Appendix I

Traffic Study

RoadNet

Traffic Study
Rezoning of land south of George Booth Drive, Edgeworth

for

GeoLink

5 October 2010

Contents

Document Status	**FINAL**

Task	Responsibility	Signature
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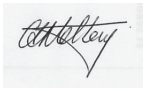
Reviewed by:	Craig Nethery	

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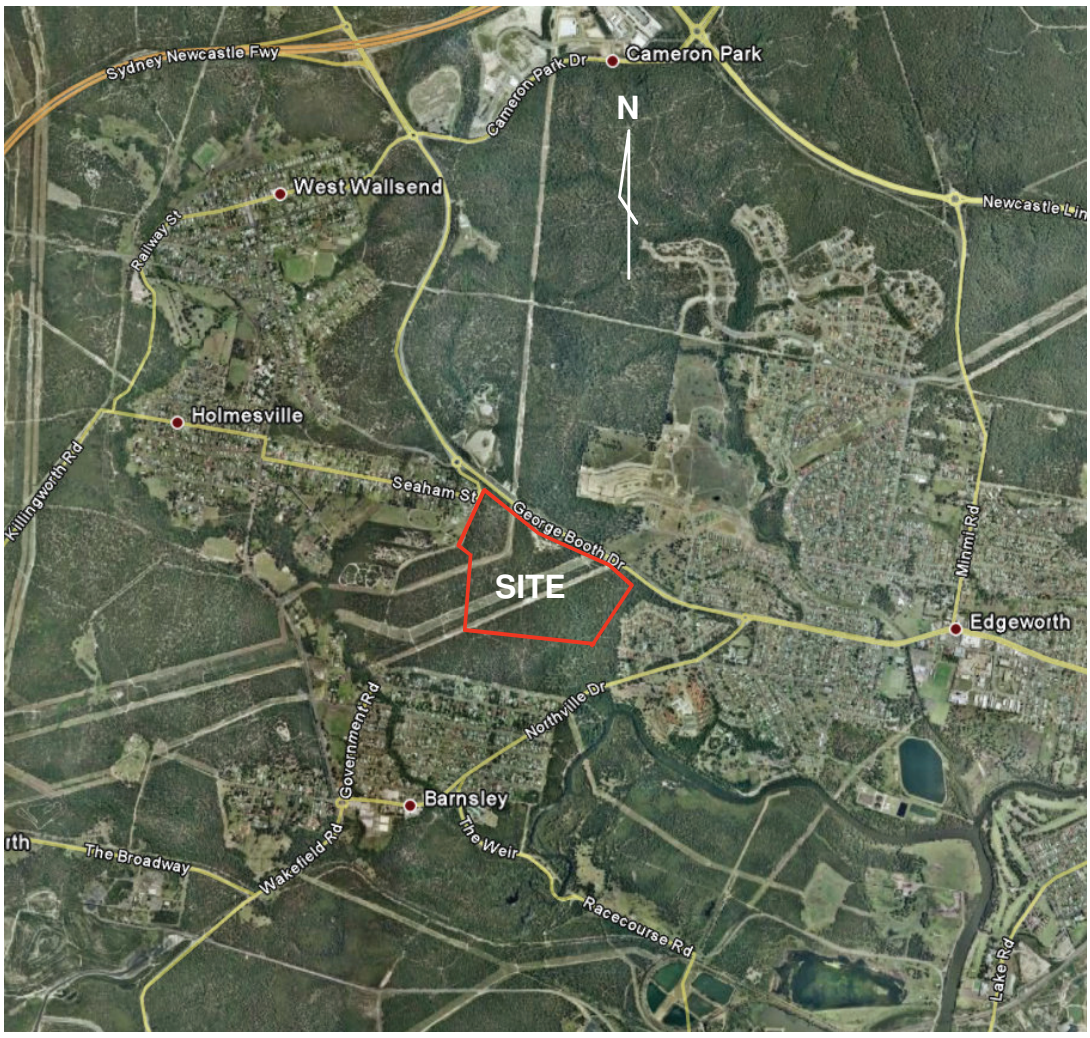
1 INTRODUCTION

RoadNet has been engaged to prepare a traffic impact assessment for the rezoning of land to the south of George Booth Drive, Edgeworth.

Issue relating to access onto George Booth Drive have largely been addressed by others. This report reviews the proposed access arrangements in light of changes to the Masterplanning for the southern precinct.

This report also examines traffic aspects of the Masterplan and makes comments on the impact on subdivision layout, intersection design, provision for buses, pedestrians and cyclists.

Figure 1 – Locality Plan showing the area under investigation for rezoning



Extract from Google Earth

2 BACKGROUND

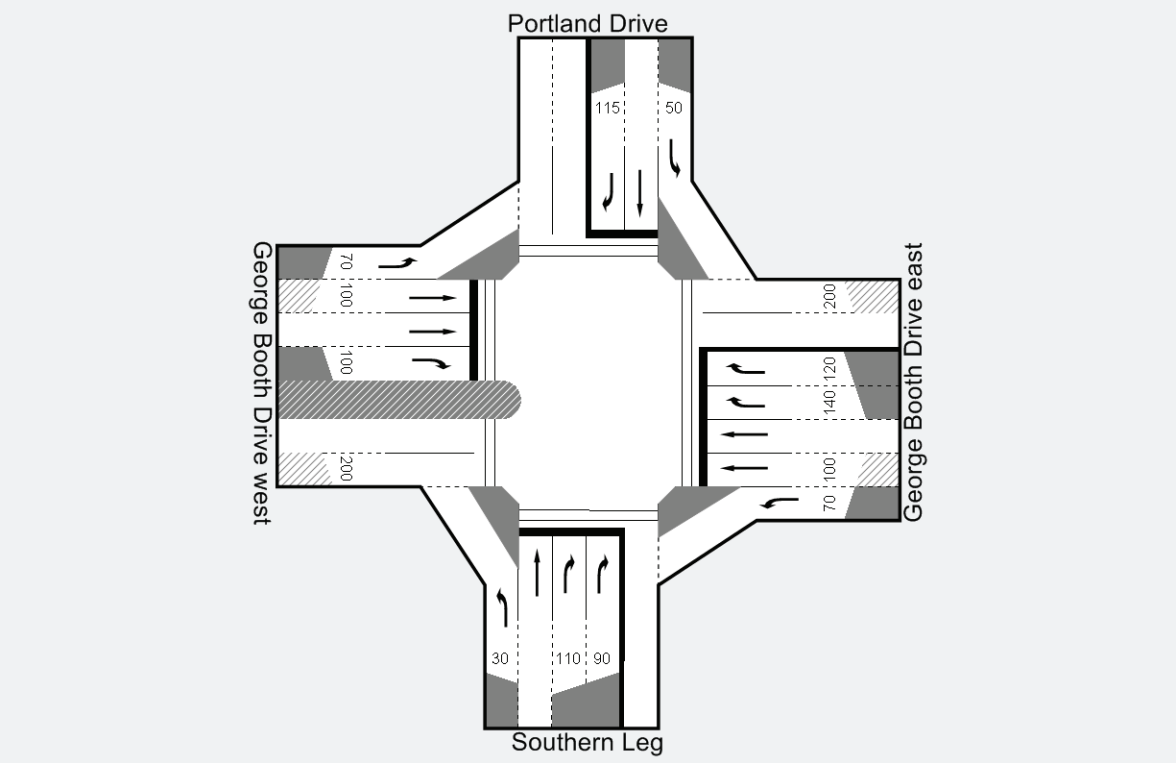
On 20 November 2008 RoadNet prepared a 'Preliminary Observations Report' in regard to traffic issues associated with developing the site. It provided comment on access options to George Booth Drive, Government Road and Carinda Avenue to Northville Drive. The project was then put on hold while environmental issues that would affect lot yields were resolved.

In the mean time development proposals for land to the north of George Booth Drive were being investigated. Brown Consulting Pty Ltd prepared a traffic study for development of this land and during the process negotiated an access arrangement onto George Booth Drive with the Roads and Traffic Authority. The arrangement involved a signalised cross intersection at Portland Drive. In considering the type and nature of access to George Booth Drive two development options for the land to the south were included. Option 1 was for 400 residential lots and Option 2 was for 750 lots. An iterative approach to the modelling resulted in an optimal lane configuration and phasing arrangement that would accommodate traffic from this number of lots.

A copy of the Brown Consulting report to the RTA has been provided for information to assist updating the traffic assessment for the subject subdivision. The report along with the sidra modelling undertaken is reviewed in this report.

The recommended layout from the Brown Study is shown in Figure 2.

Figure 2 – Recommended Intersection layout from Brown Report



3 METHODOLOGY

The methodology used to asses the impact of traffic on George Booth Drive is to review the modelling undertaken by Brown Consulting and adjust the volumes, geometry and phasing to suit the new volumes calculated from the Masterplan. Additional local road connections will allow traffic to distribute to other intersections on George Booth Drive and thereby reduce the impact of the proposed traffic signals at Portland Drive. The redistribution of traffic was taken into account and the modelling redone using the amended volumes.

The subdivision layout has been reviewed as to how it complies with the relevant Austroads Guidelines.

Traffic counts have been carried out for the area.

- George Booth Drive (Main Road) & Minmi Road
- George Booth Drive & Withers Street / Government Road
- George Booth Drive (Main Road) & Northville Drive
- Northville Drive & Appletree Road

Copies are contained in the appendix B.

This report details the analysis and findings.

4 TRAFFIC GENERATION

The Brown Consulting Study assumes that all traffic from the subdivision will enter and leave the Estate via the access road with George Booth Drive. This is evident from reviewing the volumes used in Brown's sidra model. The peak hour traffic volumes used in the sidra model for the 400 lot and the 750 lot scenarios for the southern precinct land equate to the application of the standard 0.85 trips per residential lot, ie 342vph and 638vph respectively.

The following tables show the traffic generation from two scenarios of the Draft Masterplan:

1) full residential development; and
2) a mixture of free standing residential, medium density, commercial and light industry.

Table 1- Total Residential Scenario

SCENARIO 1 Entirely Residential	Net Area (ha)	Density / ha	Lot Yield	Traffic Generation Rate	Peak Hour Trips
Low Density Residential	24.8	15	372	0.85	316
Medium Density Residential	5.4	40	216	0.5	108
Total	30.2		588		424

Assume all trips external

Table 2 – Mixed use Scenario

SCENARIO 2 Mixed Development as per Draft Structure Plan	Net Area (ha)	Density / ha	Lot Yield	Traffic Generation Rate	Peak Hour Trips	External Trips
Low Density Residential	13.4	15	201	0.85	171	171
Medium Density Residential	5.4	40	216	0.5	108	108
Live and Work Residential	1.3	41	53.3	0.4	21	21
Neighbourhood Centre Attract internal trips	2.5	1200m2	-	4.6 / 100m2	55	-55
Light Industrial - Business Park Warehouse with Retail facility	7.6	40% GFA 30,000m2	3.04	0.75 / 100m2	225	180
Total	30.2		473.34		525	425

Assume 80% of Business Park traffic is external and 20% from residential area
Assume Neighbour Centre attracts only local traffic.

The Draft Masterplan has road connections to Government Road and to Northville Drive. These road connections have not been taken into account in the Brown Consulting Study. This road network allows more direct access to George Booth Drive and areas to the south and may see 40% of traffic using alternative routes, 10% onto Government Road and 30% onto Northville Drive. This scenario would take traffic away from George Booth Drive (40% x 425 =170vph) and presumably reduce the size of that intersection. The intersection onto George Booth Drive is unlikely to attract any traffic through the subdivision from surrounding areas in the south.

The intersection layout shown in the Brown Report will more than accommodate the traffic from the southern precinct, in fact the intersection appears to be over designed.

Table 3 shows the calculation of traffic splits using the Brown model and applied to the current Masterplan proposal. Also shown is the reduction in traffic that would use the Portland Road signals if alternative routes were available.

Table 3 – Traffic splits calculated from splits in the Brown Modelling

BROWNS STUDY	left out	straight out	right out	left in	straight in	right in	Total
Traffic Assignment AM 400 Lots	84	14	191	28	3	20	340
Percentage splits	0.25	0.04	0.56	0.08	0.01	0.06	
Traffic Assignment PM 400 Lots	20	3	28	191	14	84	340
Percentage splits	0.06	0.01	0.08	0.56	0.04	0.25	
Traffic Assignment AM 750 Lots	157	27	357	53	5	38	637
Percentage splits	0.25	0.04	0.56	0.08	0.01	0.06	
Traffic Assignment PM 750 Lots	38	5	53	357	27	157	637
Percentage splits	0.06	0.01	0.08	0.56	0.04	0.25	

MASTERPLAN (Both Scenarios)	left out	straight out	right out	left in	straight in	right in	Total
Proposed Masterplan AM	105	18	238	35	3	25	425
Reduction for alt routes	10%	0%	30%	30%	0%	10%	
Predicted Traffic volumes	94	18	167	25	3	23	330
Proposed Masterplan PM	25	3	35	238	18	105	425
Reduction for alt routes	10%	0%	30%	30%	0%	10%	
Predicted Traffic volumes	23	3	25	167	18	94	330

Directional splits as per Brown Study less diverted trips onto Government Road and Northville Drive

The Brown Study assumes a split of 15% out and 85% in during both the AM and PM peaks. This split is considered to be skewed. More typical splits would be more like 70% out of the residential areas in the morning and 30% in and the reverse in the afternoon. The effect of the shopping centre on the northern side of George Booth Drive may see this split more evenly balanced for traffic from Portland Drive due to the attraction of the shopping centre.

The modelling adopts a simple approach to the diamond phasing but does not allow for the overlap right turn phase to follow the diamond movement to permit the through movement while the heavier of the two diamond movements clears. The model also does not mirror reverse the respective peaks. It retains the same splits for both am and pm.

The sidra model has been amended in this report to reflect the reduced traffic movements due to alternative accesses and the splits have been changed to more standard percentages. The phasing has also been updated to permit overlap movements. Refer to table 4 for the volumes adopted for the updated model.

Table 4 – Traffic volumes adopted for the Updated Modelling

Southern Precinct AM	Total	OUT	361	Total	IN	64		AM	70/30
	left out	straight out	right out	left in	straight in	right in		Out	In
	0.29	0.05	0.66	0.55	0.05	0.40		230	100
Southern Precinct PM	Total	OUT	64	Total	IN	361		PM	30/70
	left out	straight out	right out	left in	straight in	right in		Out	In
	0.40	0.05	0.55	0.66	0.05	0.29		100	230
Southern Precinct AM	Total	OUT	230	Total	IN	100			
	left out	straight out	right out	left in	straight in	right in			
CORRECTED VOLUMES	67	11	152	55	5	40			
Southern Precinct PM	Total	OUT	100	Total	IN	230			
	left out	straight out	right out	left in	straight in	right in			
CORRECTED VOLUMES	40	5	55	152	11	67			

5 ACCESS OPTIONS

5.1 General

The proposed signalised cross intersection on George Booth Drive with Portland Drive has been modelled and an agreement reached with RTA. The layout performed at level of service 'C' for both the 400 lot and 750 lot scenarios with a cycle time of 100 seconds and an average delay of 37.1 seconds for the higher lot yield.

The sidra model has been reviewed and rerun using reduced traffic volumes that would eventuate if road connections were made to Government Road and Northville Drive.

Intersection Modelling

Option 1 - full residential development – (588 tenements comprising 372 residential lots 216 Medium Density Tenements);

Generates 424 peak hour trips.

Option 2 - a mixture of free standing residential, medium density, commercial and light industry – (478 tenements, commercial centre, and business park).

Generates 425 peak hour trips.

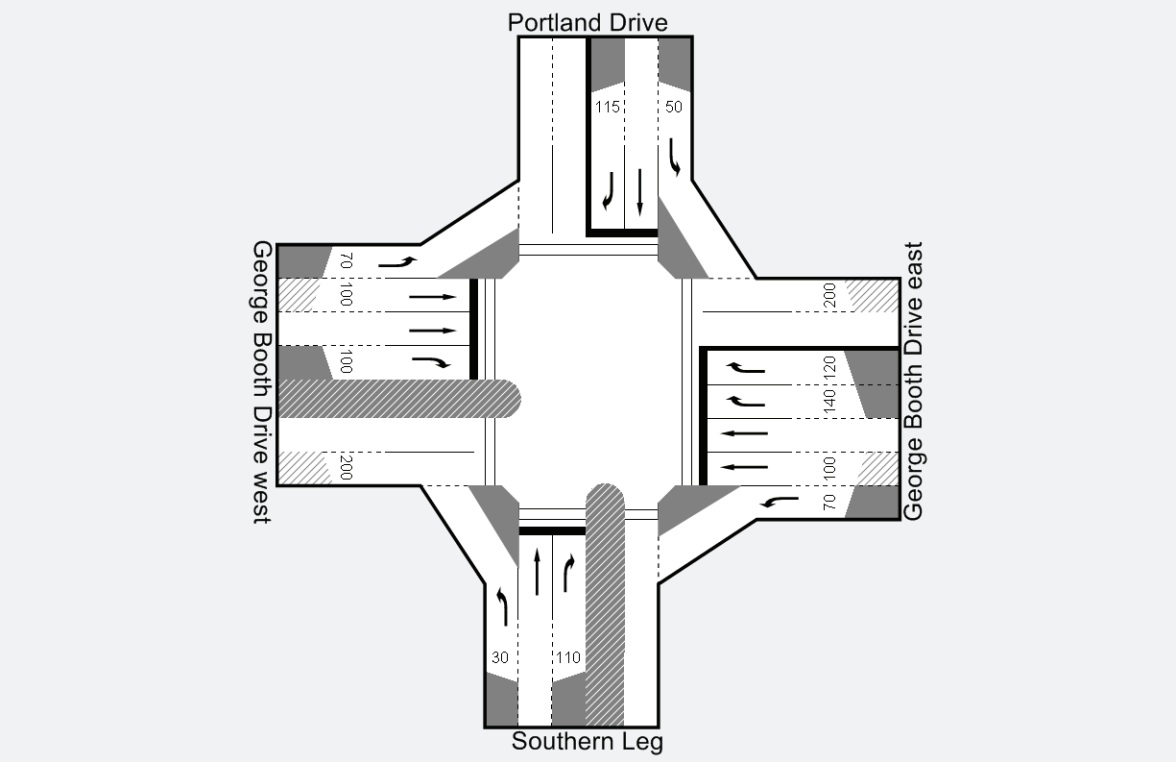
If no local road connections all with go through the Portland Road intersection.

The Brown layout in Figure 2 will accommodate this traffic.

If local road connections are made 255 trips (425- 170) will use the Portland Road intersection.

Modelling Results shows the Brown layout can be modified as per Figure 3.

Figure 3 – layout required if local road connections are made.



5.2 *Intersections with Government Road*

Government Road carries low traffic volumes, 77vph in peak hour.

Proposed intersections onto Government Road would not need any special treatments, simply a standard urban treatment with kerb and gutter.

Traffic that may use Government Road if road connections are provided is estimated as about 50 vehicles per hour depending upon the development scenario adopted.

This traffic could be split over 4 intersections so delays and traffic impact would be minimal.

Government Road would have the capacity to easily adsorb this additional traffic without undue adverse impacts.

Collector roads can carry up to 3000 vpd or 300 vph without affecting safety and amenity.

Government Road connects to Withers Street which in turn meets George Booth Drive at a roundabout. The additional traffic is not expected to adversely impact on that roundabout. This assessment is made on the basis of site inspections and a perusal of peak hour traffic counts. Modelling is not considered necessary.

5.3 *Intersections with Carinda Avenue / Northville Drive*

Carinda Road currently services a small subdivision and carries low traffic volumes.

A connection is proposed from the subdivision to Carinda Avenue which then connects as a T junction with Northville Drive.

Traffic that may use Carinda Avenue and Northville Drive if a road connection is provided is estimated as ie about 130 vehicles per hour depending upon the development scenario adopted.

Both Carinda Avenue and Northville Drive would have the capacity to adsorb this additional traffic without undue adverse impacts.

The intersection of Carinda Avenue and Northville Drive would require provision for right turn movement into Carinda Avenue, either as a CHR type junction or an urban cross section with sufficient width for passing turning traffic.

Northville Drive meets George Booth Drive at a roundabout. The additional traffic is not expected to adversely impact on that roundabout. This assessment is made on the basis of site inspections and a perusal of peak hour traffic counts. Modelling is not considered necessary.

6 PUBLIC TRANSPORT

Future residential development in the subdivision as well as proposed urban development to the north will generate additional demand for public transport services.

The size and layout of the subdivision would not necessarily attract a bus route through the subdivision. Buses would be more likely to travel along George Booth Drive. Buses may travel along the southern and western boundary of the site, ie Carinda Avenue and Government Road. Provision for bus stops should be made on this route.

Bus stops / bus bays should be provided on both sides of George Booth Drive either side of Portland Drive.

7 PEDESTRIANS / CYCLISTS

A major shopping centre is proposed in Portland Drive so a strong pedestrian desire line could be expected across George Booth Drive from the proposed subdivision. Traffic signals with pedestrian facilities is proposed at the cross intersection. This will be adequate to provide for pedestrians and cyclists to cross the road. Consideration of cyclist facilities in the traffic signals is desirable.

Footpath improvements / connections are needed throughout the locality to link precincts and to access public transport bus stops.

Pedestrian linkages are proposed to the south to connect existing subdivisions.

The road layout will allow traffic to distribute resulting in relatively low traffic volumes on each street. Accordingly, cyclists would be able to use the local streets in safety and not require separate cycle facilities.

8 ROAD SAFETY

The subdivision layout contains a number of cross intersections. Consideration should be given to installing roundabout control at the more heavily traffic sites, in particular the three cross intersections on the road leading from the traffic signals to the southeast.

The proposed intersection on the sharp bend at the western end of Carinda Avenue extension is located on the inside of the curve and would have poor sight distance. It should be relocated or removed. The sharp bend is also too sharp for being located at the end of two long straight sections of road. The alignment should be improved.

The northernmost junction proposed on Government Road forms an offset cross junction with Seaham Street. Desirably more separation is needed for an offset in this configuration. A cross intersection controlled by a roundabout may be a safer option.

9 AMENITY

Should Scenario 2 be adopted (Light Industry / Business Park) traffic from that area may impact on Carinda Avenue residents enjoyment of their properties. In this regard the proposed short road connection from the Industrial area to Carinda Avenue should be reconsidered. It should possibly be removed and this would cause most industrial traffic to use the Portland Drive signals.

10 CONCLUSIONS

The layout shown in Figure 2 will more than meet the needs of development scenarios for the southern precinct.

The layout shown in Figure 3 is all that is needed to accommodate the development proposals contained in the Masterplan. In fact, the reduced traffic, the reduced number of lanes and the amended phasing drops the cycle time from 100 seconds in Browns model to 80 seconds with the same level of service.

The volumes shown in the sidra model entering Portland Road are very high when compared to the exiting volumes. This looks like a morning peak scenario but heavily skewed with 83% in and 17% out. These volumes and splits have also been applied to the pm peak hour. The approved layout for Portland Drive intersection relating to the northern side should be checked against the modelling to ensure that the traffic volumes for am and pm peaks reflect the expected conditions.

APPENDIX A
INTERSECTION MODELLING RESULTS
REVISED VOLUMES AND PHASING

Intersection as Currently Proposed

MOVEMENT SUMMARY

Site: BC Layout_PM_Diamond + Revised Sth Precinct Dev

GBD and Portland DriveBC Layout - Diverted trips - PM peak
Signals - Fixed Time Cycle Time = 80 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Southern Leg											
1	L	42	4.0	0.082	10.2	LOS A	0.6	4.5	0.32	0.65	46.9
2	T	5	4.0	0.011	24.1	LOS B	0.2	1.8	0.77	0.51	34.5
3	R	58	4.0	0.214	48.1	LOS D	1.7	12.5	0.97	0.72	26.0
Approach		105	4.0	0.214	31.8	LOS C	1.7	12.5	0.70	0.68	32.1
East: George Booth Drive east											
4	L	160	4.0	0.140	8.4	LOS A	1.1	7.8	0.20	0.65	48.7
5	T	503	12.0	0.795	39.2	LOS C	12.1	93.7	1.00	0.95	27.6
6	R	616	4.0	0.853	49.8	LOS D	15.0	108.6	1.00	0.98	25.4
Approach		1279	7.1	0.853	40.4	LOS C	15.0	108.6	0.90	0.92	27.9
North: Portland Drive											
7	L	153	4.0	0.191	9.5	LOS A	1.8	13.1	0.29	0.66	47.7
8	T	12	4.0	0.024	24.3	LOS B	0.5	3.9	0.78	0.54	34.4
9	R	63	4.0	0.466	49.4	LOS D	3.7	26.5	1.00	0.75	25.5
Approach		227	4.0	0.466	21.3	LOS B	3.7	26.5	0.51	0.68	37.9
West: George Booth Drive west											
10	L	411	4.0	0.486	11.3	LOS A	6.7	48.4	0.44	0.72	45.9
11	T	387	12.0	0.612	34.3	LOS C	9.0	69.5	0.97	0.81	29.4
12	R	71	4.0	0.195	37.4	LOS C	3.4	24.6	0.87	0.76	29.7
Approach		868	7.6	0.612	23.7	LOS B	9.0	69.5	0.71	0.76	35.5
All Vehicles		2480	6.9	0.853	32.4	LOS C	15.0	108.6	0.79	0.83	31.2

Intersection with only One Right Turn Lane from the south

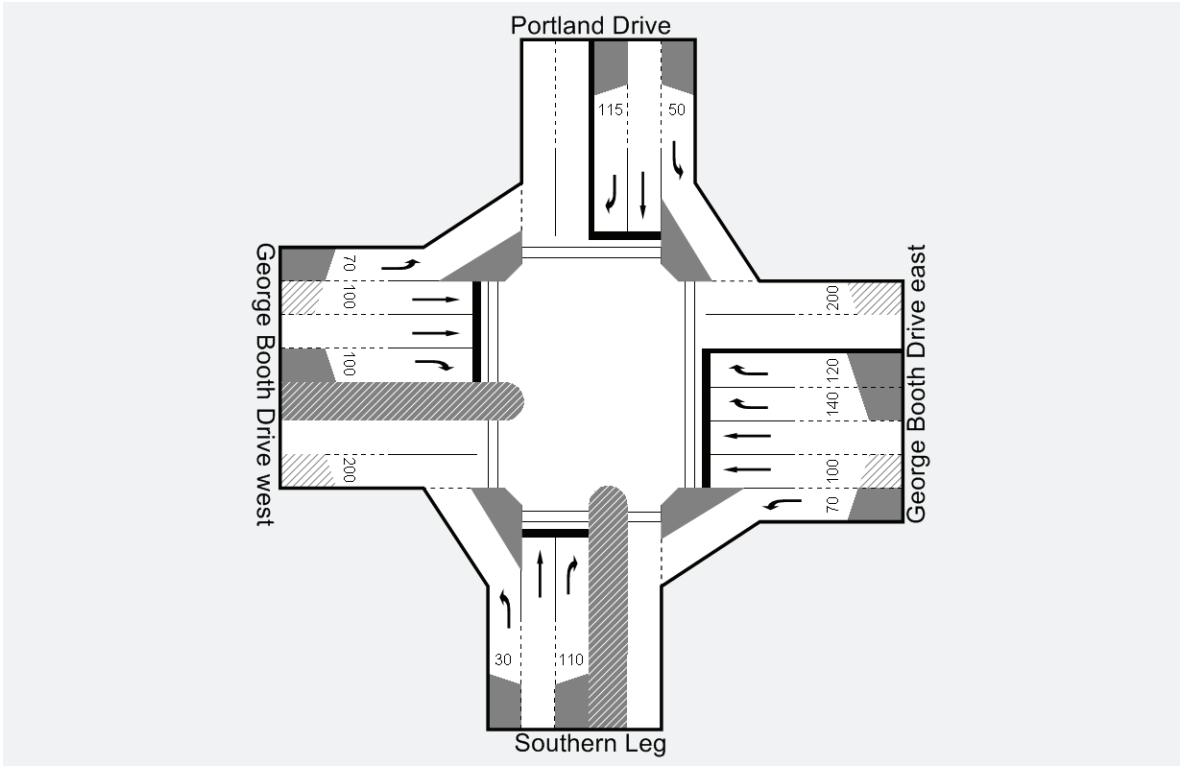
MOVEMENT SUMMARY

Site: BC Layout_PM_Diamond + Revised Sth + fewer lanes

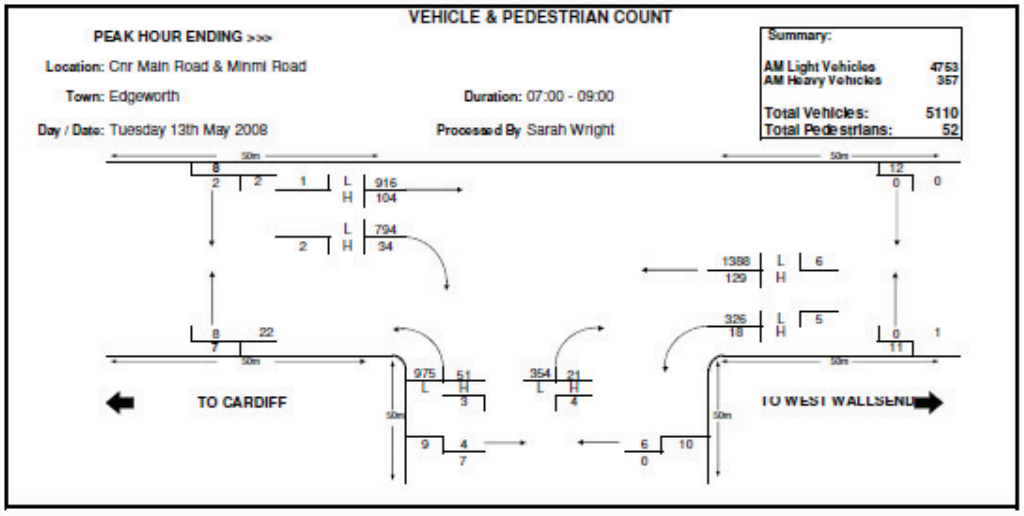
GBD and Portland DriveBC Layout - Diverted trips - PM peak - one RT lanefrom the south
Signals - Fixed Time Cycle Time = 80 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Southern Leg											
1	L	42	4.0	0.082	10.2	LOS A	0.6	4.5	0.32	0.65	46.9
2	T	5	4.0	0.011	24.1	LOS B	0.2	1.8	0.77	0.51	34.5
3	R	58	4.0	0.427	49.1	LOS D	3.4	24.4	0.99	0.75	25.6
Approach		105	4.0	0.428	32.3	LOS C	3.4	24.4	0.71	0.70	31.9
East: George Booth Drive east											
4	L	160	4.0	0.140	8.4	LOS A	1.1	7.8	0.20	0.65	48.7
5	T	503	12.0	0.795	39.2	LOS C	12.1	93.7	1.00	0.95	27.6
6	R	616	4.0	0.853	49.8	LOS D	15.0	108.6	1.00	0.98	25.4
Approach		1279	7.1	0.853	40.4	LOS C	15.0	108.6	0.90	0.92	27.9
North: Portland Drive											
7	L	153	4.0	0.199	9.7	LOS A	1.9	14.0	0.31	0.67	47.5
8	T	12	4.0	0.024	24.3	LOS B	0.5	3.9	0.78	0.54	34.4
9	R	63	4.0	0.466	49.4	LOS D	3.7	26.5	1.00	0.75	25.5
Approach		227	4.0	0.466	21.5	LOS B	3.7	26.5	0.52	0.68	37.8
West: George Booth Drive west											
10	L	411	4.0	0.486	11.3	LOS A	6.7	48.4	0.44	0.72	45.9
11	T	387	12.0	0.612	34.3	LOS C	9.0	69.5	0.97	0.81	29.4
12	R	71	4.0	0.195	37.6	LOS C	3.4	24.6	0.87	0.76	29.6
Approach		868	7.6	0.612	23.7	LOS B	9.0	69.5	0.71	0.76	35.5
All Vehicles		2480	6.9	0.853	32.5	LOS C	15.0	108.6	0.79	0.83	31.2



APPENDIX B
INTERSECTION COUNTS



AM		All Vehicles 1		2		3		4		5		6		Pedestrians 7		8		9		10		11		12		PEDS 1/4 HR		VEHICLE TOTALS 1/4		HR
			HR		HR		HR		HR		HR		HR		HR		HR		HR		HR		HR		HR					
07:15	L	89		94		81		31		37		148		1		0		0		0		0		0		1		480		
	H	12		2		9		2		2		18		3		0		0		0		0		0				45		
07:30	L	117		97		90		22		25		113		0		0		2		0		0		0		2		464		
	H	6		1		2		1		2		22		0		0		3		0		0		0				34		
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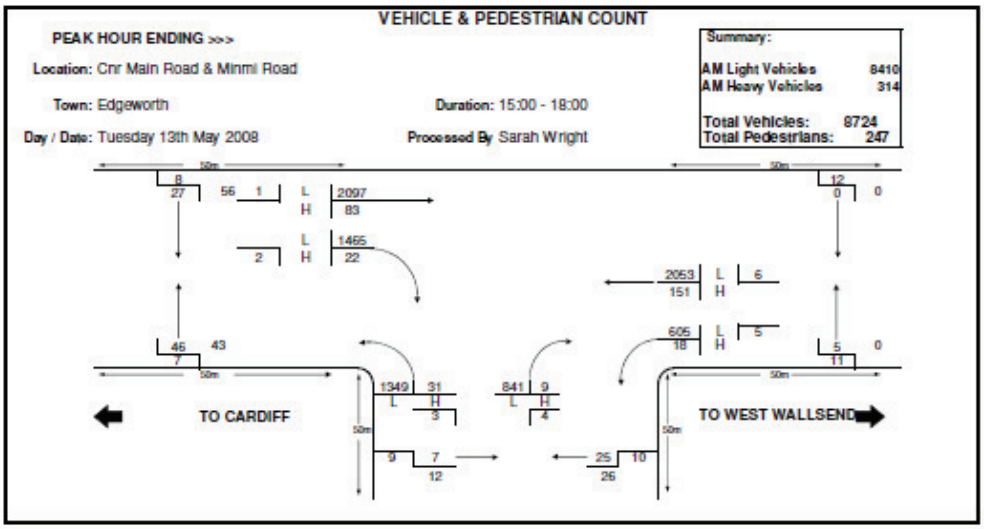
	H	15	55	3	18	9	21	4	15	3	9	14	59	6	12	0	2	0	4	0	0	0	1	0	0			48	177	
09:00	L	114	419	95	380	151	537	90	244	78	173	231	744	3	6	0	2	0	2	5	6	0	0	0	0	8	16	759	2497	
	H	17	60	7	18	9	28	2	14	3	10	13	56	2	14	0	2	0	4	0	0	0	1	0	0			51	186	
Total	L	916		794		975		354		326		1388		8		2		4		6		0		0						
	H	104		34		51		21		18		129		22		2		7		0		1		0						

Total Light Vehicles = 4753 Vehicle Totals 5110
Total Heavy Vehicles = 357 Pedestrians Totals 52

Pedestrians L = Children H = Adults



PM		1		2		3		4		5		6		7		8		9		10		11		12		PEDS 1/4	PEDS HR	VEHICLE TOTALS 1/4	VEHICLE TOTALS HR
			HR		HR		HR		HR		HR		HR		HR		HR		HR		HR		HR		HR				
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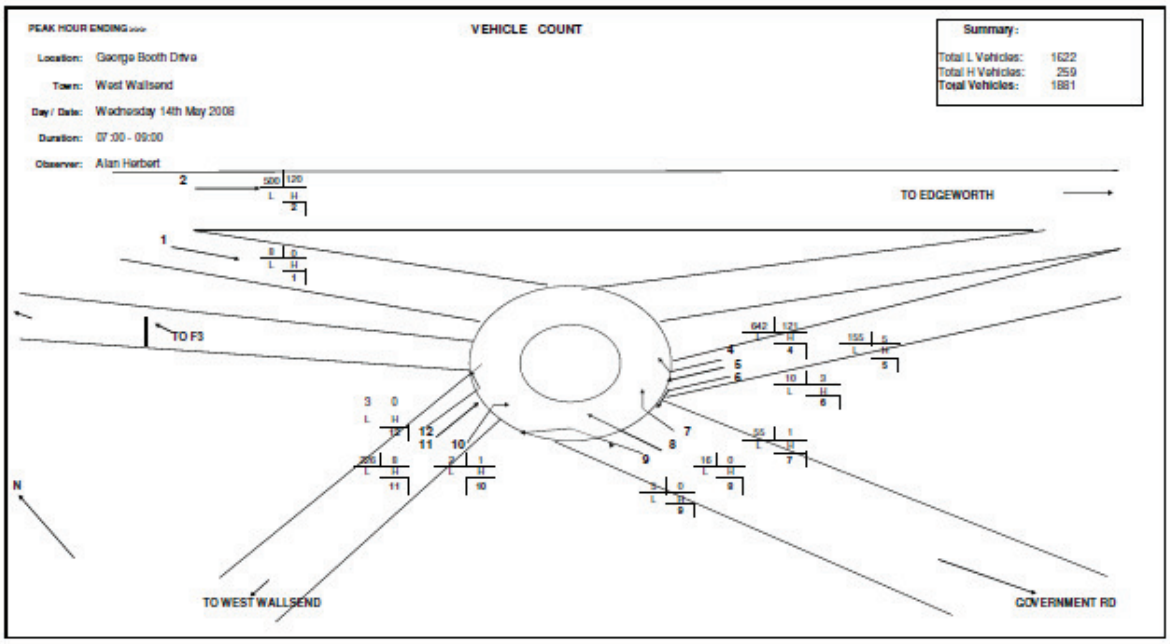
	H	8		5		5		0		1		7		1		8		1		2		0		0		0		26	
15:45	L	167		146		104		63		36		176		3		1		0		1		0		0		0		692	
	H	10		3		6		4		0		15		5		5		1		4		0		0		0		38	
16:00	L	172	630	129	#	98	389	65	240	47	214	176	681	4	25	2	13	2	6	3	21	0	0	0	0	0	0	687	2643
	H	8	38	4	#	2	18	2	6	1	3	16	59	10	25	4	29	1	10	5	24	0	0	0	0	0	0	33	140
16:15	L	161	678	106	#	111	433	74	261	58	201	159	698	3	14	2	5	0	3	1	7	0	0	0	0	0	0	669	2766
	H	9	35	0	#	3	16	2	8	1	3	15	53	4	20	6	23	0	3	0	11	0	0	0	0	0	0	30	127
16:30	L	204	704	99	#	115	428	80	282	37	178	158	669	10	20	3	8	0	2	3	8	0	0	0	0	0	0	693	2741
	H	8	35	1	8	3	14	0	8	1	3	15	61	3	22	2	17	1	3	0	9	0	0	0	0	0	0	28	129
16:45	L	179	716	129	#	125	449	91	310	46	188	178	671	2	19	2	9	1	3	0	7	5	5	0	0	0	0	748	2797
	H	2	27	0	5	2	10	0	4	0	3	13	59	2	19	8	20	1	3	0	5	0	0	0	0	0	0	17	108
17:00	L	183	727	101	#	112	463	80	325	35	176	177	672	0	15	0	7	0	1	0	4	0	5	0	0	0	0	688	2798
	H	6	25	0	1	2	10	0	2	0	2	11	54	2	11	7	23	0	2	2	2	0	0	0	0	0	0	19	94
17:15	L	213	779	136	#	127	479	74	325	38	156	174	687	0	12	2	7	0	1		3	0	5	0	0	0	0	762	2891
	H	6	22	0	1	1	8	1	1	11	12	11	50	3	10	3	20	0	2	0	2	0	0	0	0	0	0	30	94
17:30	L	160	735	134	#	125	489	70	315	55	174	139	668	1	3	0	4	0	1	0	0	0	5	0	0	0	0	683	2881
	H	7	21	1	1	1	6	0	1	1	12	9	44	4	11	1	19	0	1	0	2	0	0	0	0	0	0	19	95
17:45	L	195	751	149	#	114	478	65	289	61	189	209	699	0	1	2	4	0	0	0	0	0	0	0	0	0	0	793	2926
	H	5	24	3	4	0	4	0	1	1	13	11	42	0	9	0	11	0	0	0	2	0	0	0	0	0	0	20	88
18:00	L	172	740	122	#	131	497	67	276	61	215	178	700	5	6	3	7	0	0	0	0	0	0	0	0	0	0	731	2969
	H	2	20	1	5	1	3	0	1	0	13	7	38	0	7	0	4	0	0	0	0	0	0	0	0	0	0	11	80
Total	L	2097		1465		1349		841		605		2053		46		27		7		25		5		0		0			
	H	83		22		31		9		18		151		43		56		12		26		0		0					

All Vehicles — Pedestrians

Total Light Vehicles = 8410 — Vehicle Totals 8724
Total Heavy Vehicles = 314 — Pedestrians Totals 247

Pedestrians L = Children H = Adults



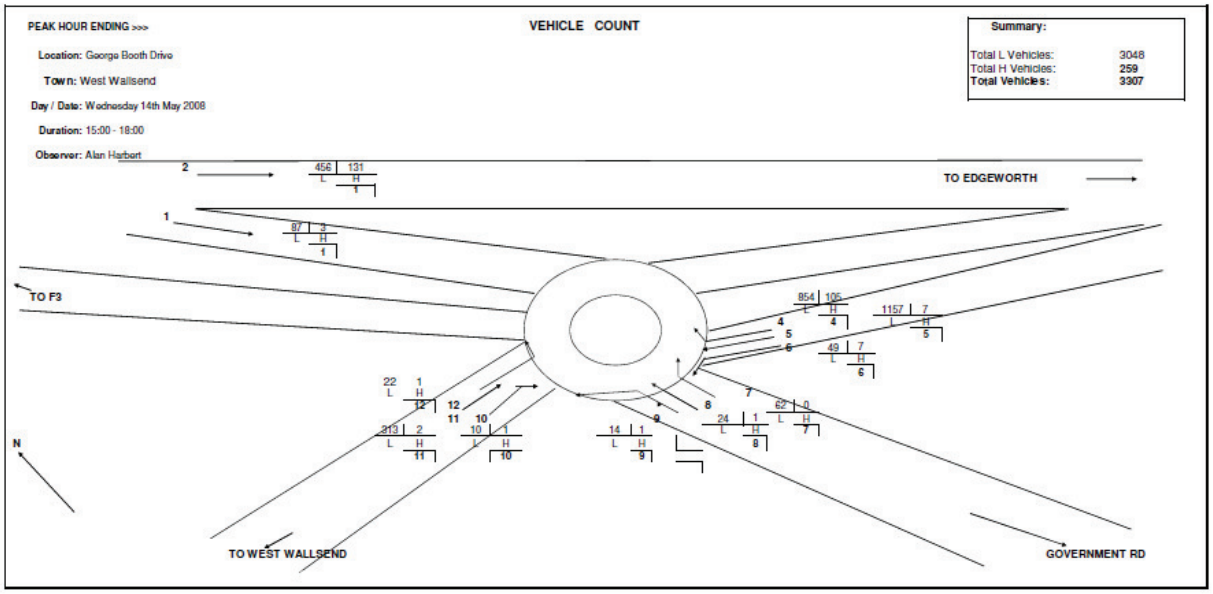
ALL VEHICLES

VEHICLE TOTALS

AM	1		HR	2		HR	4		HR	5		HR	6		HR	7		HR	8		HR	9		HR	10		HR	11		HR	12		HR	15min	HR
7:15	L	0			64			88			6			2			6			5			0			1			20			0			192	
	H	0			14			24			0			0			0			0			0			0			0			0			38	
7:30	L	2			81			108			14			0			9			3			1			1			23			1			243	
	H	0			15			21			0			0			0			0			0			0			3			0			39	
7:45	L	0			68			83			9			1			6			1			0			0			31			1			200	
	H	0			18			19			1			0			1			0			0			0			0			0			37	
8:00	L	1	3	79	292	107	386	24	53	2	5	7	28	2	11	0	1	0	2	26	100	0	2	248	883	
	H	0	0	14	59	11	75	2	3	1	1	0	1	0	0	0	0	0	0	1	4	0	0	29	143	
8:15	L	4	7	84	312	105	403	36	83	1	4	8	30	3	9	3	4	0	1	39	119	0	2	283	974	
	H	0	0	8	53	10	61	2	5	0	1	0	1	0	0	0	0	1	1	1	5	0	0	22	127	
8:30	L	1	6	59	290	94	389	22	91	0	4	11	32	1	7	1	4	0	0	41	137	1	2	231	962	
	H	0	0	15	53	11	51	0	5	1	2	0	1	0	0	0	0	0	1	2	4	0	0	29	117	
8:45	L	0	6	65	287	57	363	44	126	4	7	8	34	1	7	0	4	0	0	44	150	0	1	223	985	
	H	0	0	17	54	10	42	0	4	0	2	0	0	0	0	0	0	0	1	1	5	0	0	28	108	
9:00	L	0	5	0	208	0	256	0	102	0	5	0	27	0	5	0	4	0	0	2	126	0	1	2	739	
	H	0	0	21	61	15	48	0	2	1	2	0	0	0	0	0	0	0	1	0	4	0	0	37	116	
TOTALS	L	8		500		642		155		10		55		16		5		2		226		3												
	H	0		120		121		5		3		1		0		0		1		8		0												
																								TOTAL	1881									

Total Light Vehicles .. 1622
Total Heavy Vehicles .. 259

Vehicle Totals 1881

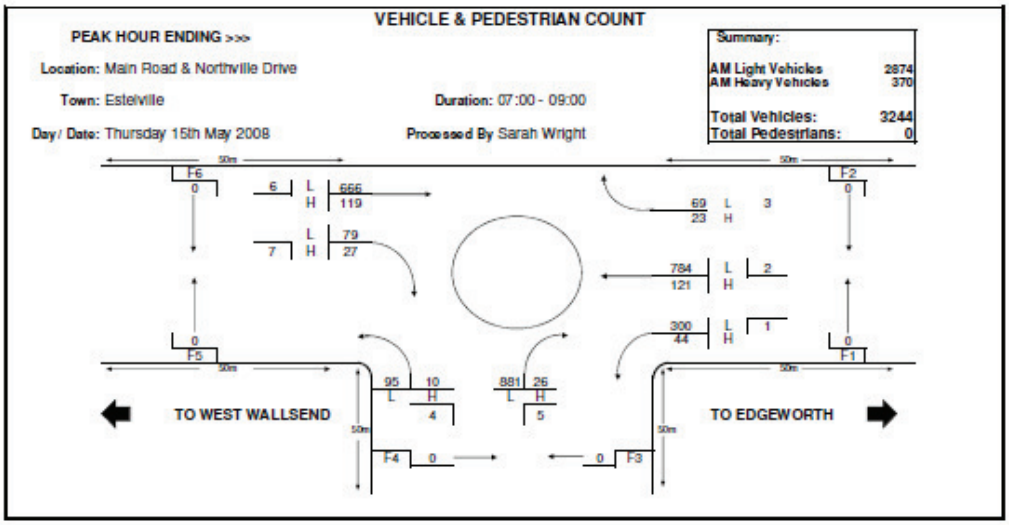


ALL VEHICLES

PM	1	HR	2	HR	4	HR	5	HR	6	HR	7	HR	8	HR	9	HR	10	HR	11	HR	12	HR	VEHICLE TOTALS 15min	HR
15:15	L	4	77		59		35		9		5		2		2		0		40		0		233	
	H	0	14		18		1		1		0		0		1		1		1		1		38	
15:30	L	8	80		64		36		0		6		1		0		0		32		7		234	
	H	0	8		6		0		1		0		0		0		0		1		0		16	
15:45	L	7	108		70		30		3		6		1		2		2		27		0		256	
	H	1	13		9		0		0		0		0		0		0		0		0		23	
16:00	L	2	21	109	374	96	289	39	140	11	23	6	23	2	6	0	4	0	2	30	129	0	7	295	1018
	H	1	2	26	61	11	44	1	2	1	3	0	0	0	0	0	1	0	1	0	2	0	1	40	117
16:15	L	3	20	91	388	93	323	38	143	9	23	5	23	3	7	3	5	0	2	32	121	1	8	278	1296
	H	0	2	19	66	8	34	0	1	1	3	0	0	1	1	0	0	0	0	0	1	0	0	29	108
16:30	L	3	15	114	422	81	340	41	148	10	33	2	19	4	10	1	6	1	3	25	114	2	3	284	1113
	H	1	3	14	72	10	38	0	1	0	2	0	0	0	1	0	0	0	0	0	0	0	0	25	117
16:45	L	1	9	111	425	80	350	58	176	10	40	7	20	3	12	1	5	1	2	22	109	2	5	296	1153
	H	0	2	10	69	7	36	3	4	1	3	0	0	0	1	0	0	0	0	0	0	0	0	21	115
17:00	L	7	14	121	437	89	343	36	173	7	36	5	19	0	10	1	6	1	3	28	107	1	6	296	1154
	H	0	1	4	47	9	34	1	4	0	2	0	0	0	1	0	0	0	0	0	0	0	0	14	89
17:15	L	4	15	123	469	76	326	57	192	8	35	7	21	4	11	1	4	3	6	27	102	3	8	313	1189
	H	0	1	8	36	8	34	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	16	76
17:30	L	6	18	115	470	77	322	41	192	10	35	9	28	3	10	2	5	0	5	27	104	3	9	293	1198
	H	0	0	4	26	9	33	1	5	2	3	0	0	0	0	0	0	0	0	0	0	0	0	16	67
17:45	L	4	21	107	466	69	311	44	178	10	35	3	24	1	8	1	5	1	5	22	104	3	10	265	1167
	H	0	0	8	24	5	31	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	13	59
18:00	L	0	14	1	346	0	222	1	143	0	28	1	20	0	8	0	4	1	5	1	77	0	9	5	876
	H	0	0	3	23	5	27	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	8	53
TOTALS	L	49	1157		854		456		87		62		24		14		10		313		22			
	H	3	131		105		7		7		0		1		1		1		2		1			
																						TOTAL	3307	

Total Light Vehicles = 3048
Total Heavy Vehicles = 259

Vehicle Totals 3307



AM		1		2		3		4		5		6		7		F1		F2		F3		F4		F5		PEDS 1/4	PEDS HR	VEHICLE TOTALS 1/4	VEHICLE TOTALS HR
			HR		HR		HR		HR		HR		HR		HR		HR		HR		HR		HR		HR				
07:15	L	34		72		6		7		59		67		6		0		0		0		0		0		6		245	
	H	7		21		1		1		1		12		6		0		0		0		0		0				43	
07:30	L	40		83		5		8		101		60		8		0		0		0		0		0		8		297	
	H	3		10		0		2		1		15		2		0		0		0		0		0				31	
07:45	L	34		95		3		10		120		94		13		0		0		0		0		0		13		356	
	H	9		16		1		0		6		21		5		0		0		0		0		0				53	
08:00	L	39	146	108	358	0	14	7	32	126	406	88	309	11	38	0	0	0	0	0	0	0	0	0	0	11	38	367	1303
	H	5	24	13	60	1	3	3	6	5	13	18	66	3	16	0	0	0	0	0	0	0	0	0	0			45	188
08:15	L	35	147	109	395	3	11	13	38	123	470	80	322	9	41	0	0	0	0	0	0	0	0	0	0	9	41	363	1424
	H	2	19	15	54	15	17	1	6	2	14	11	65	5	15	0	0	0	0	0	0	0	0	0	0			46	175
08:30	L	44	151	127	439	15	21	15	45	107	476	75	337	12	45	0	0	0	0	0	0	0	0	0	0	12	45	383	1514
	H	8	24	20	64	1	18	1	5	0	13	19	69	1	14	0	0	0	0	0	0	0	0	0	0			49	193
08:45	L	38	155	103	447	18	36	27	62	132	488	103	346	15	47	0	0	0	0	0	0	0	0	0	0	15	47	421	1581
	H	4	19	18	66	2	19	0	5	5	12	16	64	2	11	0	0	0	0	0	0	0	0	0	0			45	185
09:00	L	37	154	87	426	19	55	8	63	113	475	99	357	5	41	0	0	0	0	0	0	0	0	0	0	5	41	363	1571
	H	6	20	8	61	2	20	2	4	6	13	7	53	3	11	0	0	0	0	0	0	0	0	0	0			31	182
Total	L	300		784		69		95		881		666		79		0		0		0		0		0					
	H	44		121		23		10		26		119		27		0		0		0		0		0					

All Vehicles

Pedestrians

Total Light Vehicles = 2874 Vehicle Totals 3244
Total Heavy Vehicles = 370 Pedestrians Totals 0

L = Children H = Adults

VEHICLE & PEDESTRIAN COUNT

PEAK HOUR ENDING >>>

Location: Main Rd and Northville Drive

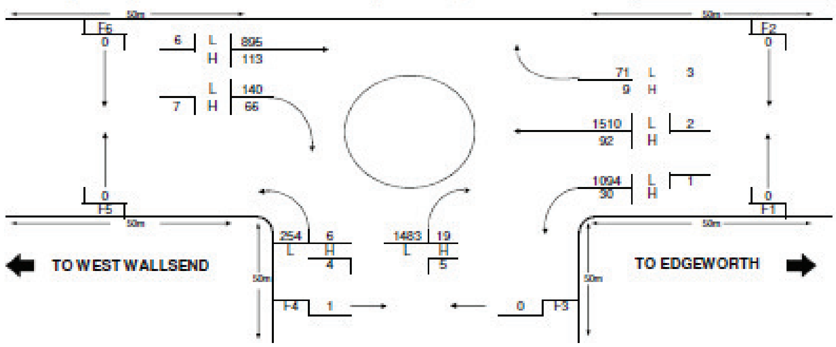
Town: Estelville

Duration: 15:00 - 18:00

Day / Date: Thursday 15th May 2008

Processed By Sarah Wright

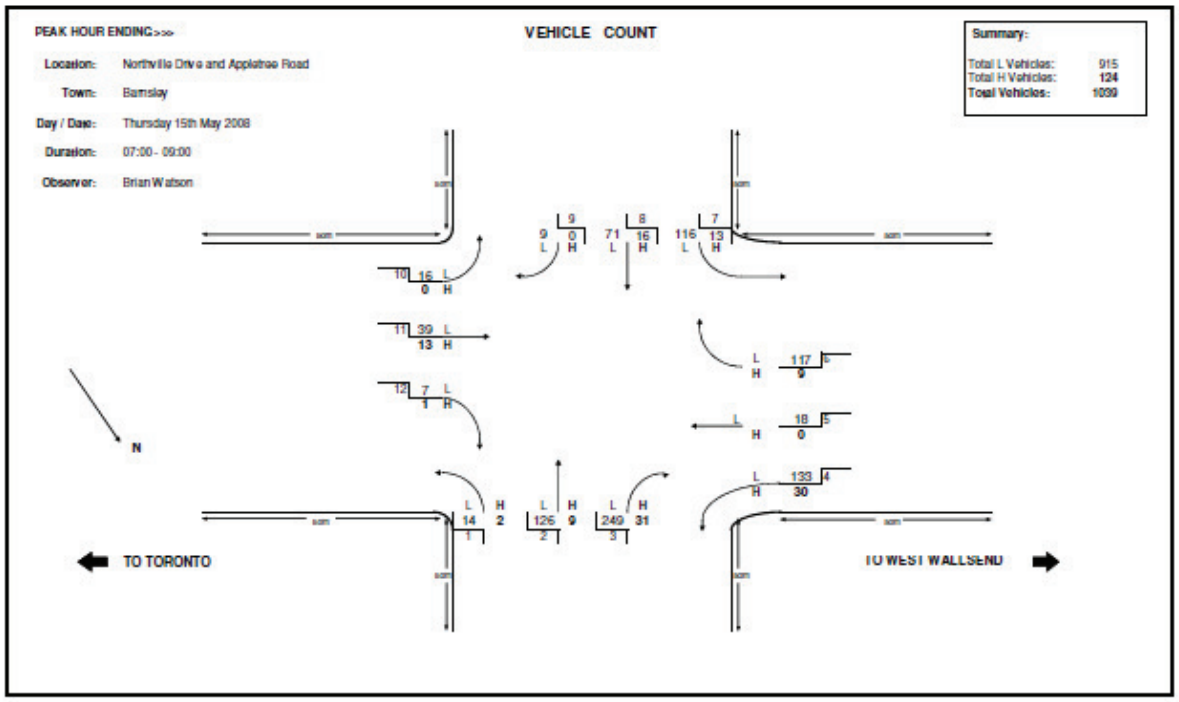
Summary:	
PM Light Vehicles	5447
PM Heavy Vehicles	335
Total Vehicles:	5782
Total Pedestrians:	1



PM		All Vehicles 1	HR	2	HR	3	HR	4	HR	5	HR	6	HR	7	HR	Pedestrians F1	HR	F2	HR	F3	HR	F4	HR	F5	HR	PEDS 1/4	PEDS HR	VEHICLE TOTALS 1/4	VEHICLE TOTALS HR
15:00	L	83		156		18		19		120		67		14		0		0		0		0		0		0			
	H	0		0		0		0		0		0		0		0		0		0		0		0		0			
15:15	L	84		92		1		15		110		75		20		0		0		0		0		0		0		397	
	H	1		13		2		2		2		11		1		0		0		0		0		0		0		32	
15:30	L	88		114		2		19		102		73		7		0		0		0		0		0		0		405	
	H	4		14		4		0		0		17		4		0		0		0		1		0		1		43	
15:45	L	88		137		4		27		107		76		6		0		0		0		0		0		0		445	
	H	3		5		0		0		2		7		1		0		0		0		0		0		0		18	
16:00	L	96	356	145	488	6	13	22	83	141	460	65	289	13	46	0	0	0	0	0	0	0	0	0	0	0	0	488	1735
	H	1	9	13	45	1	7	1	3	6	10	9	44	4	10	0	0	0	0	0	0	0	1	0	0	0	1	35	128
16:15	L	95	367	116	512	2	14	22	90	109	459	65	279	14	40	0	0	0	0	0	0	0	0	0	0	0	0	423	1761
	H	7	15	11	43	0	5	0	1	1	9	15	48	2	11	0	0	0	0	0	0	0	1	0	0	0	1	36	132
16:30	L	107	386	100	498	6	18	27	98	143	500	79	285	14	47	0	0	0	0	0	0	0	0	0	0	0	0	476	1832
	H	2	13	0	29	0	1	0	1	1	10	5	36	5	12	0	0	0	0	0	0	0	0	0	0	0	0	13	102
16:45	L	115	413	140	501	6	20	21	92	135	528	91	300	11	52	0	0	0	0	0	0	0	0	0	0	0	0	519	1906
	H	5	15	1	25	1	2	2	3	3	11	10	39	10	21	0	0	0	0	0	0	0	0	0	0	0	0	32	116
17:00	L	85	402	115	471	3	17	27	97	138	525	74	309	15	54	0	0	0	0	0	0	0	0	0	0	0	0	457	1875
	H	1	15	9	21	0	1	0	2	2	7	13	43	13	30	0	0	0	0	0	0	0	0	0	0	0	0	38	119
17:15	L	83	390	138	493	10	25	20	95	135	551	71	315	6	46	0	0	0	0	0	0	0	0	0	0	0	0	463	1915
	H	4	12	8	18	0	1	0	2	0	6	10	38	10	38	0	0	0	0	0	0	0	0	0	0	0	0	32	115
17:30	L	82	365	120	513	4	23	19	87	125	533	74	310	10	42	0	0	0	0	0	0	0	0	0	0	0	0	434	1973
	H	0	10	6	24	1	2	1	3	1	6	8	41	8	41	0	0	0	0	0	0	0	0	0	0	0	0	25	127
17:45	L	82	332	125	498	9	26	15	81	109	507	79	298	9	40	0	0	0	0	0	0	0	0	0	0	0	0	428	1782
	H	1	6	4	27	0	1	0	1	0	3	3	34	3	34	0	0	0	0	0	0	0	0	0	0	0	0	11	106
18:00	L	6	253	12	395	0	23	1	55	9	378	6	230	1	26	0	0	0	0	0	0	0	0	0	0	0	0	35	1360
	H	1	6	8	26	0	1	0	1	1	2	5	26	5	26	0	0	0	0	0	0	0	0	0	0	0	0	20	88
Total	**L**	**1094**		**1510**		**71**		**254**		**1483**		**895**		**140**		**0**		**0**		**0**		**0**		**0**		**0**			
	H	**30**		**92**		**9**		**6**		**19**		**113**		**66**		**0**		**0**		**0**		**1**		**0**		**1**			

Total Light Vehicles =	**5447**	**Vehicle**	**Totals**	**5782**
Total Heavy Vehicles =	**335**	**Pedestrians**	**Totals**	**1**

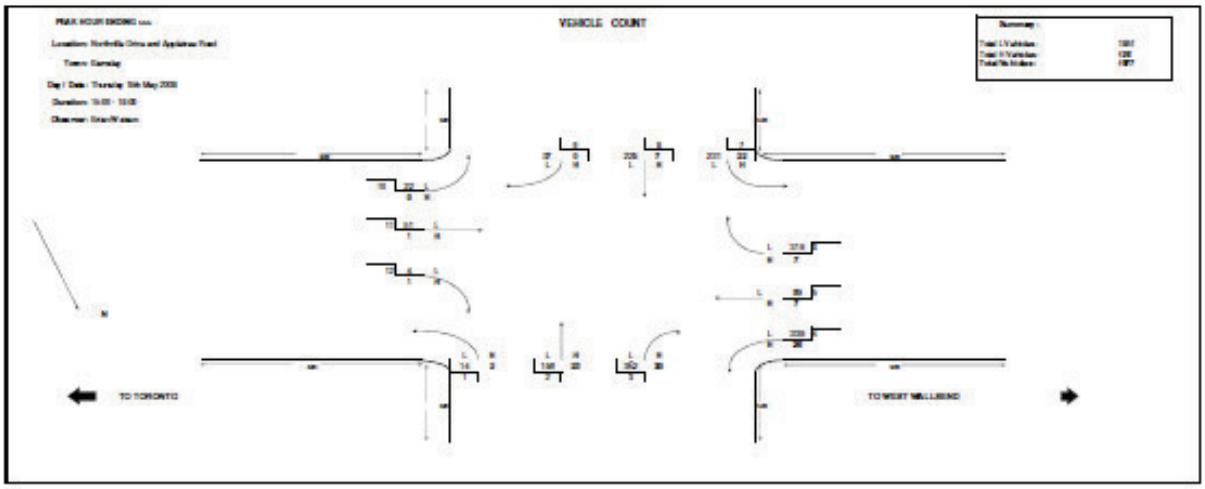
L = Childern **H = Adults**



ALL VEHICLES

	AM	1 AM	HR	2 AM	HR	3 AM	HR	4 AM	HR	5 AM	HR	6 AM	HR	7 PM	HR	8 PM	HR	9 PM	HR	10 PM	HR	11 PM	HR	12 PM	HR	VEHICLE TOTALS 15min	HR
7:15	L	7		4		28		15		2		5		15		7		1		0		5		1		90	
	H	1		1		0		5		0		1		0		1		0		0		11		0		20	
7:30	L	2		16		22		23		7		9		6		3		0		2		6		2		98	
	H	0		1		4		2		0		1		0		1		0		0		0		0		9	
7:45	L	0		13		32		14		1		10		5		13		1		2		4		1		96	
	H	0		0		2		10		0		0		0		0		0		0		0		0		12	
8:00	L	0	9	21	54	34	116	18	70	2	12	8	32	11	37	7	30	1	3	1	5	0	15	0	4	103	387
	H	0	1	2	4	7	13	4	21	0	0	0	2	11	11	11	13	0	0	0	0	11	0	0		35	76
8:15	L	3	5	16	66	39	127	19	74	0	10	14	41	16	38	4	27	0	2	2	7	4	14	1	4	118	415
	H	0	0	0	3	1	14	3	19	0	0	1	2	1	12	0	12	0	0	0	0	0	0	0	0	6	62
8:30	L	0	3	20	70	27	132	15	66	2	5	25	57	16	48	15	39	2	4	1	6	9	17	1	3	133	450
	H	1	1	2	4	5	15	4	21	0	0	2	3	0	12	1	12	0	0	0	0	1	1	0	0	16	69
8:45	L	0	3	22	79	40	140	18	70	1	5	23	70	24	67	11	37	1	4	4	8	4	17	1	3	149	503
	H	0	1	1	5	6	19	1	12	0	0	1	4	1	13	1	13	0	0	0	0	1	2	1	1	13	70
9:00	L	2	5	14	72	27	133	11	63	3	6	23	85	23	79	11	41	3	6	4	11	7	24	0	3	128	528
	H	0	1	2	5	6	18	1	9	0	0	3	7	0	2	1	3	0	0	0	0	0	2	0	1	13	48
TOTALS	L	14		126		249		133		18		117		116		71		9		16		39		7			
	H	2		9		31		30		0		9		13		16		0		0		13		1			
																									TOTAL	1039	

Total Light Vehicles = # 915 Vehicle Totals 1039
Total Heavy Vehicles = 0 124



PM	1	HR	2	HR	3	HR	4	HR	5	HR	6	HR	7	HR	8	HR	9	HR	10	HR	11	HR	12	HR	VEHICLE TOTALS	HR
15:00	L	0		4		24		26		6		18		36		15		7		2		6		0		132	
	H	0		1		2		1		1		0		2		0		0		0		0		0		7	
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15:45	L	0		15		31		26		4		19		30		20		0		1		1		0		136	
	H	0		3		4		8		1		1		17		0		0		0		0		0		38	
16:00	L	1	1	24	84	34	119	31	118	10	33	33	103	3	57	17	73	7	18	2	5	3	12	0	1	172	503
	H	0	0	2	8	8	14	1	10	0	3	6	3	0	28	1	1	0	0	0	0	0	0	1	0	12	37
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	H	1	1	3	7	2	14	0	10	0	0	1	4	0	15	2	3	0	0	0	0	0	0	0	1	17	57
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	H	0	1	2	9	3	17	2	13	0	4	1	3	0	17	2	6	0	0	0	0	0	0	0	0	10	69
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	H	0	1	0	13	2	16	0	7	0	1	0	1	1	3	0	4	0	0	0	0	1	1	0	0	4	60
17:30	L	0	8	13	68	29	124	15	110	9	30	24	119	17	62	20	74	4	10	2	10	3	23	0	0	135	539
	H	0	1	1	12	3	16	1	6	0	1	2	2	0	3	0	3	0	0	0	0	1	0	0	0	7	57
17:45	L	2	6	12	65	34	139	22	98	5	33	22	114	20	76	27	78	0	9	2	11	2	18	1	1	148	524
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	H	0	0	0	2	0	6	1	4	0	0	0	2	0	1	0	0	0	0	0	0	0	1	0	0	1	16
TOTALS	L	14		199		502		399		99		378		331		226		37		23		61		4			
	H	3		22		30		26		7		7		2		7		0		0		1		1		TOTAL	1877

Appendix J

Brown Consulting Modelling Report

Job No: X08116

18 June 2010

RTA Newcastle
59 Darby St
Newcastle 2300

Attention: Mr. David Young

Dear David,

RE: SIDRA analysis of George Booth Drive / Portland Drive

This report has been prepared on behalf of Roche Group to present the findings of traffic investigations to determine a suitable configuration of the proposed George Booth Drive and Portland Drive signalised intersection to provide access to a new shopping centre and residential land release.

Background

A T-intersection configuration to provide access to the proposed shopping centre has been previously approved by the RTA and has been subject to an agreed Works Authorisation Deed (WAD). It is now proposed to construct a four – way intersection to provide access to a future identified land release area south of the intersection. The development application for the shopping centre and connecting roads has now been approved by Council. A copy of the DA plans which show the proposed road connection from George Booth Drive and the roundabout which would provide access into the main car park is provided in **Appendix A** of this report.

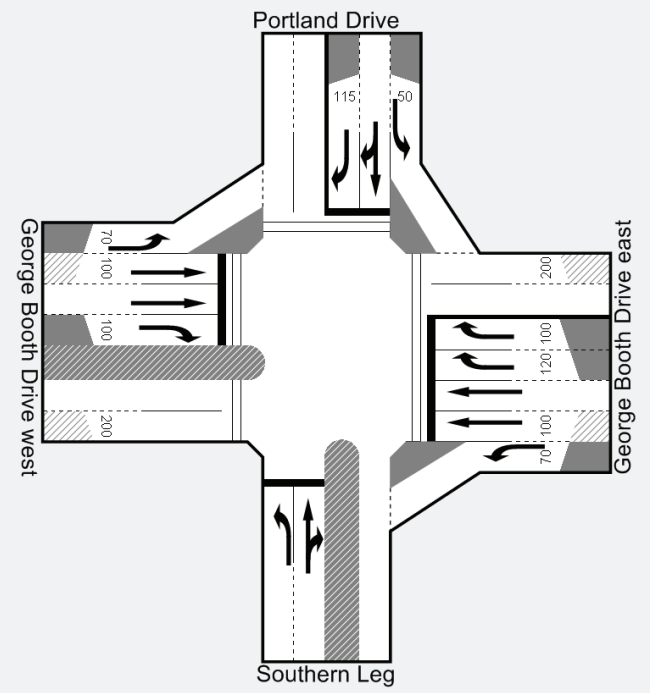
Better Transport Futures (BTF) was commissioned by Roche Group to undertake SIDRA modelling of a four (4) way intersection configuration at the location. This analysis included an assessment of AM and PM peak operating conditions for two potential development scenarios of lands which would be serviced by the southern leg of the intersection. These scenarios included a potential yield of both 400 and 750 lots. It should be noted that BTF prepared a Paramics model of the area and included in their modelling background growth to adequately assess future operating conditions at full development of both the shopping centre and the residential land release to the south of the intersection. A report and recommended intersection configuration was submitted to the RTA for their consideration. At the time, the modelling assumed three (3) phases operating at the intersection with filter right turns from the northern and south legs of the intersection.

The RTA reviewed this modelling and in their dated 1st of March 2010 proposed a modified intersection configuration to that which was recommended in the work undertaken by BTF. In addition, the letter indicated an assumed lot yield of 350 lots.

Brown Consulting (NSW) Pty Ltd
Engineers & Managers ABN 30 109 434 513
Telephone 02 8808 5000 Facsimile 02 8808 5099
Level 2, 2 Burbank Place, Norwest Business Park, PO Box 8300 Baulkham Hills BC NSW 2153
E-mail sydney@brownconsulting.com.au **Website** www.brownconsulting.com.au

It is acknowledged that BTF were not requested to assume a four (4) phase intersection as part of their work and the RTA imposed this minimum requirement following assessment of the modelling prepared by BTF. On a separate matter, as there is the potential to provide more than 350 lots, there was concern that the RTA design was bound to a maximum yield of 350 lots and would have to be revisited should additional lots be proposed. **Figure 1** shows the intersection layout recommended by the RTA.

Figure 1 - RTA Recommended Intersection Configuration



From **Figure 1** it was noted the RTA layout included shared right turn / through lanes on both the southern and northern legs of the intersection.

Building upon the modelling work undertaken by BTF, Brown Consulting NSW reviewed the RTA intersection configuration shown in **Figure 1** using the same forecast volumes which were estimated in the BTF SIDRA models (400 lots & 750 lots development yield scenarios). This analysis indicated that under the 750 lot scenario for the AM peak period, the intersection would operate at a Level of Service F.

This report summarises the findings of a SIDRA analysis to determine an appropriate intersection configuration for approval by the RTA which accommodates up to 750 residential lots in lands to the south of the intersection so concept design and detailed engineering design drawings can be prepared.

Traffic Flows

As the work undertaken by BTF included Paramics modelling of the area and forecast background traffic growth in George Booth Drive well into the future, the same volumes estimated by BTF were adopted for this SIDRA analysis.

The BTF analysis allowed for 12 year background growth, in accordance with standard RTA requirements. A growth rate of 2.5% over 12 years was adopted, again providing a worst case scenario as it is considered that the Pambulong development will be the major driver in terms of traffic growth along George Booth Drive in this locality. Allowing for the development traffic plus 2.5% growth effectively allows for some double dipping.[1]

Table 1 and **Table 2** below summarise the traffic flows estimated by BTFF and adopted in this SIDRA analysis.

Table 1 - Directional Flows - 400 Lot Scenario

Movement		Morning Peak	Evening Peak
George Booth Drive EAST	Through	420	420
	Right Turn	560	560
	Left Turn	27	184
George Booth Drive WEST	Through	323	323
	Right Turn	20	81
	Left Turn	374	374
Portland Drive	Through	3	0
	Right Turn	57	57
	Left Turn	140	140
Southern Leg	Through	14	3
	Right Turn	183	27
	Left Turn	81	20

Table 2- Direction Flows - 750 Lot Scenario

Movement		Morning Peak	Evening Peak
George Booth Drive EAST	Through	420	420
	Right Turn	560	560
	Left Turn	50	343
George Booth Drive WEST	Through	323	323
	Right Turn	36	151
	Left Turn	374	374
Portland Drive	Through	5	26
	Right Turn	57	57
	Left Turn	140	140
Southern Leg	Through	26	5
	Right Turn	343	51
	Left Turn	150	37

It should be noted that the PM peak traffic generated by the shopping centre has been used in both the AM and PM peak models to provide a conservative estimate of future intersection operating conditions. That is, whilst it is expected the AM weekday peak hour traffic generation of the shopping centre would be far lower than the PM peak, the PM flows have been used in the AM models. This is the same approach adopted by BTF in their assessment of the intersection.

[1] Source: Better Transport future report on SIDRA analysis

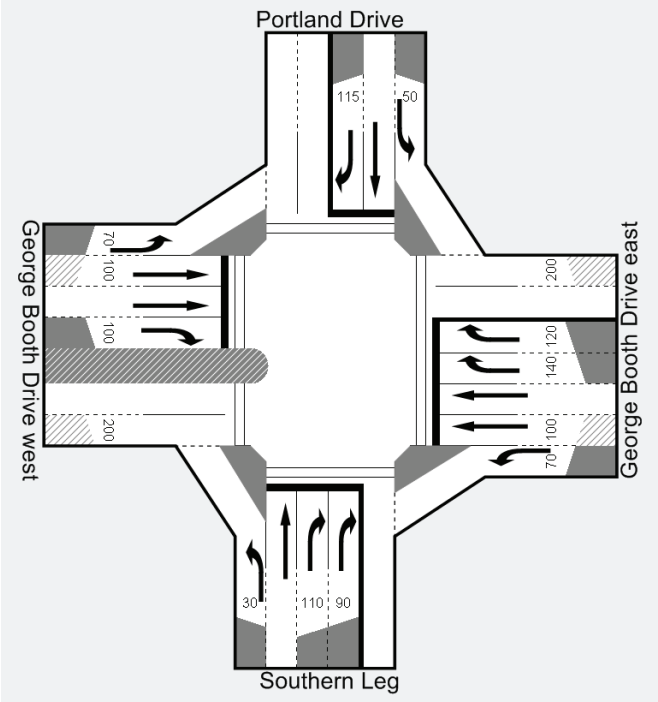
Assumed Phasing

As requested we have adopted a double diamond phasing of the intersection with no filter turns on any leg of the intersection. It should also be noted that the BTF modelling assumed a cycle time of 90 seconds. Whilst not specifically imposed, the SIDRA modelling undertaken as part of this exercise assumed a cycle time range of between 100 and 140 seconds and allowed SIDRA to determine the most efficient cycle time. The application of this range is standard practice at Brown Consulting NSW.

Adopted Intersection Configuration

Having regard to the above traffic flow and phasing assumptions, **Figure 2** shows the recommended resultant configuration which was found to operate at a satisfactory level of service for both peak periods for both the 400 lot and 750 lot scenarios.

Figure 2 - Recommended Intersection Configuration



From **Figure 2** it can be seen that the differences to that which was suggested by the RTA in their letter dated 1 March 2010 include:

1. No shared through / right turn lanes on either the northern or southern legs of the intersection;
2. Double right turn lane and a left turn slip lane from the southern leg of the intersection;
3. Single right turn lane from the northern leg of the intersection;
4. Increase of 20m in storage capacity of both the right turn lanes from George Booth Drive into the shopping centre; and
5. Pedestrian crossing phasing's on all legs of the intersection.

The 115m long right turn bay from the northern leg of the intersection represents the available storage capacity which could be created between the signalised intersection and the proposed roundabout shown in **Appendix A** which would service the shopping centre car park.

Modelling Results

Table 3 below summarises the resultant AM and PM peak period intersection operating conditions of the recommended intersection configuration shown in **Figure 2** for both the 400 and 750 lot scenarios.

Table 3- George Booth Drive Future Intersection Performance – Diamond Phasing

Lot Yield	AM Peak		PM Peak	
	Avg Delay (secs)	LOS	Avg Delay (secs)	LOS
400 Lots	34.7	C	31.1	C
750 Lots	37.1	C	30.2	C

From **Table 3** it can be seen that the intersection configuration shown in **Figure 2** would operate at a satisfactory level of service during the AM and PM peak periods for both development yield scenarios well into the future.

95% Percentile Back of Queue

A summary of the 95th percentile back of queue distance for each right turn and left turn bay of each leg of the intersection is summarised in **Table 4** below:

Table 4 - 95th Percentile Queue Distances

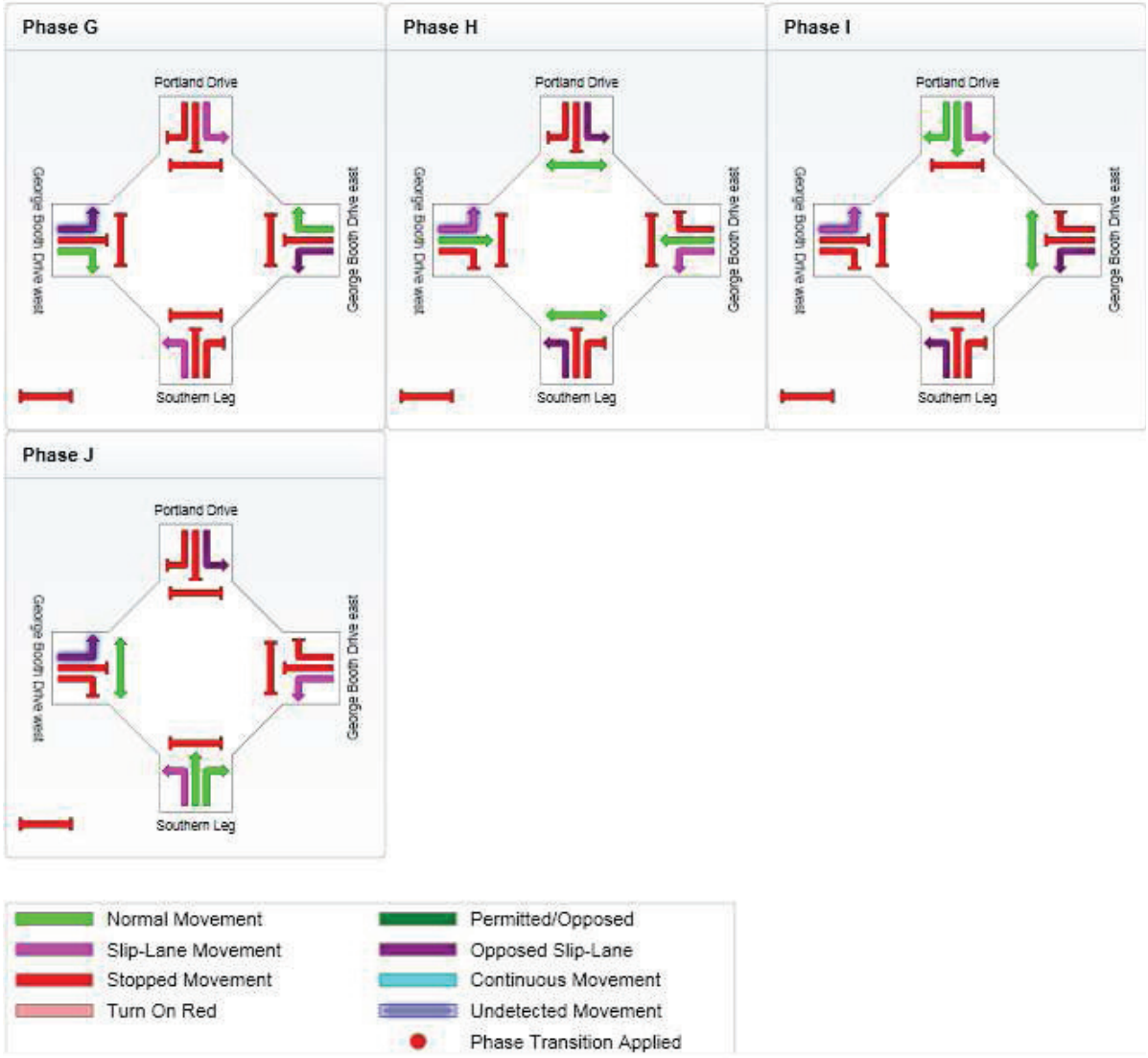
		400 Lots		750 Lots	
Movement		**Morning Peak**	**Evening Peak**	**Morning Peak**	**Evening Peak**
George Booth Drive EAST	Right Turn	109	106	116	106
	Left Turn	1	11	2	34
George Booth Drive WEST	Right Turn	9	33	17	59
	Left Turn	55	53	56	53
Portland Drive	Right Turn	31	33	29	33
	Left Turn	18	14	22	15
Southern Leg	Right Turn	48	8	81	15
	Left Turn	11	3	21	5

From **Table 4** it can be seen that the proposed right turn and left turn bay lengths would accommodate the potential 95th percentile back of queue for both development yield scenarios.

Sensitivity Test

To ascertain the flexibility in the potential future phasing of the intersection, a sensitivity test assuming split phasing on the side roads was undertaken. The adopted four (4) phase arrangement is shown in **Figure 3**.

Figure 3 – Assumed Side Road Split Phasing



The resultant intersection performance of the above phasing is provided in **Table 5**.

Table 5- George Booth Drive Future Intersection Performance – Side Road Split Phasing

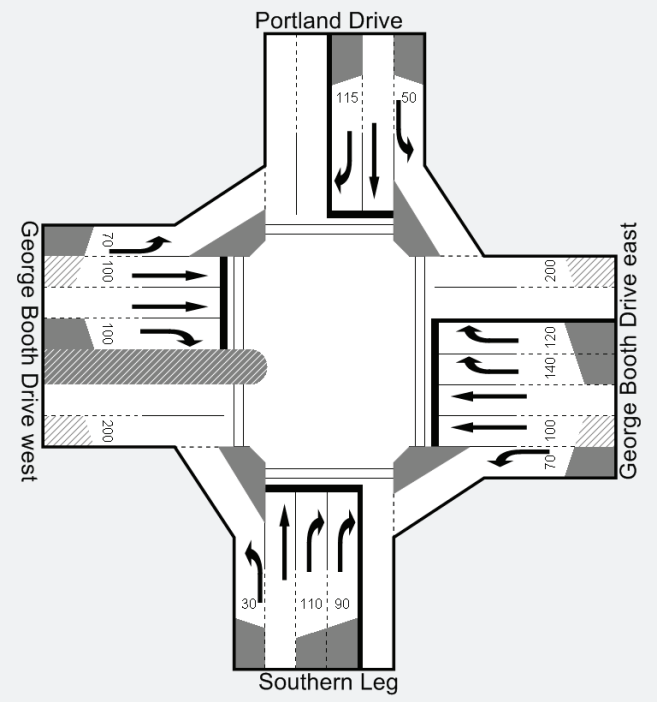
Lot Yield	AM Peak		PM Peak	
	Avg Delay (secs)	LOS	Avg Delay (secs)	LOS
400 Lots	37.5	C	35.3	C
750 Lots	37.9	C	34.1	C

Avg Delay (sec/veh) is over all movements at signals, and for worst movement at priority and roundabouts

From **Table 5** it can be seen that if split phasing was assumed for the northern and southern legs of the intersection, the intersection would still operate at a satisfactory level of service in the future for either potential development scenario.

Conclusion

This report has analysed a potential intersection configuration for the intersection of George Booth Drive and Portland Drive, Pambulong. To provide adequate capacity for development of up to 750 lots on the lands which the southern leg of the intersection would serve, we recommend the following intersection configuration.



This above intersection configuration would operate at a satisfactory level of service in the future for both the AM and PM peak periods for up a 750 residential lot development on the southern side of the intersection. This lot yield is expected to be greater than which would be achieved from the available land holdings. The 95th percentile queue of any right turn or left turn movements would be accommodated without impact on through volumes.

We trust the information presented above assists you in your assessment of the location. We have provided electronic copies of all SIDRA files for your review as part of our submission including both the original BTF files and our models.

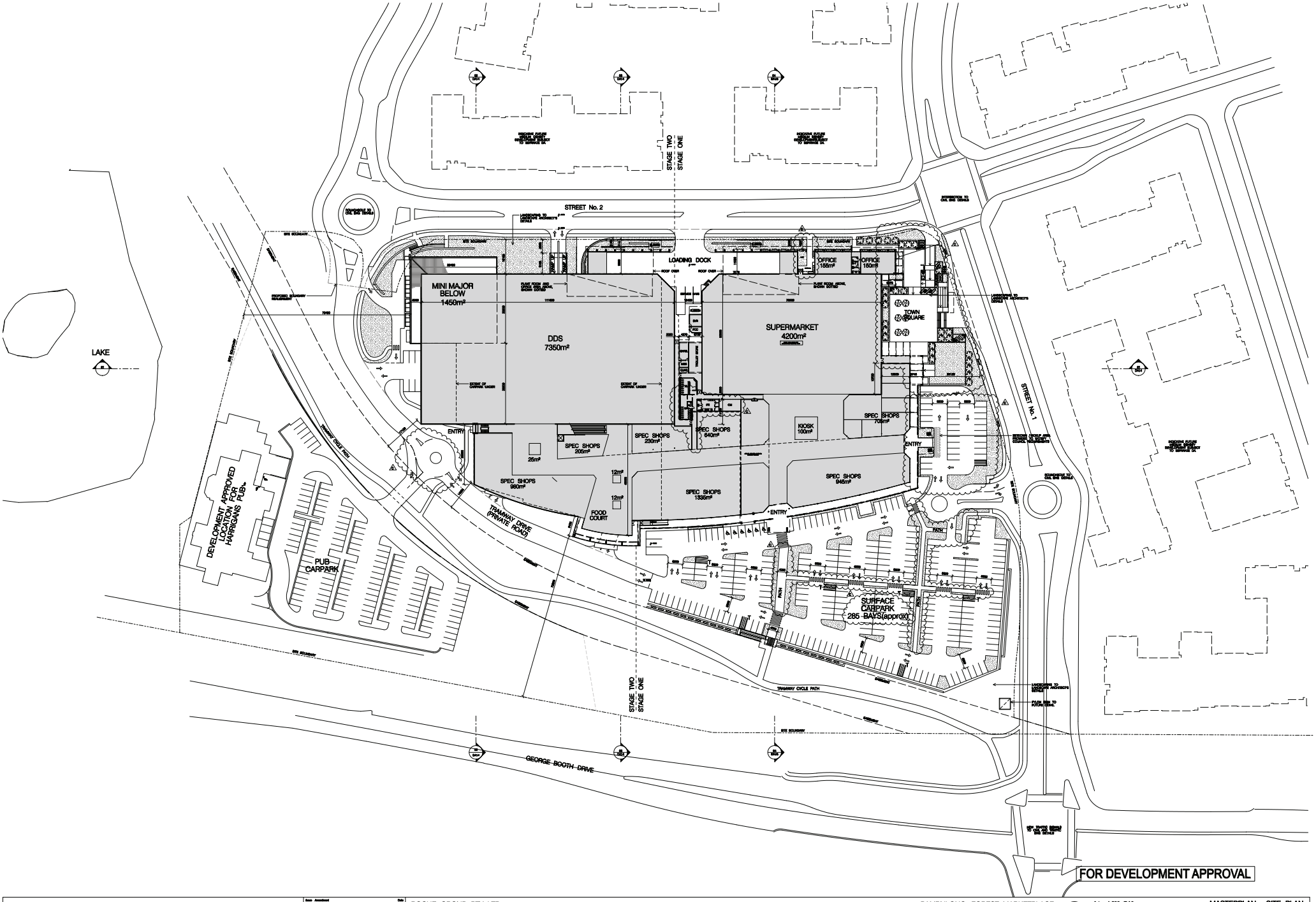
We look forward to discussing this matter with you in the near future and please contact me if you wish to discuss anything presented in this report.

Yours faithfully,

BROWN CONSULTING (NSW) PTY LTD

DEAN BRODIE
Manager - Roads & Traffic
Brown Consulting (NSW)

Appendix A – DA Approved Plan of Shopping Centre



SCOTTCARVER
ARCHITECTURE + URBAN DESIGN

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ROCHE GROUP PTY. LTD.

PAMBULONG FOREST MARKETPLACE
GEORGE BOOTH DRIVE
LOT 1000 AND LOT 1001 DP.1092795

MASTERPLAN - SITE PLAN

Scale 1:500 @A0
0 5 10 15 20 25 50m

Date Printed 9/09/2008

Project No. DA004

Issue C

Appendix K

Development Scenarios

6 April 2010

Simon Waterworth
Geolink
PO Box 1446
Coffs Harbour
NSW 2450

GeoLINK Received 12.04.10
Project 1062
☐ reviewed
☐ noted file-no action required
☑ action, as follows
scanned → SJW

Dear Simon

Subject: **Proposed Rezoning of Land at 2 Cologne Close and 40 Carinda Avenue Edgeworth, and Part of 23 and 25 Government Road Holmesville – Lot 107 DP 1000408, Lot 88 DP 755262, Lot 17 DP 849003, and Part of Lots 6 and 7 DP 4647**

Staff from Council's Integrated Planning (IP) Department have attended a series of meetings with the proponent and DECCW in relation to the abovementioned rezoning proposal. Items discussed at the meetings included: Masked Owl habitat, offset requirements, and development potential within the site. In relation to two of these matters, namely Masked Owl habitat and development potential, the IP Department is able to provide the following update.

Masked Owl Habitat

On 16 November 2009, the IP Department appointed Forest Fauna to undertake a study to establish the suitability and use of large hollows on the site for Large Forest Owls. Stage 1 of the Study, which examines trees in the northern portion of the site, is complete. Stage 2, which examines trees in the southern area, is incomplete. A copy of the Summary Report for Stage 1 is attached for your information.

The Masked Owl Stage 1 Summary Report concluded that the Masked Owl utilises two trees in the northern portion of the land for nesting and/or roosting. Tree number 13 was identified as a roost tree, whilst Tree number 46 is a nest and roost tree.

The IP Department will forward the finalised Study to Geolink in due course. Council officers are of the opinion that the Study should be considered by Geolink in the overall LES process, and that a 150 metre buffer is required around each nest and/or roost tree.

Development Potential

On 6 October 2009, the IP Department forwarded five development scenarios to Geolink for assessment. The IP Department requested that Geolink assess the merit of each of the development scenarios and consider alternatives, bearing in mind the results of the environmental studies that had been completed to date.

On 4 November 2009, Geolink provided their assessment of the five scenarios and offered two alternatives, namely Option A and Option B. In recent meetings with the proponent and

126-138 Main Road Speers Point NSW 2284 Box 1906, Hunter Region Mail Centre NSW 2310
Phone: 02 4921 0333 **Fax:** 02 4958 7257 **Email:** council@lakemac.nsw.gov.au **Website:** www.lakemac.com.au
ABN: 81 065 027 868

DECCW, Council officers referred to Geolink's options when discussing development potential within the land.

In a meeting held with the proponent and DECCW on 17 March 2010, three new development scenarios were tabled, as follows.

1. land on the attached map that is outlined in red;
2. land on the attached map that is outlined in black; and
3. an equivalent amount of land to that outlined in red, but may consist of any land within the black line.

The development scenarios listed above were formulated on the basis of:

- Geolink's alternative option, 'Option A'.
- Stage 1 of the Masked Owl Study; and
- discussions with the proponent and DECCW. To date, most of the development opportunities and constraints considered in the above discussions relate to the environmental issues raised in consultant reports. However, these issues cannot be considered in isolation of economic and social issues.

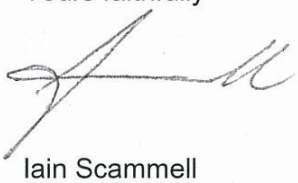
Council therefore requests that Geolink proceed with the LES, preparing an assessment that considers the relevant social, economic and environmental issues, as outlined in the project brief.

It is believed the above information will inform Geolink as to the environmental limitations of the site. However, Council's IP Department is keen to ensure that social and economic considerations are appropriately considered in recommending future land uses for the site. In determining the most appropriate land use zones within the site, Geolink should consider the merits of the three development scenarios listed above.

The IP Department requests that Geolink now proceed with the LES and in doing so, provide an updated timeframe for completion of the Study.

Should you require further information, please contact me on 4921 0470.

Yours faithfully



Iain Scammell
Strategic Planner
Integrated Planning Department

Plan of: Constraints Mapping
Lot 107 D.P.1000408

Location: George Booth Drive
West Wallsend

Council: Lake Macquarie

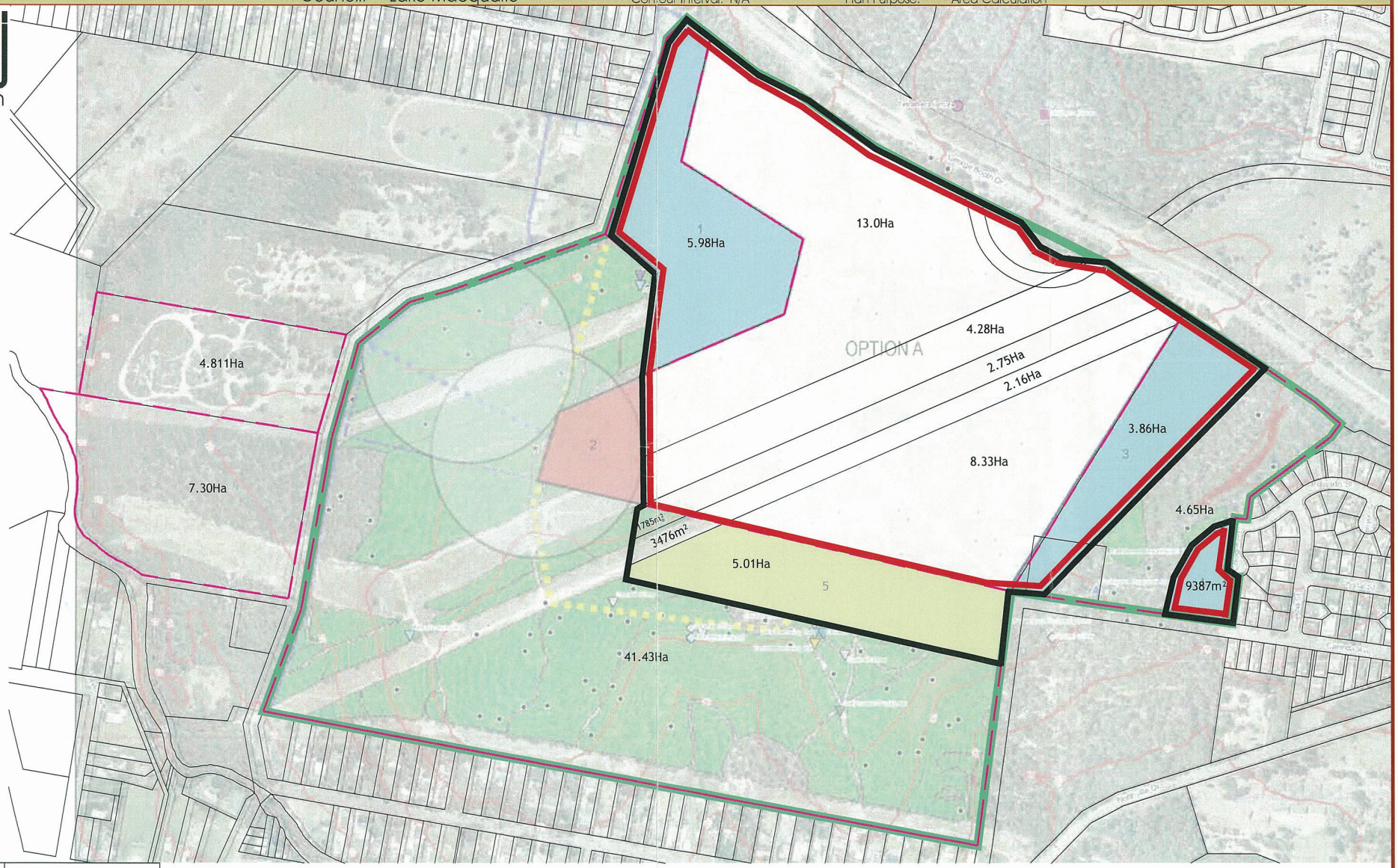
Datum:	N/A	Date:	1st December 2009
Origin:	N/A	Sheet:	1 of 1
Projection:	M.G.A. 56	Plan By:	MJH
Origin:	L.P.I. Data	Project Manager:	TC
North Direction:	Grid	Office:	Hunter
Contour Interval:	N/A	Plan Purpose:	Area Calculation

Version:	B (18/10/2010)
Client:	Hammersmith Management Pty. Ltd.
Survey:	N/A
AutoCAD:	Dwg\238300-LOT107-001-B
Our Ref:	238300

adw johnson

N

adw johnson



Ver.	Date	Comment
B	18/01/2010	Additional Area Calculations
A	01/12/2009	Constraints Mapping

Bar Scale 1: 2500 (A1), 1: 5000 (A3)

adw johnson pty. ltd. unit 7, building 2, 335 hillsborough road, warners bay 2282 ph: (02) 49785100 fax: (02) 49785199 hunter@adwjohnson.com.au abn 62 129 445 398

Plotted By: matthewh Plot Date: 20/01/10 - 09:35 Cad File: N:\238300\Dwg\238300-LOT107-001-B.dwg