate for through traffic on Solitary Island Ways ;
- a 20 year design horizon (year 2040) ;
- an assessment of various upgrade options for the Solitary Islands Way / Newmans Road intersection.

2.0 REVISED DESIGN TRAFFIC CALCULATIONS

2.1 Background Traffic Volumes

Background traffic volumes have been estimated by applying a 2% per annum growth rate to through traffic volumes on Solitary Islands Way. A design horizon has been set at the year 2040, with the commencement year assumed to be 2020. It is noted that the surveyed turning movement volumes shown in the GHD report dated 15th November 2015 are marginally higher than those surveyed by RTE in February 2018. To be conservative, the GHD volumes have been adopted, along with the through traffic volumes on Solitary Islands Way, provided to RTE by Council.

2.2 Traffic Generated by Other Future Development

Traffic generation estimates have been applied for the following future development areas along Newmans Road :

- West Woolgoolga Development Control Plan (DCP) – 139 lots ;
- Approved Manufactured Home Park to the south of Macintosh Crescent (196 sites).

It is noted that the GHD traffic report dated 15th November 2015 allowed for the following development in the above areas :

- West Woolgoolga Development Control Plan (DCP) – 139 lots ;
- Approved DA (45 lots and 92 x Seniors Living Dwellings).

A trip generation of 75 vehicles per hour was adopted for the approved development. The current proposal will have a similar generation of 78 vehicles per hour (i.e. 196 sites x 0.4 trips). On this

basis, the trip generation outlined in the GHD report has been assumed for both the DCP and approved DA.

2.3 Proposed Development Traffic

It has been assumed that all traffic generated by the southern precinct will use Newmans Road to access Solitary Island Way. Trip generation estimates as outlined in the Traffic Impact Assessment are provided below:

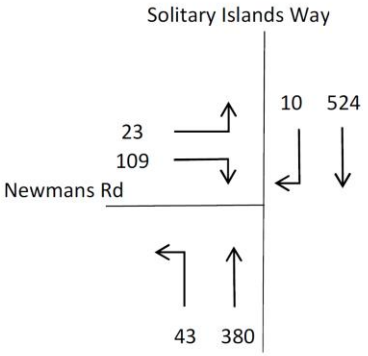
Table 5.1 - Estimated Development Traffic Generation (Proposed southern precinct)

Component	Morning Peak Hour			Afternoon Peak Hour		
	In	Out	Total	In	Out	Total
Southern precinct (94 lots):	15	61	**76**	45	31	**76**

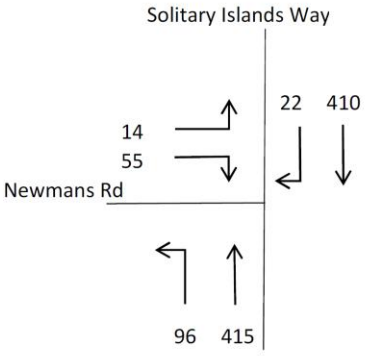
Peak Hour Distribution: AM – 20 /80, PM – 60 / 40

2.4 Design Traffic Volumes

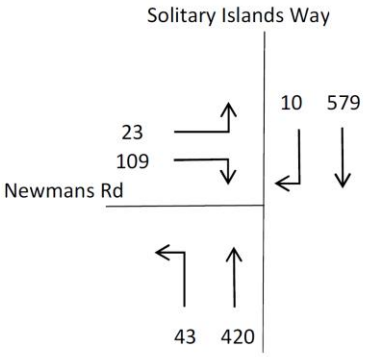
The design traffic volumes equate to the summation of the above traffic estimates for the commencement year and the year 2040. The traffic volume estimates are shown in Figures 2.1 and 2.2, with the design volumes shown in Figure 2.3.



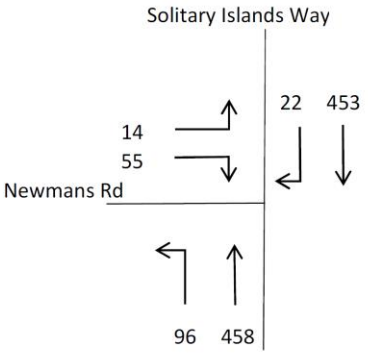
Surveyed Volumes - AM 2015
Source: GHD report dated 6/11/95



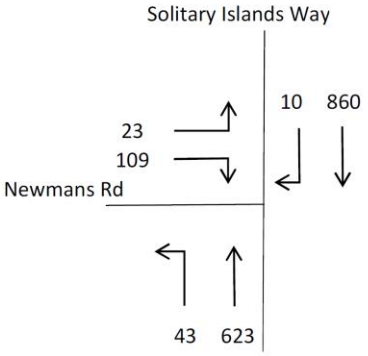
Surveyed Volumes - PM 2015
Source: GHD report dated 6/11/95



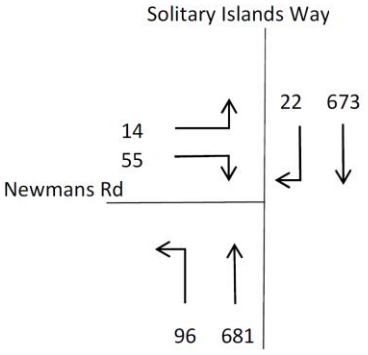
Estimated Year 2020 background volumes
AM peak (without proposal)
2% per annum applied to through
traffic on Sol Islands Way



Estimated Year 2020 background volumes
AM peak (without proposal)
2% per annum applied to through
traffic on Sol Islands Way

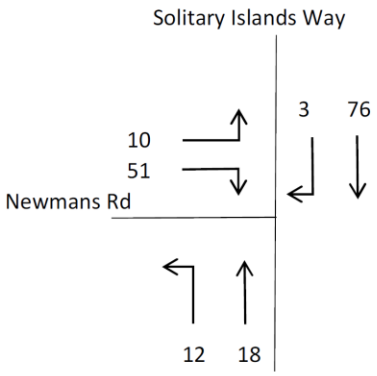


Estimated Year 2040 background volumes
AM peak (without proposal)
2% per annum applied to through
traffic on Sol Islands Way

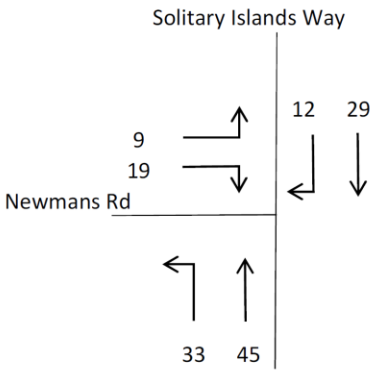


Estimated Year 2040 background volumes
AM peak (without proposal)
2% per annum applied to through
traffic on Sol Islands Way

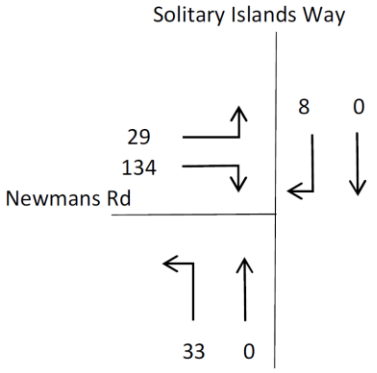
FIGURE 2.1 – BACKGROUND TRAFFIC VOLUME ESTIMATES FOR THE SOLITARY ISLANDS WAY / NEWMANS RD INTERSECTION



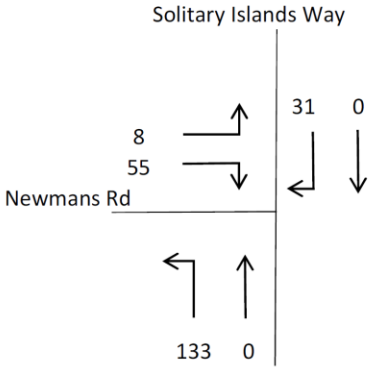
Estimated Proposal Traffic - AM peak hr
With distribution adjustments suggested by Council



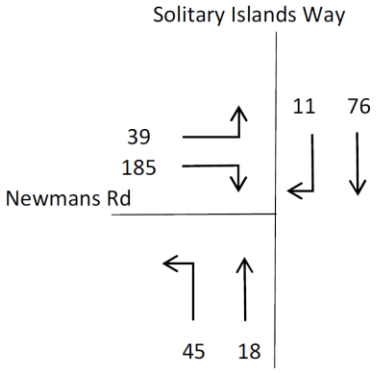
Estimated Proposal Traffic - PM peak hr
With distribution adjustments suggested by Council



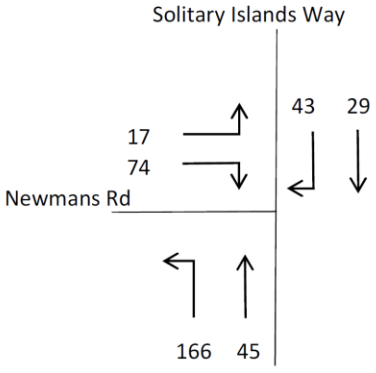
Approved / DCP Development - AM peak hr
As per GHD report dated 6/11/2015



Approved / DCP Development - PM peak hr
As per GHD report dated 6/11/2015

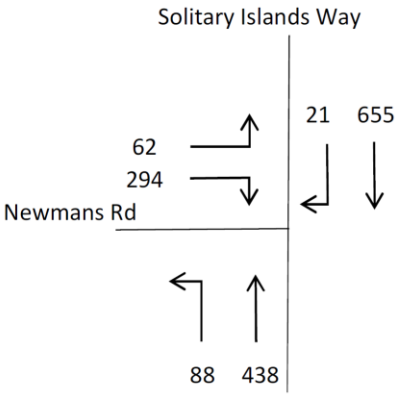


Proposal & Approved / DCP development
AM peak hour

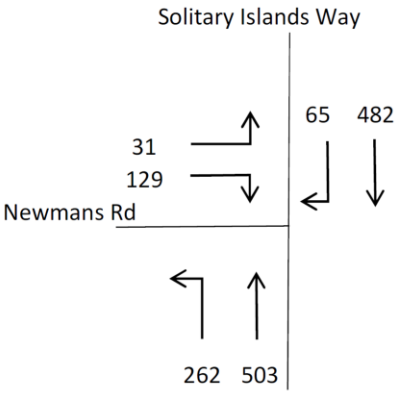


Proposal & Approved / DCP development
PM peak hour

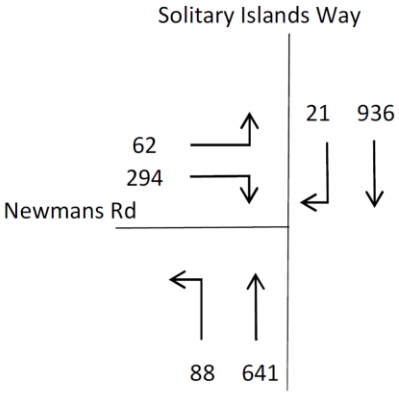
FIGURE 2.2 – ESTIMATED TRAFFIC VOLUMES AT THE SOLITARY ISLANDS WAY / NEWMANS ROAD INTERSECTION (GENERATED BY THE PROPOSAL AND OTHER PLANNED DEVELOPMENT ALONG NEWMANS ROAD)



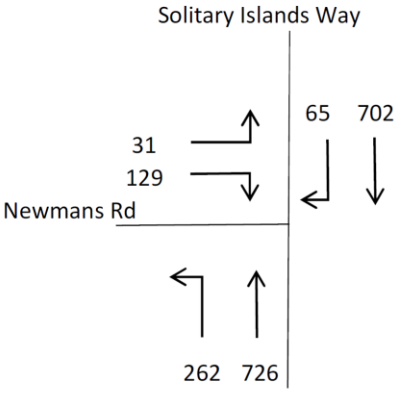
DESIGN TRAFFIC VOLUMES - AM PEAK HOUR
2020 background traffic volumes +
Proposal & Approved / DCP development



DESIGN TRAFFIC VOLUMES - PM PEAK HOUR
2020 background traffic volumes +
Proposal & Approved / DCP development



DESIGN TRAFFIC VOLUMES - AM PEAK HOUR
2040 background traffic volumes +
Proposal & Approved / DCP development



DESIGN TRAFFIC VOLUMES - PM PEAK HOUR
2040 background traffic volumes +
Proposal & Approved / DCP development

FIGURE 2.3 – DESIGN PEAK HOUR TRAFFIC VOLUMES (2020 AND 2040) AT THE SOLITARY ISLANDS WAY / NEWMANS ROAD INTERSECTION

3.0 SOLITARY ISLANDS WAY / NEWMANS ROAD INTERSECTION

3.1 Existing Intersection Layout

The results of the SIDRA analysis are presented in Appendix C and summarised below in Table 3.1. The criteria for evaluating the SIDRA results is presented in Appendix B.

Table 3.1: SIDRA Results (Solitary Islands Way / Newmans Road intersection)

Scenario	Degree of Saturation	Level of Service*	Total Average Delay (seconds)	Queue Length (metres)
2020 AM Peak – design traffic	1.024	F	26.4	204
2020 PM Peak – design traffic	0.44	C	3.1	13.1

The SIDRA output is provided in Attachment B.

As shown in the original Traffic Impact Assessment, the existing Solitary Islands Way / Newmans Road intersection is currently performing satisfactorily. However, as shown above in Table 3.1, the intersection would fail with the Newmans Road catchment fully developed (i.e. the proposal, the approved manufacturing home park, and the west Woolgoolga DCP completed). As shown, the intersection would fail during the morning peak hour which is the critical period for the right turn movement from Newmans Road to the south.

3.2 Future Upgrade Requirements

Further traffic modelling has been carried out to test the performance of the following intersection controls:

- Roundabout;
- Traffic signals.

As shown in Table 3.2, a roundabout option has been modelled using an inside island diameter of 20 metres. It is noted that the GHD report from November 2015 assumed a 10 metre diameter, however it is considered that such would not be appropriate for a major road such as Solitary Islands Way. As shown in Table 3.2, a single lane roundabout would approach capacity during the year 2020 morning peak hour, assuming the full development of the Newmans Road catchment. This option would not be suitable for the ultimate design horizon (2040).

A sensitivity analysis has been carried out for a double lane roundabout layout. As shown in Table 3.2, a double lane roundabout would perform satisfactorily for ultimate traffic conditions.

Table 3.2: SIDRA Results (Solitary Islands Way / Newmans Road – single lane roundabout)

Scenario	Degree of Saturation	Level of Service*	Total Average Delay (seconds)	Queue Length (metres)
2020 AM Peak – design traffic	0.702	A	8.0	64
2020 PM Peak – design traffic	0.569	A	5.8	42
2040 AM Peak – design traffic	0.989	C	21.0	314
2040 PM Peak – design traffic	0.729	A	6.0	77
Sensitivity – 2040 AM Peak – design traffic	0.524	A	6.6	34
Sensitivity – 2040 PM Peak – design traffic	0.487	A	5.5	32

The SIDRA output is provided in Attachment C.

The traffic modelling indicates that the signalised layout tested by GHD would fail during the short – medium term, as there would be excessive queuing on Solitary Islands Way, in each direction. Further modelling indicates that a signalised layout would need to include a second short through lane in each direction on Solitary Islands Way. As shown below, this layout would perform satisfactorily under year 2040 peak traffic periods. The modelled intersection layout is shown in Appendix D.

Table 3.3: SIDRA Results (Solitary Islands Way / Newmans Road – traffic signals)

Scenario	Degree of Saturation	Level of Service*	Total Average Delay (seconds)	Queue Length (metres)
2040 AM Peak – design traffic	1.079	F	110.4	869
2040 PM Peak – design traffic	0.888	C	31.1	309
Sensitivity – 2040 AM Peak – design traffic	0.867	D	37.4	206.9
Sensitivity – 2040 PM Peak – design traffic	0.757	C	26.2	105.9

The SIDRA output is provided in Attachment D.

It appears that the requires signalised layout may not be practical given constraints associated with the bridge just to the north of the intersection. However, as shown in Figure 3.1., it may be possible to achieve the double lane roundabout layout without impacting upon the bridge. Detailed investigations of each option should be carried out by Council.

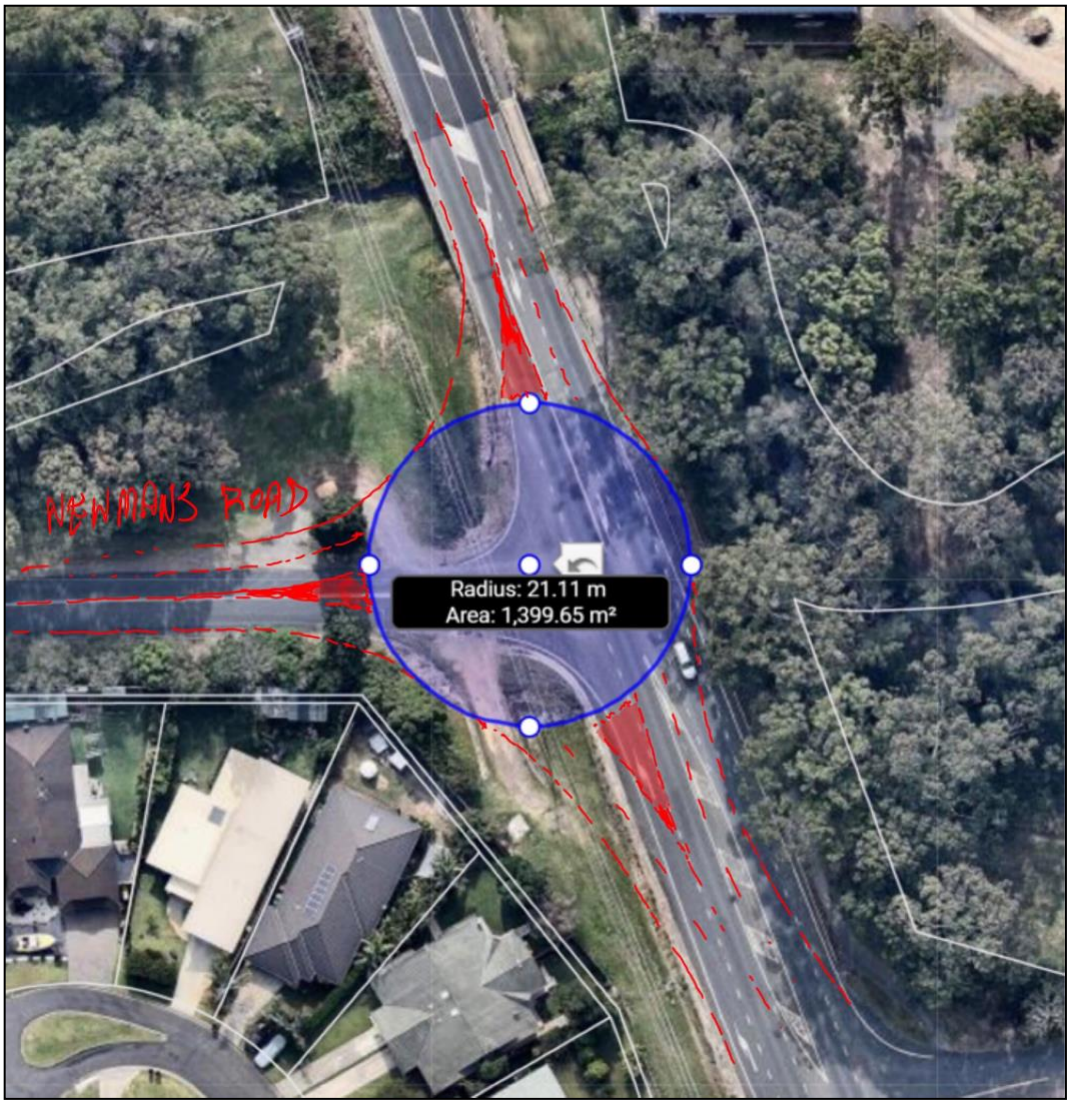


FIGURE 3.1 – CONCEPT SKETCH OF DOUBLE LANE ROUNDABOUT

4.0 SUMMARY OF CONCLUSIONS & RECOMMENDATIONS

- Further traffic modelling has been carried out which allows for other planned development in Newmans Road and also a design horizon at the year 2040. The analysis also allows more conservative assumptions with respect to background traffic growth and trip distribution.

- The traffic modelling indicates that the Solitary Islands Way / Newmans Road intersection would need to be upgraded to a roundabout or traffic signal control in the medium term future, as the Newmans Road catchment develops.

- The modelling indicates that a roundabout would need to comprise of two circulating lanes, with a double approach lane on each Solitary Islands Way approach.

- A signalised layout would need to comprise of a second short through lane in each direction on Solitary Islands Way in order to accommodate ultimate queuing demands. It may not be practical to achieve this layout due to constraints associated with the bridge located just to the north of Newmans Road.

APPENDICES

APPENDIX A – CRITERIA FOR EVALUATING SIDRA RESULTS
APPENDIX B – DETAILED SIDRA RESULTS

APPENDIX A – CRITERIA FOR EVALUATING SIDRA RESULTS

1. Level of Service (LOS)

LOS	Traffic Signals and Roundabouts	Give Way and Stop Signs
'A'	Good operation.	Good operation.
'B'	Good with acceptable delays and spare capacity.	Acceptable delays and spare capacity.
'C'	Satisfactory.	Satisfactory but accident study required.
'D'	Operating near capacity.	Near capacity and accident study required.
'E'	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode.	At capacity and requires other control mode.
'F'	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires other control mode.

2. Average Vehicle Delay (AVD)

The AVD provides a measure of the operational performance of an intersection as indicated on the table below which relates AVD to LOS. The AVD's listed in the table should be taken as a guide only as longer delays could be tolerated in some locations (i.e. inner city conditions) and on some roads (i.e. minor side street intersecting with a major arterial route).

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	less than 14	Good operation.	Good operation.
B	15 to 28	Good with acceptable delays and spare capacity.	Acceptable delays and spare capacity.
C	29 to 42	Satisfactory.	Satisfactory but accident study required.
D	43 to 56	Operating near capacity.	Near capacity and accident study required.
E	57 to 70	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode.	At capacity and requires other control mode.

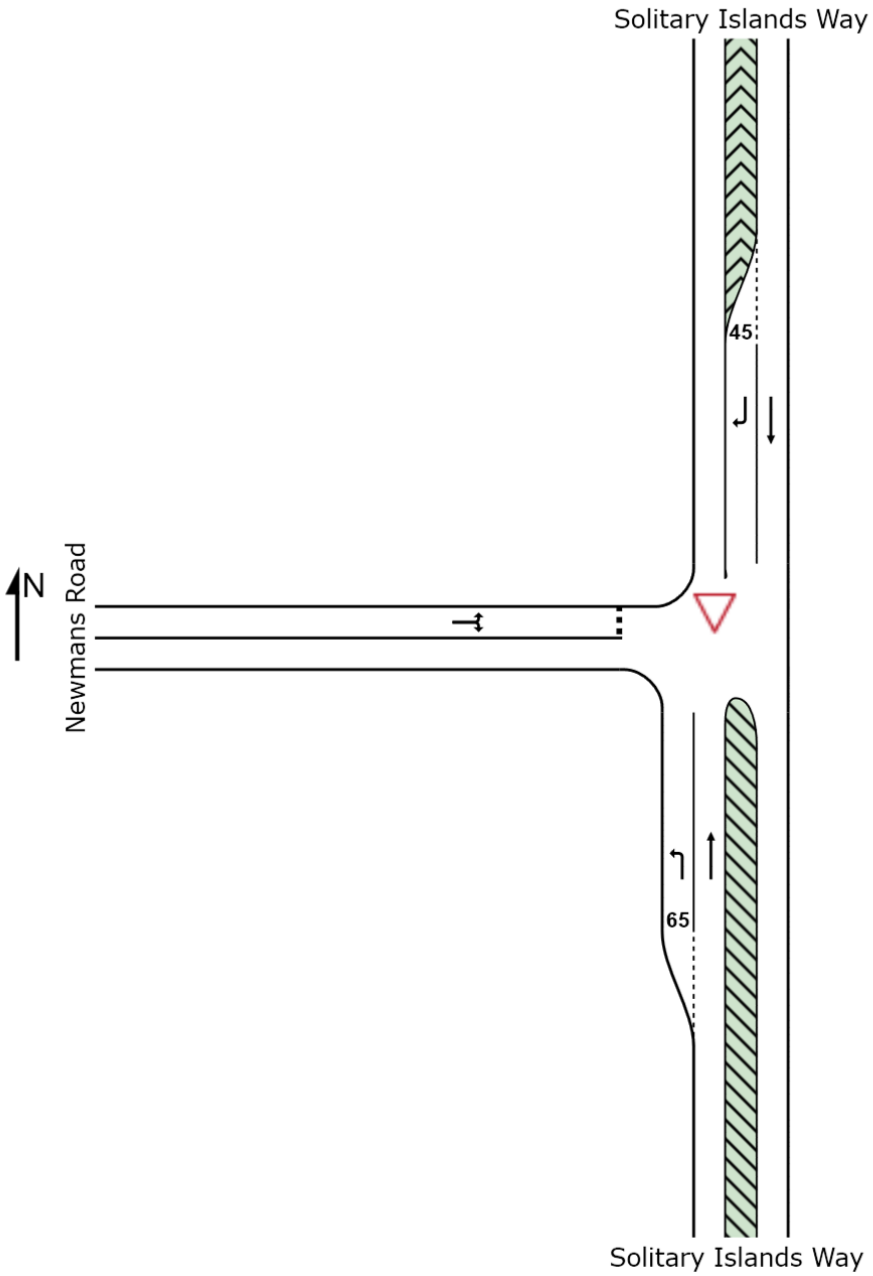
3. Degree of Saturation (DS)

The DS is another measure of the operational performance of individual intersections.

For intersections controlled by **traffic signals**[1] both queue length and delay increase rapidly as DS approaches 1, and it is usual to attempt to keep DS to less than 0.9. Values of DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceeds 0.9 queues can be anticipated.
For intersections controlled by a **roundabout or GIVE WAY or STOP signs**, satisfactory intersection operation is indicated by a DS of 0.8 or less.

[1] *The values of DS for intersections under traffic signal control are only valid for cycle length of 120 secs.*

APPENDIX B – SIDRA RESULTS (EXISTING SOL ISLANDS WAY / NEWMANS RD)



YEAR 2020 – WITH NEWMANS ROAD FULLY DEVELOPED

MOVEMENT SUMMARY

Site: 2020 AM Peak - DESIGN

17274 - Newmans Road / Solitary Islands Way Intersection
Sensitivity model - no traffic to west
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: Solitary Islands Way											
1	L2	88	5.0	0.049	5.6	LOS A	0.0	0.0	0.00	0.58	48.9
2	T1	438	10.0	0.239	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		526	9.2	0.239	1.0	NA	0.0	0.0	0.00	0.10	58.6
North: Solitary Islands Way											
8	T1	655	10.0	0.358	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
9	R2	21	5.0	0.021	7.7	LOS A	0.1	0.6	0.52	0.66	46.0
Approach		676	9.8	0.358	0.3	NA	0.1	0.6	0.02	0.02	59.6
West: Newmans Road											
10	L2	62	5.0	1.024	103.0	LOS F	27.9	203.8	1.00	3.27	13.2
12	R2	294	5.0	1.024	115.7	LOS F	27.9	203.8	1.00	3.27	13.2
Approach		356	5.0	1.024	113.5	LOS F	27.9	203.8	1.00	3.27	13.2
All Vehicles		1558	8.5	1.024	26.4	NA	27.9	203.8	0.24	0.79	39.5

MOVEMENT SUMMARY

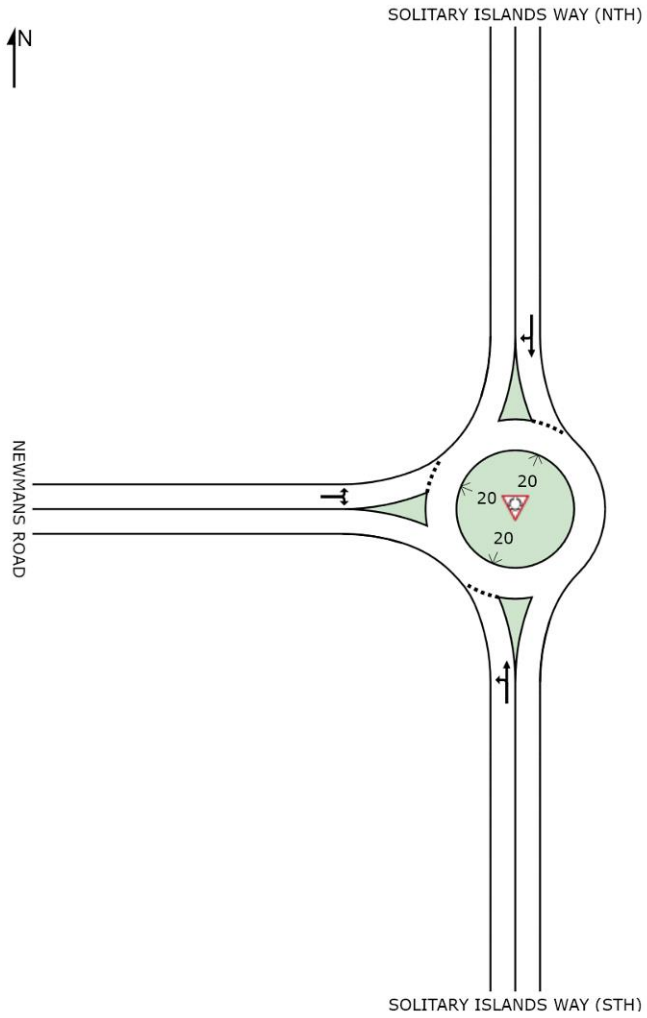
Site: 2020 PM Peak - DESIGN

17274 - Newmans Road / Solitary Islands Way Intersection
Sensitivity model - no traffic to west
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: Solitary Islands Way											
1	L2	262	5.0	0.146	5.6	LOS A	0.0	0.0	0.00	0.57	48.8
2	T1	503	10.0	0.275	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		765	8.3	0.275	1.9	NA	0.0	0.0	0.00	0.20	57.1
North: Solitary Islands Way											
8	T1	482	10.0	0.263	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
9	R2	65	5.0	0.087	9.5	LOS A	0.4	2.6	0.62	0.81	44.1
Approach		547	9.4	0.263	1.2	NA	0.4	2.6	0.07	0.10	58.5
West: Newmans Road											
10	L2	31	5.0	0.440	7.9	LOS A	1.8	13.1	0.79	0.99	39.6
12	R2	129	5.0	0.440	16.5	LOS C	1.8	13.1	0.79	0.99	39.3
Approach		160	5.0	0.440	14.9	LOS B	1.8	13.1	0.79	0.99	39.4
All Vehicles		1472	8.3	0.440	3.1	NA	1.8	13.1	0.11	0.25	55.9

APPENDIX C – SIDRA RESULTS (SOL ISLANDS WAY / NEWMANS RD – SINGLE LANE ROUNDABOUT)



YEAR 2020 – WITH NEWMANS ROAD FULLY DEVELOPED

MOVEMENT SUMMARY

Site: 2020 AM Peak DESIGN roundabout

Solitary Islands Way / Newmans Rd, Woolgoolga
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: SOLITARY ISLANDS WAY (STH)											
1	L2	93	5.0	0.362	4.0	LOS A	3.1	23.0	0.17	0.40	54.6
2	T1	461	10.0	0.362	4.3	LOS A	3.1	23.0	0.17	0.40	55.9
Approach		554	9.2	0.362	4.3	LOS A	3.1	23.0	0.17	0.40	55.7
North: SOLITARY ISLANDS WAY (NTH)											
8	T1	689	10.0	0.702	9.0	LOS A	8.4	64.1	0.84	0.82	52.5
9	R2	22	5.0	0.702	13.4	LOS B	8.4	64.1	0.84	0.82	52.5
Approach		712	9.8	0.702	9.1	LOS A	8.4	64.1	0.84	0.82	52.5
West: NEWMANS ROAD											
10	L2	65	5.0	0.404	7.3	LOS A	2.6	19.1	0.68	0.79	50.2
12	R2	309	5.0	0.404	12.1	LOS B	2.6	19.1	0.68	0.79	51.2
Approach		375	5.0	0.404	11.3	LOS B	2.6	19.1	0.68	0.79	51.0
All Vehicles		1640	8.5	0.702	8.0	LOS A	8.4	64.1	0.58	0.67	53.2

MOVEMENT SUMMARY

Site: 2020 PM Peak DESIGN single roundabout

Solitary Islands Way / Newmans Rd, Woolgoolga
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: SOLITARY ISLANDS WAY (STH)											
1	L2	276	5.0	0.569	4.5	LOS A	5.6	41.7	0.38	0.44	53.8
2	T1	529	10.0	0.569	4.8	LOS A	5.6	41.7	0.38	0.44	55.0
Approach		805	8.3	0.569	4.7	LOS A	5.6	41.7	0.38	0.44	54.6
North: SOLITARY ISLANDS WAY (NTH)											
8	T1	507	10.0	0.465	5.2	LOS A	3.8	28.8	0.48	0.52	54.0
9	R2	68	5.0	0.465	9.7	LOS A	3.8	28.8	0.48	0.52	54.0
Approach		576	9.4	0.465	5.7	LOS A	3.8	28.8	0.48	0.52	54.0
West: NEWMANS ROAD											
10	L2	33	5.0	0.199	7.2	LOS A	1.2	8.6	0.66	0.76	50.3
12	R2	136	5.0	0.199	12.0	LOS B	1.2	8.6	0.66	0.76	51.3
Approach		168	5.0	0.199	11.1	LOS B	1.2	8.6	0.66	0.76	51.1
All Vehicles		1549	8.3	0.569	5.8	LOS A	5.6	41.7	0.44	0.51	54.0

YEAR 2040 – WITH NEWMANS ROAD FULLY DEVELOPED

MOVEMENT SUMMARY

Site: 2040 AM Peak DESIGN single roundabout

Solitary Islands Way / Newmans Rd, Woolgoolga
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: SOLITARY ISLANDS WAY (STH)											
1	L2	93	5.0	0.496	4.1	LOS A	5.3	40.1	0.21	0.39	54.4
2	T1	675	10.0	0.496	4.3	LOS A	5.3	40.1	0.21	0.39	55.7
Approach		767	9.4	0.496	4.3	LOS A	5.3	40.1	0.21	0.39	55.5
North: SOLITARY ISLANDS WAY (NTH)											
8	T1	985	10.0	0.989	36.0	LOS D	41.3	313.8	1.00	1.59	38.2
9	R2	22	5.0	0.989	40.4	LOS D	41.3	313.8	1.00	1.59	38.2
Approach		1007	9.9	0.989	36.1	LOS D	41.3	313.8	1.00	1.59	38.2
West: NEWMANS ROAD											
10	L2	65	5.0	0.488	10.7	LOS B	3.8	28.0	0.82	0.95	48.0
12	R2	309	5.0	0.488	15.5	LOS B	3.8	28.0	0.82	0.95	49.0
Approach		375	5.0	0.488	14.7	LOS B	3.8	28.0	0.82	0.95	48.8
All Vehicles		2149	8.9	0.989	21.0	LOS C	41.3	313.8	0.69	1.05	44.9

MOVEMENT SUMMARY

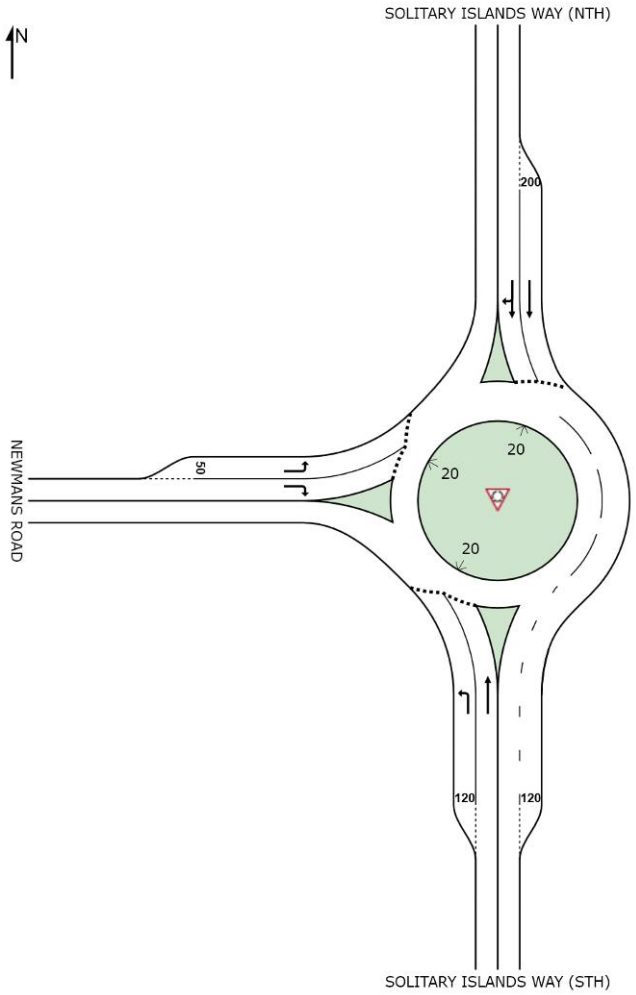
Site: 2040 PM Peak DESIGN single roundabout

Solitary Islands Way / Newmans Rd, Woolgoolga
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: SOLITARY ISLANDS WAY (STH)											
1	L2	276	5.0	0.729	4.7	LOS A	10.2	76.8	0.53	0.45	53.1
2	T1	764	10.0	0.729	5.0	LOS A	10.2	76.8	0.53	0.45	54.3
Approach		1040	8.7	0.729	4.9	LOS A	10.2	76.8	0.53	0.45	54.0
North: SOLITARY ISLANDS WAY (NTH)											
8	T1	739	10.0	0.645	5.5	LOS A	7.1	53.5	0.63	0.54	53.5
9	R2	68	5.0	0.645	10.0	LOS B	7.1	53.5	0.63	0.54	53.5
Approach		807	9.6	0.645	5.9	LOS A	7.1	53.5	0.63	0.54	53.5
West: NEWMANS ROAD											
10	L2	33	5.0	0.263	9.6	LOS A	1.8	12.9	0.83	0.87	48.7
12	R2	136	5.0	0.263	14.4	LOS B	1.8	12.9	0.83	0.87	49.7
Approach		168	5.0	0.263	13.5	LOS B	1.8	12.9	0.83	0.87	49.5
All Vehicles		2016	8.7	0.729	6.0	LOS A	10.2	76.8	0.59	0.52	53.4

SENSITIVITY – 2040 AM PEAK HOUR (TWO LANE ROUNDABOUT)



MOVEMENT SUMMARY

Site: 2040 AM Peak DESIGN two lane roundabout

Solitary Islands Way / Newmans Rd, Woolgoolga
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	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 per veh	Average Speed km/h
South: SOLITARY ISLANDS WAY (STH)											
1	L2	93	5.0	0.081	4.3	LOS A	0.5	3.3	0.14	0.47	54.6
2	T1	675	10.0	0.402	4.3	LOS A	3.4	26.2	0.16	0.39	55.9
Approach		767	9.4	0.402	4.3	LOS A	3.4	26.2	0.16	0.40	55.7
North: SOLITARY ISLANDS WAY (NTH)											
8	T1	985	10.0	0.524	6.2	LOS A	4.5	33.8	0.67	0.61	53.4
9	R2	22	5.0	0.524	10.6	LOS B	4.5	33.8	0.69	0.60	53.3
Approach		1007	9.9	0.524	6.3	LOS A	4.5	33.8	0.67	0.61	53.4
West: NEWMANS ROAD											
10	L2	65	5.0	0.101	9.3	LOS A	0.5	3.9	0.68	0.74	51.2
12	R2	309	5.0	0.312	12.7	LOS B	2.1	15.5	0.74	0.80	50.3
Approach		375	5.0	0.312	12.1	LOS B	2.1	15.5	0.73	0.79	50.4
All Vehicles		2149	8.9	0.524	6.6	LOS A	4.5	33.8	0.50	0.57	53.6

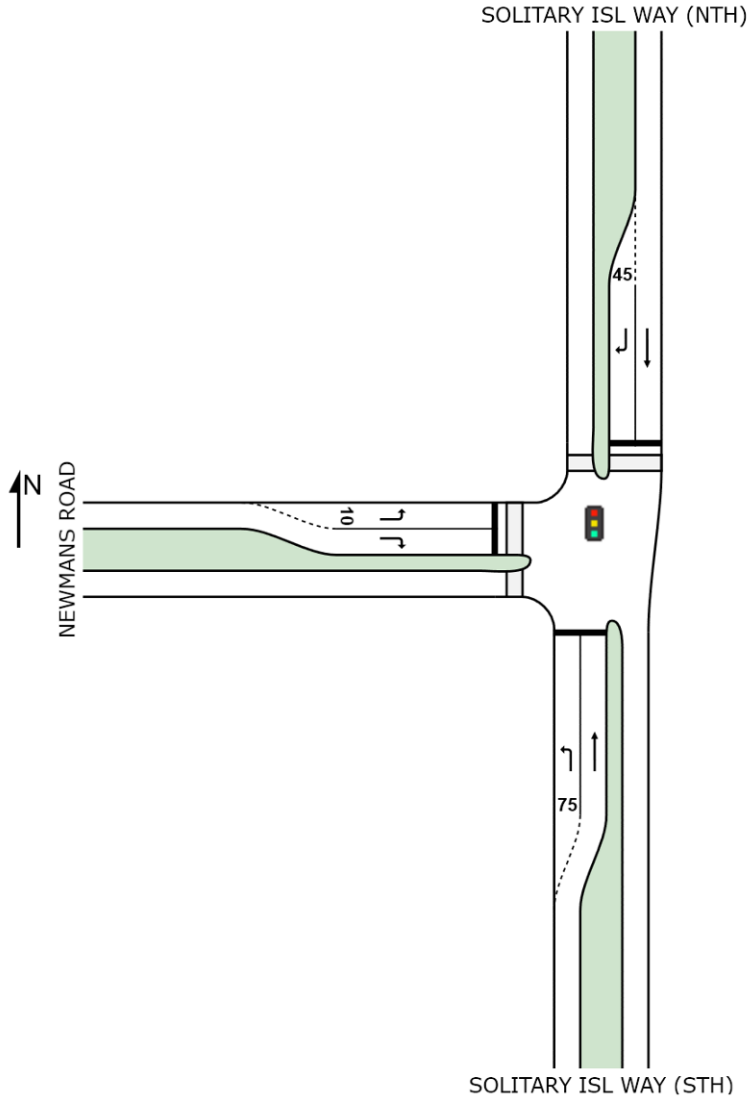
MOVEMENT SUMMARY

Site: 2040 PM Peak DESIGN two lane roundabout

Solitary Islands Way / Newmans Rd, Woolgoolga
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	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 per veh	Average Speed km/h
South: SOLITARY ISLANDS WAY (STH)											
1	L2	276	5.0	0.232	4.7	LOS A	1.4	10.3	0.26	0.49	54.2
2	T1	764	10.0	0.487	4.6	LOS A	4.1	31.5	0.31	0.42	55.1
Approach		1040	8.7	0.487	4.6	LOS A	4.1	31.5	0.30	0.43	54.9
North: SOLITARY ISLANDS WAY (NTH)											
8	T1	739	10.0	0.353	4.9	LOS A	2.7	20.3	0.41	0.48	54.4
9	R2	68	5.0	0.353	9.4	LOS A	2.7	20.3	0.41	0.49	54.3
Approach		807	9.6	0.353	5.3	LOS A	2.7	20.3	0.41	0.49	54.4
West: NEWMANS ROAD											
10	L2	33	5.0	0.057	10.0	LOS B	0.3	2.3	0.73	0.73	50.7
12	R2	136	5.0	0.154	13.0	LOS B	1.0	7.6	0.76	0.78	50.1
Approach		168	5.0	0.154	12.5	LOS B	1.0	7.6	0.76	0.77	50.2
All Vehicles		2016	8.7	0.487	5.5	LOS A	4.1	31.5	0.38	0.48	54.3

APPENDIX D – SIDRA RESULTS (TRAFFIC SIGNALS AS PER GHD REPORT)



YEAR 2040 – WITH NEWMANS ROAD FULLY DEVELOPED

MOVEMENT SUMMARY

Site: 2040 AM Peak DESIGN signals

Solitary Islands Way / Newmans Rd
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: SOLITARY ISL WAY (STH)											
1	L2	93	5.0	0.103	26.3	LOS C	3.5	25.4	0.56	0.71	41.0
2	T1	675	10.0	0.797	31.4	LOS C	38.5	292.3	0.86	0.78	39.6
Approach		767	9.4	0.797	30.8	LOS C	38.5	292.3	0.82	0.77	39.7
North: SOLITARY ISL WAY (NTH)											
8	T1	985	5.0	1.065	137.3	LOS F	119.0	868.7	1.00	1.42	18.4
9	R2	22	10.0	0.319	86.3	LOS F	1.7	12.8	1.00	0.71	24.4
Approach		1007	5.1	1.065	136.2	LOS F	119.0	868.7	1.00	1.40	18.5
West: NEWMANS ROAD											
10	L2	65	5.0	1.079	347.7	LOS F	8.0	58.2	1.00	1.15	8.9
12	R2	309	5.0	1.060	173.7	LOS F	36.2	264.5	1.00	1.15	15.4
Approach		375	5.0	1.079	204.0	LOS F	36.2	264.5	1.00	1.15	13.7
All Vehicles		2149	6.6	1.079	110.4	LOS F	119.0	868.7	0.94	1.13	21.3

MOVEMENT SUMMARY

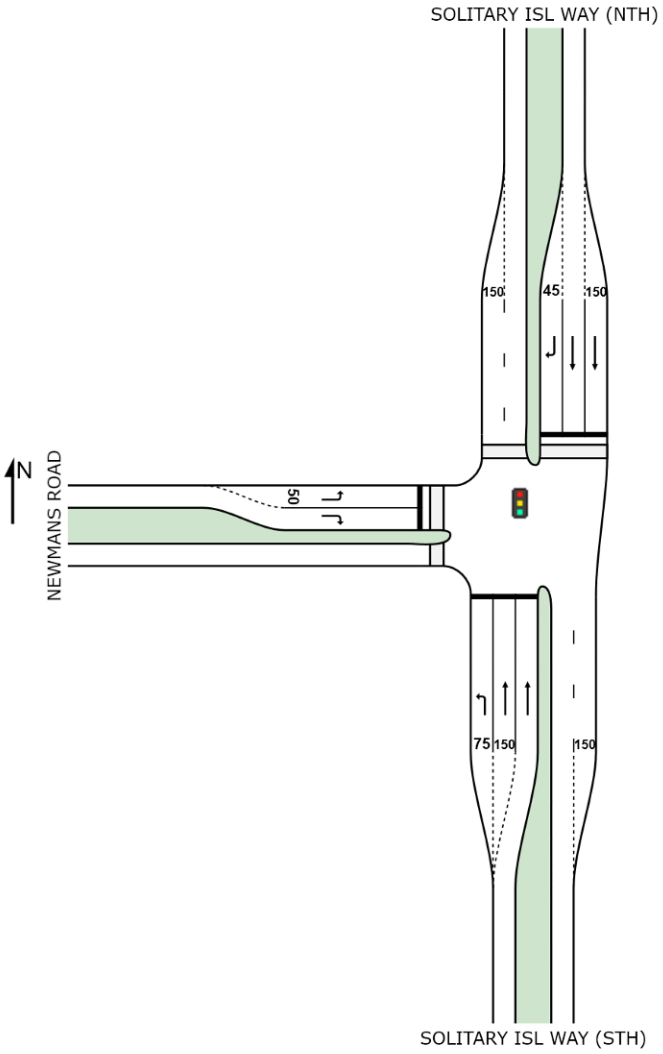
Site: 2040 PM Peak DESIGN GHD signals

Solitary Islands Way / Newmans Rd
Signals - Fixed Time Isolated Cycle Time = 130 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: SOLITARY ISL WAY (STH)											
1	L2	276	5.0	0.267	20.1	LOS C	8.6	62.5	0.53	0.73	44.1
2	T1	764	10.0	0.879	30.7	LOS C	40.7	309.0	0.79	0.79	39.9
Approach		1040	8.7	0.879	27.9	LOS C	40.7	309.0	0.72	0.78	40.9
North: SOLITARY ISL WAY (NTH)											
8	T1	739	5.0	0.735	20.2	LOS C	32.0	233.8	0.75	0.69	45.0
9	R2	68	10.0	0.855	82.9	LOS F	4.9	37.3	1.00	0.92	25.0
Approach		807	5.4	0.855	25.5	LOS C	32.0	233.8	0.77	0.71	42.2
West: NEWMANS ROAD											
10	L2	33	5.0	0.197	66.1	LOS E	2.0	14.4	0.96	0.73	28.3
12	R2	136	5.0	0.888	80.3	LOS F	9.7	70.7	1.00	0.96	25.5
Approach		168	5.0	0.888	77.5	LOS E	9.7	70.7	0.99	0.91	26.0
All Vehicles		2016	7.1	0.888	31.1	LOS C	40.7	309.0	0.76	0.76	39.5

SENSITIVITY – EXPANDED SIGNALISED LAYOUT



YEAR 2040 – WITH NEWMANS ROAD FULLY DEVELOPED

MOVEMENT SUMMARY

Site: 2040 AM Peak DESIGN RTE signals

Solitary Islands Way / Newmans Rd
Signals - Fixed Time Isolated Cycle Time = 100 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: SOLITARY ISL WAY (STH)											
1	L2	93	5.0	0.152	30.2	LOS C	3.1	22.9	0.73	0.74	39.3
2	T1	675	10.0	0.603	29.0	LOS C	15.3	116.2	0.87	0.75	40.6
Approach		767	9.4	0.603	29.1	LOS C	15.3	116.2	0.85	0.74	40.5
North: SOLITARY ISL WAY (NTH)											
8	T1	985	5.0	0.867	36.9	LOS D	28.3	206.9	0.96	0.92	37.3
9	R2	22	10.0	0.213	57.2	LOS E	1.1	8.4	0.98	0.71	30.4
Approach		1007	5.1	0.867	37.4	LOS D	28.3	206.9	0.96	0.92	37.1
West: NEWMANS ROAD											
10	L2	65	5.0	0.243	47.0	LOS D	2.9	21.1	0.92	0.75	33.3
12	R2	309	5.0	0.862	55.9	LOS E	16.7	122.1	1.00	0.96	30.8
Approach		375	5.0	0.862	54.4	LOS D	16.7	122.1	0.99	0.93	31.2
All Vehicles		2149	6.6	0.867	37.4	LOS D	28.3	206.9	0.93	0.86	37.0

MOVEMENT SUMMARY

Site: 2040 PM Peak DESIGN RTE signals

Solitary Islands Way / Newmans Rd
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: SOLITARY ISL WAY (STH)											
1	L2	276	5.0	0.489	27.0	LOS C	7.8	57.0	0.86	0.81	40.7
2	T1	764	10.0	0.739	24.0	LOS C	13.9	105.9	0.93	0.83	43.0
Approach		1040	8.7	0.739	24.8	LOS C	13.9	105.9	0.91	0.82	42.4
North: SOLITARY ISL WAY (NTH)											
8	T1	739	5.0	0.722	23.3	LOS C	12.5	91.5	0.91	0.80	43.4
9	R2	68	10.0	0.460	41.3	LOS D	2.4	18.4	0.99	0.76	35.0
Approach		807	5.4	0.722	24.8	LOS C	12.5	91.5	0.92	0.80	42.5
West: NEWMANS ROAD											
10	L2	33	5.0	0.116	33.8	LOS C	1.0	7.2	0.89	0.71	37.8
12	R2	136	5.0	0.757	43.5	LOS D	5.1	37.2	1.00	0.90	34.4
Approach		168	5.0	0.757	41.6	LOS D	5.1	37.2	0.98	0.86	35.0
All Vehicles		2016	7.1	0.757	26.2	LOS C	13.9	105.9	0.92	0.82	41.7