APPENDIX A

WEST DAPTO ROAD – TRAFFIC COUNT DATA

CfeIT bob.white@cfeit.com (02) 9740 8600

Traffic Count Summary Report

Count Number	3190	Ref : 135/12	Lat/Long : S34 28 14.4 / E150 48 56.3 UBD 39 Q-7
Street	WEST DAPTO RD WEST DAPTO : Between PRINCES HWY & GRANGE ST (bidirectional) :		
Location	Just west of railway level crossing, ELP		*Carriageway*

Start Date	26-JUL-12
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	62
Weekly 85th Percentile Speed	74
Five Day AADT	4603
Seven Day AADT	4189

TOTAL COUNT MATRIX

	MON *30TH*	TUE *31ST*	WED *1ST*	THU *26TH*	FRI *27TH*	SAT *28TH*	SUN *29TH*	5 Day Total	5 Day Average	7 Day Total	7 Day Average
Midnight - 1am	7	14	18	12	11	14	30	62	12	106	15
1am - 2am	6	9	10	6	7	18	13	38	8	69	10
2am - 3am	10	9	7	11	5	12	10	42	8	64	9
3am - 4am	9	12	14	14	18	9	12	67	13	88	13
4am - 5am	22	24	27	24	20	12	14	117	23	143	20
5am - 6am	84	98	99	106	82	38	16	469	94	523	75
6am - 7am	204	221	228	235	243	76	43	1131	226	1250	179
7am - 8am	271	285	286	283	274	109	94	1399	280	1602	229
8am - 9am	392	367	349	363	343	190	121	1814	363	2125	304
9am - 10am	320	303	293	305	303	216	205	1524	305	1945	278
10am - 11am	325	339	251	262	313	363	274	1490	298	2127	304
11am - Midday	290	322	301	314	383	334	333	1610	322	2277	325
Midday - 1pm	292	346	297	334	432	386	322	1701	340	2409	344
1pm - 2pm	308	386	339	321	363	303	295	1717	343	2315	331
2pm - 3pm	369	409	368	318	384	340	246	1848	370	2434	348
3pm - 4pm	451	439	431	418	448	308	256	2187	437	2751	393
4pm - 5pm	353	364	351	306	361	216	183	1735	347	2134	305
5pm - 6pm	343	344	343	310	303	180	133	1643	329	1956	279
6pm - 7pm	151	185	168	175	162	99	86	841	168	1026	147
7pm - 8pm	101	125	94	96	85	70	44	501	100	615	88
8pm - 9pm	58	80	84	81	75	49	43	378	76	470	67
9pm - 10pm	56	63	70	83	80	48	45	352	70	445	64
10pm - 11pm	23	39	44	30	71	41	17	207	41	265	38
11pm - Midnight	27	29	30	23	32	27	18	141	28	186	27
Total	4472	4812	4502	4430	4798	3458	2853	23014	4602	29325	4189

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Traffic Count Summary Report

Count Number	3190	Ref : 135/12	Lat/Long : S34 28 14.4 / E150 48 56.3 UBD 39 Q-7
Street	WEST DAPTO RD WEST DAPTO : From PRINCES HWY to GRANGE ST : WEST BOUND		
Location	Just west of railway level crossing, ELP		*Carriageway*

Start Date	26-JUL-12
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	61
Weekly 85th Percentile Speed	74
Five Day AADT	2378
Seven Day AADT	2170

TOTAL COUNT MATRIX

	MON *30TH*	TUE *31ST*	WED *1ST*	THU *26TH*	FRI *27TH*	SAT *28TH*	SUN *29TH*	5 Day Total	5 Day Average	7 Day Total	7 Day Average
Midnight - 1am	6	9	7	10	8	12	22	40	8	74	11
1am - 2am	4	7	3	3	6	11	7	23	5	41	6
2am - 3am	5	5	5	6	1	5	7	22	4	34	5
3am - 4am	1	3	6	4	10	5	5	24	5	34	5
4am - 5am	5	7	6	5	5	4	5	28	6	37	5
5am - 6am	39	56	54	53	31	16	11	233	47	260	37
6am - 7am	105	102	119	133	130	47	22	589	118	658	94
7am - 8am	111	114	122	122	115	45	43	584	117	672	96
8am - 9am	139	126	107	134	108	76	57	614	123	747	107
9am - 10am	163	149	146	137	158	111	82	753	151	946	135
10am - 11am	151	184	138	137	159	191	158	769	154	1118	160
11am - Midday	147	180	154	150	231	190	167	862	172	1219	174
Midday - 1pm	170	138	143	168	180	221	153	799	160	1173	168
1pm - 2pm	162	222	180	172	206	149	157	942	188	1248	178
2pm - 3pm	158	166	172	149	184	178	129	829	166	1136	162
3pm - 4pm	232	228	218	203	246	142	146	1127	225	1415	202
4pm - 5pm	211	206	232	188	223	133	107	1060	212	1300	186
5pm - 6pm	236	232	226	211	193	93	63	1098	220	1254	179
6pm - 7pm	108	127	100	118	99	43	51	552	110	646	92
7pm - 8pm	65	60	69	67	42	29	23	303	61	355	51
8pm - 9pm	33	40	56	45	39	32	28	213	43	273	39
9pm - 10pm	42	47	47	52	49	30	24	237	47	291	42
10pm - 11pm	13	21	17	21	46	27	13	118	24	158	23
11pm - Midnight	11	16	16	10	20	17	11	73	15	101	14
Total	2317	2445	2343	2298	2489	1807	1491	11892	2378	15190	2170

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Traffic Count Summary Report

Count Number	3190	Ref : 135/12	Lat/Long : S34 28 14.4 / E150 48 56.3	UBD 39 Q-7
Street	WEST DAPTO RD WEST DAPTO : From GRANGE ST to PRINCES HWY : EAST BOUND			
Location	Just west of railway level crossing, ELP			Carriageway

TOTAL COUNT MATRIX

Start Date	26-JUL-12
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	62
Weekly 85th Percentile Speed	75
Five Day AADT	2224
Seven Day AADT	2019

	MON 30TH	TUE 31ST	WED 1ST	THU 26TH	FRI 27TH	SAT 28TH	SUN 29TH	5 Day Total	5 Day Average	7 Day Total	7 Day Average
Midnight - 1am	1	5	11	2	3	2	8	22	4	32	5
1am - 2am	2	2	7	3	1	7	6	15	3	28	4
2am - 3am	5	4	2	5	4	7	3	20	4	30	4
3am - 4am	8	9	8	10	8	4	7	43	9	54	8
4am - 5am	17	17	21	19	15	8	9	89	18	106	15
5am - 6am	45	42	45	53	51	22	5	236	47	263	38
6am - 7am	99	119	109	102	113	29	21	542	108	592	85
7am - 8am	160	171	164	161	159	64	51	815	163	930	133
8am - 9am	253	241	242	229	235	114	64	1200	240	1378	197
9am - 10am	157	154	147	168	145	105	123	771	154	999	143
10am - 11am	174	155	113	125	154	172	116	721	144	1009	144
11am - Midday	143	142	147	164	152	144	166	748	150	1058	151
Midday - 1pm	122	208	154	166	252	165	169	902	180	1236	177
1pm - 2pm	146	164	159	149	157	154	138	775	155	1067	152
2pm - 3pm	211	243	196	169	200	162	117	1019	204	1298	185
3pm - 4pm	219	211	213	215	202	166	110	1060	212	1336	191
4pm - 5pm	142	158	119	118	138	83	76	675	135	834	119
5pm - 6pm	107	112	117	99	110	87	70	545	109	702	100
6pm - 7pm	43	58	68	57	63	56	35	289	58	380	54
7pm - 8pm	36	65	25	29	43	41	21	198	40	260	37
8pm - 9pm	25	40	28	36	36	17	15	165	33	197	28
9pm - 10pm	14	16	23	31	31	18	21	115	23	154	22
10pm - 11pm	10	18	27	9	25	14	4	89	18	107	15
11pm - Midnight	16	13	14	13	12	10	7	68	14	85	12
Total	2155	2367	2159	2132	2309	1651	1362	11122	2224	14135	2019

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KFW

APPENDIX B

PROPOSED SITE LAYOUT KFW PLAN KF110816-C10/J

DO NOT SCALE

DRAINAGE NOTES

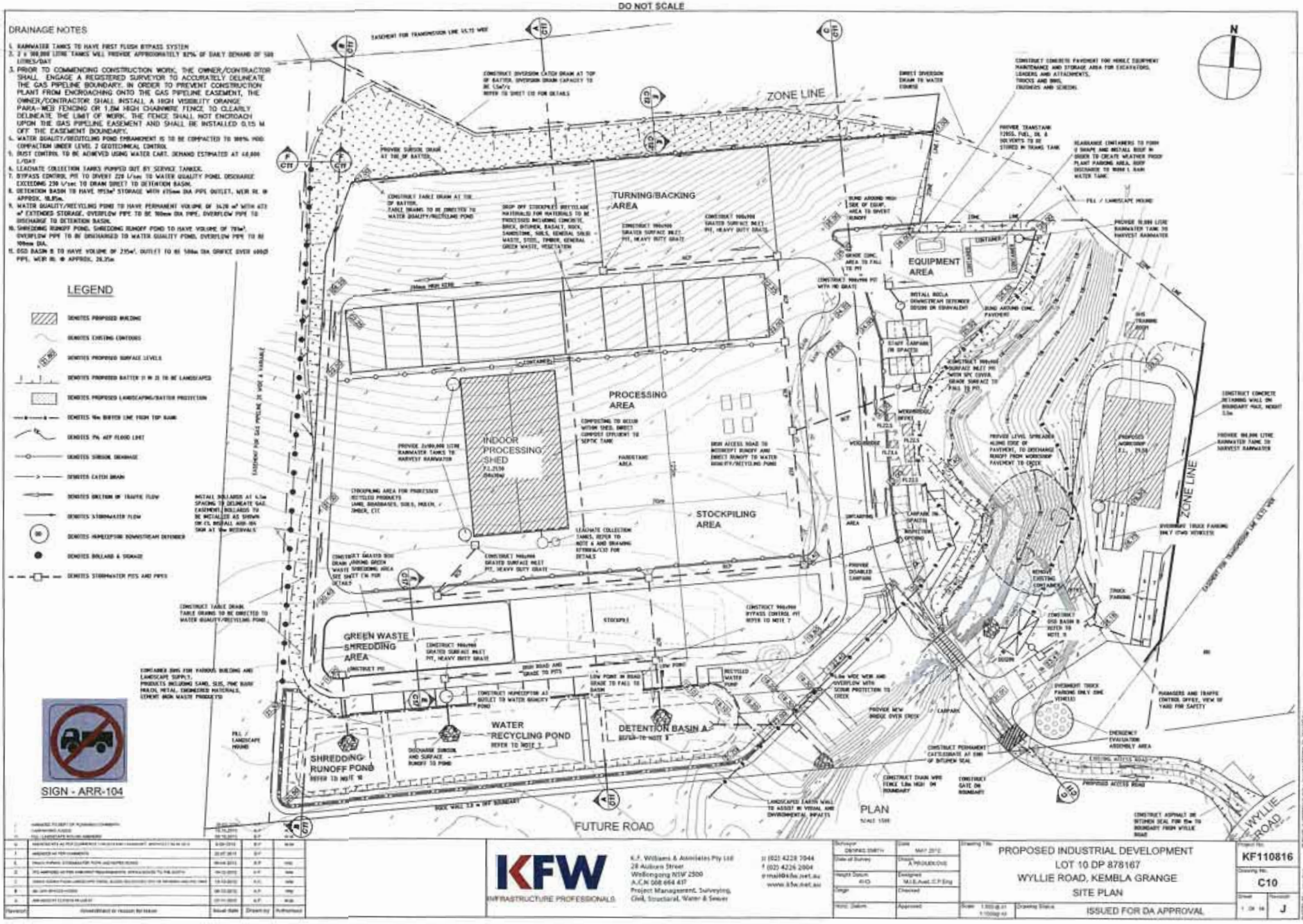
1. RAINWATER TANKS TO HAVE FIRST FLUSH BYPASS SYSTEM
2. 2 x 100,000 LITRE TANKS WILL PROVIDE APPROXIMATELY 82% OF DAILY DEMAND OF 500 LITRES/DAY
3. PRIOR TO COMMENCING CONSTRUCTION WORK, THE OWNER/CONTRACTOR SHALL ENGAGE A REGISTERED SURVEYOR TO ACCURATELY DELINEATE THE GAS PIPELINE BOUNDARY. IN ORDER TO PREVENT CONSTRUCTION PLANT FROM ENCROACHING ONTO THE GAS PIPELINE EASEMENT, THE OWNER/CONTRACTOR SHALL INSTALL A HIGH VISIBILITY ORANGE PARA-MESH FENCING OR 1.8M HIGH CHAINWIRE FENCE, TO CLEARLY DELINEATE THE LIMIT OF WORK. THE FENCE SHALL NOT ENCROACH UPON THE GAS PIPELINE EASEMENT AND SHALL BE INSTALLED 0.15 M OFF THE EASEMENT BOUNDARY.
4. WATER QUALITY/RECYCLING POND EMBANKMENT IS TO BE COMPACTED TO 98% MOD COMPACTION UNDER LEVEL 2 GEOTECHNICAL CONTROL
5. DUST CONTROL TO BE ACHIEVED USING WATER CART. DEMAND ESTIMATED AT 40,000 L/DAY
6. LEACHATE COLLECTION TANKS PUMPED OUT BY SERVICE TANKER.
7. BYPASS CONTROL PIT TO DIVERT 220 L/sec TO WATER QUALITY POND. DISCHARGE EXCEEDING 230 L/sec TO DRAIN DIRECT TO DETENTION BASIN.
8. DETENTION BASIN TO HAVE 1953m³ STORAGE WITH 675mm DIA PIPE OUTLET, WEIR RL @ APPROX. 18.85m.
9. WATER QUALITY/RECYCLING POND TO HAVE PERMANENT VOLUME OF 3620 m³ WITH 423 m³ EXTENDED STORAGE, OVERFLOW PIPE TO BE 760mm DIA PIPE, OVERFLOW PIPE TO DISCHARGE TO DETENTION BASIN.
10. SHREDDING RUNOFF POND. SHREDDING RUNOFF POND TO HAVE VOLUME OF 781m³. OVERFLOW PIPE TO BE DISCHARGED TO WATER QUALITY POND, OVERFLOW PIPE TO BE 900mm DIA.
11. OSD BASIN B TO HAVE VOLUME OF 235m³, OUTLET TO BE 500mm DIA ORIFICE OVER 600D PIPE, WEIR RL @ APPROX. 28.25m

LEGEND

- DENOTES PROPOSED BUILDING
- DENOTES EXISTING CONTOURS
- DENOTES PROPOSED SURFACE LEVELS
- DENOTES PROPOSED BATTER (1 IN 3) TO BE LANDSCAPED
- DENOTES PROPOSED LANDSCAPING/BATTER PROTECTION
- DENOTES 10m BUFFER LINE FROM TOP BANK
- DENOTES 1% AEP FLOOD LINE
- DENOTES SUBSOIL DRAINAGE
- DENOTES CATCH DRAIN
- DENOTES DIRECTION OF TRAFFIC FLOW
- DENOTES STORMWATER FLOW
- DENOTES HUMECEPTOR/DOWNSTREAM DEFENDER
- DENOTES BOLLARD & SIGNAGE
- DENOTES STORMWATER PITS AND PIPES

INSTALL BOLLARDS AT 4.5m SPACING TO DELINEATE GAS EASEMENT. BOLLARDS TO BE INSTALLED AS SHOWN ON CL BOLLARD ARR-104 SIGN AT the RECEIVALS

SIGN - ARR-104



Surveyor: DARRAG SMITH	Date: MAY 2012	Drawing Title: PROPOSED INDUSTRIAL DEVELOPMENT LOT 10 DP 878167 WYLLIE ROAD, KEMBLA GRANGE SITE PLAN	Project No: KF110816
Date of Survey:	Drawn: A.PROUDLOVE		Drawing No: C10
Height Datum: AHD	Designed: M.E.B.Aust. C.P.Eng		Sheet: 1 OF 14
Origin:	Checked:		Revision: J
Horiz. Datum:	Approved:	Scale: 1:500 @ A1 1:1000@ A3	Drawing Status: ISSUED FOR DA APPROVAL

Rev	Description	Issue date	Drawn by	Authorised
J	AMENDED AS PER COMMENTS	8.08.2013	B.P.	M.M.
I	AMENDED AS PER COMMENTS	22.07.2013	B.P.	
H	TRUCK PARKING, STORMWATER FLOW, AND NOTES ADDED	18.06.2013	B.P.	M.M.
G	PIT, AMENDED WATER MANAGEMENT, APPROACH ROAD TO THE SOUTH	04.03.2013	B.P.	M.M.
F	ADDED SURFACE LEVELS, LANDSCAPING, TRUCK, BUILDING DIMENSIONS ON THE NORTHERN AND PIT AREA	13.12.2012	B.P.	M.M.
E	AS AMENDED	08.10.2012	B.P.	M.M.
D	AMENDED AS PER COMMENTS	27.11.2012	B.P.	M.M.

KFW INFRASTRUCTURE PROFESSIONALS

K.F. Williams & Associates Pty Ltd
28 Aubrey Street
Wollongong NSW 2500
A.C.N. 008 694 417
Project Management, Surveying, Civil, Structural, Water & Sewer

t (02) 4228 7044
f (02) 4226 2004
e mail@kfw.net.au
www.kfw.net.au

KFW

APPENDIX C

WCC DCP2009 – D16 PLAN OF FUTURE ROAD NETWORK & ~~PREDICTED TRAFFIC VOLUMES~~

Figure 6.7 Proposed Road Network

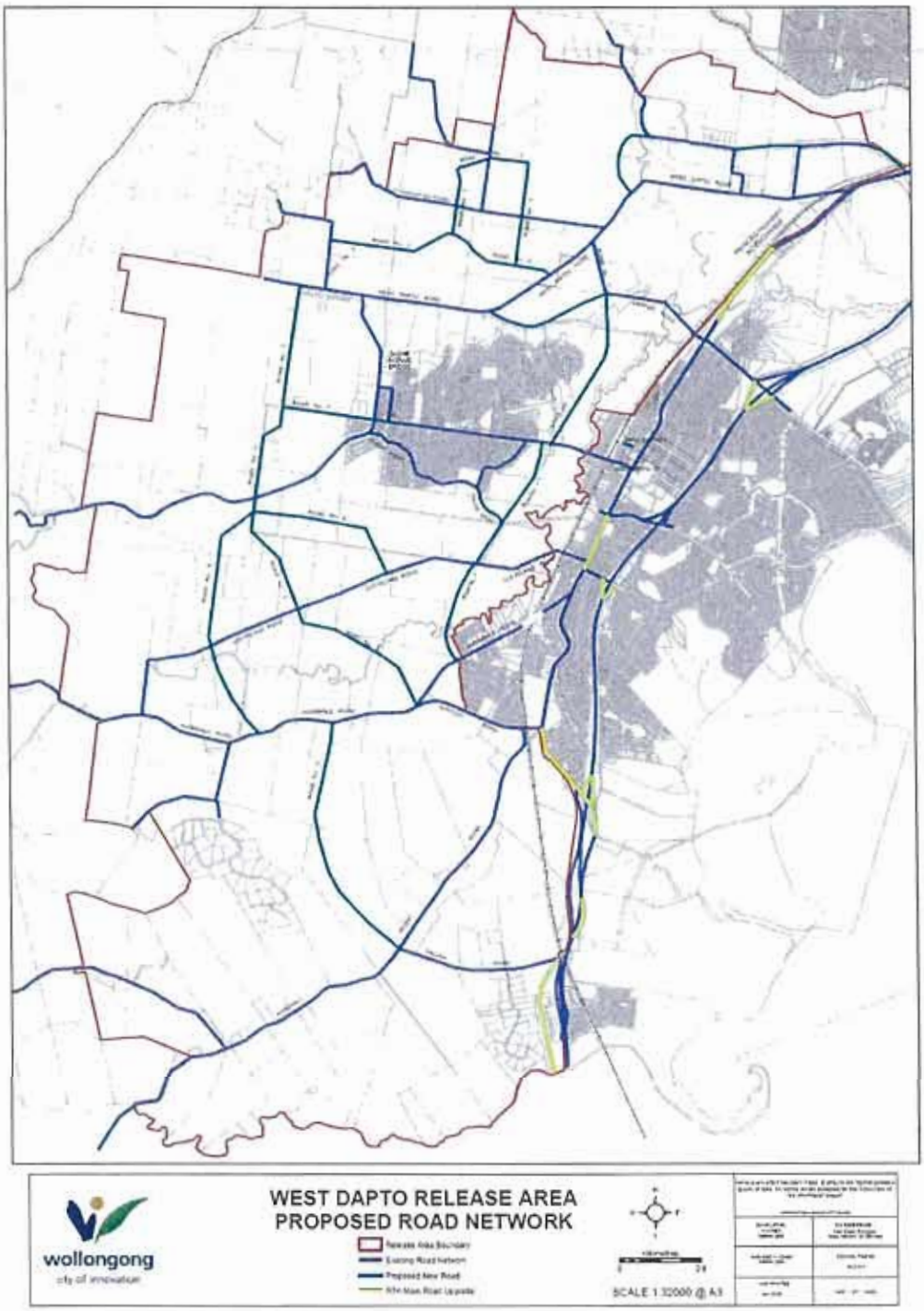


Figure 6.8 Cycleway network

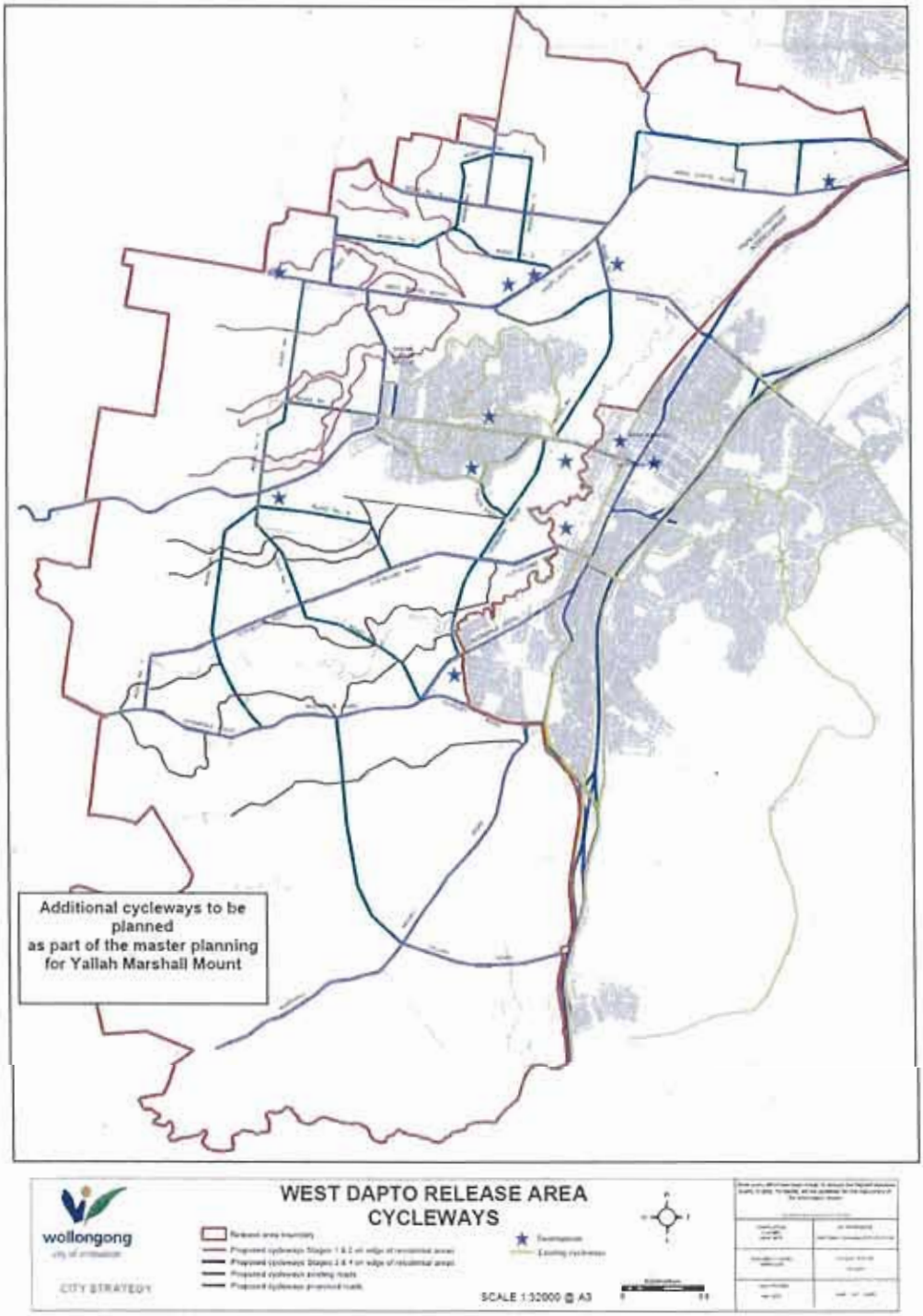


Figure 6.9 Road Types

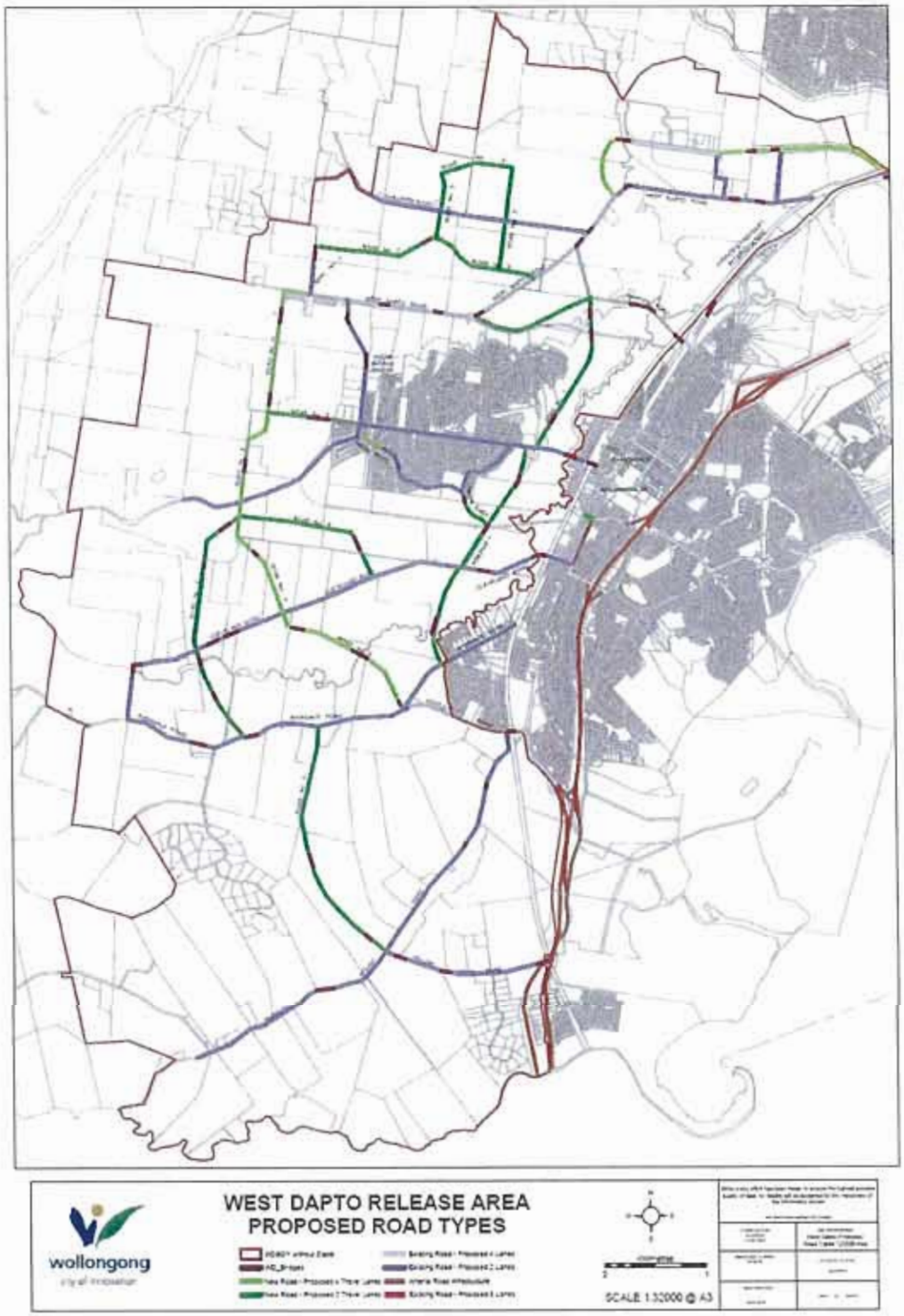
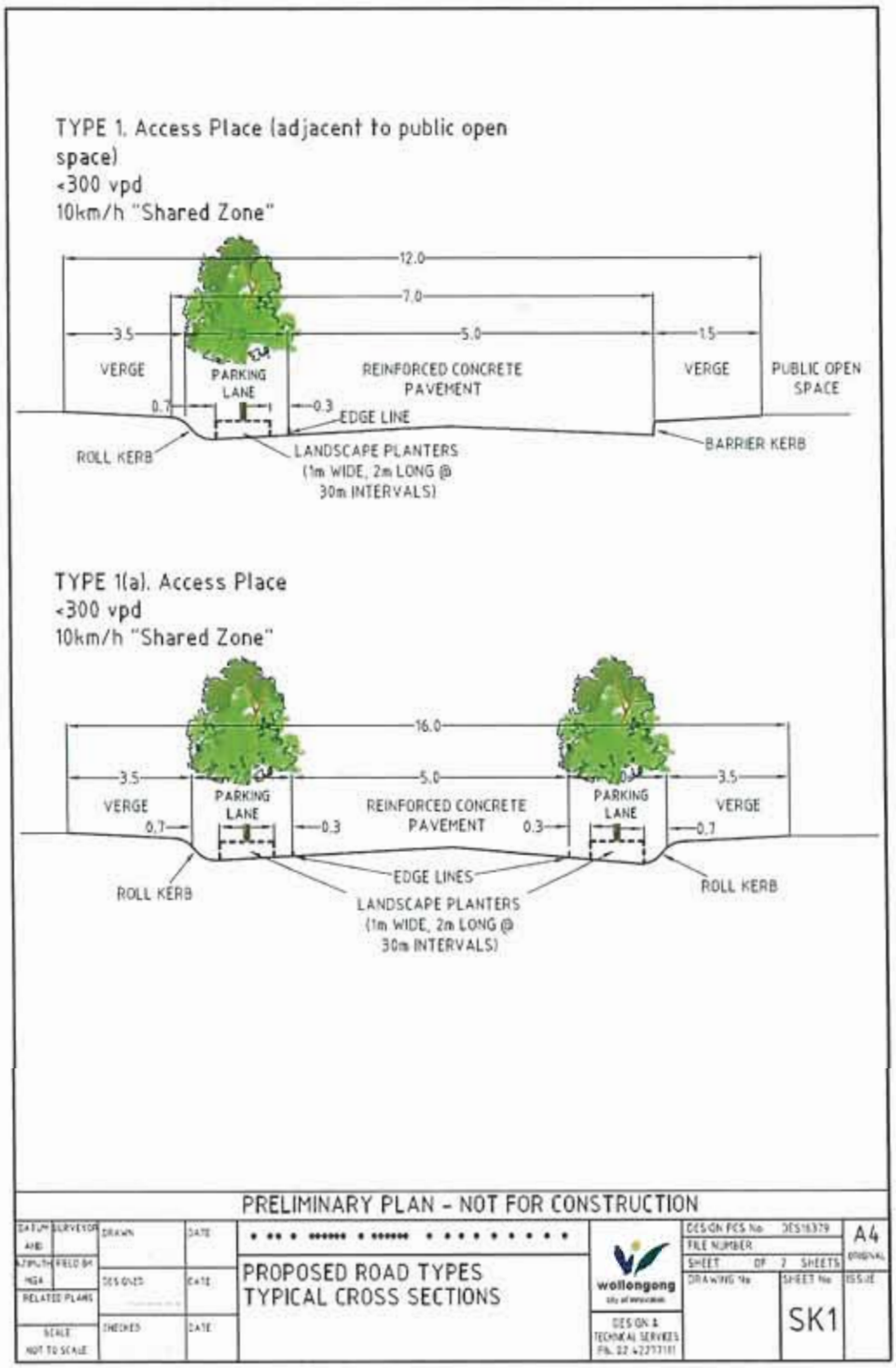
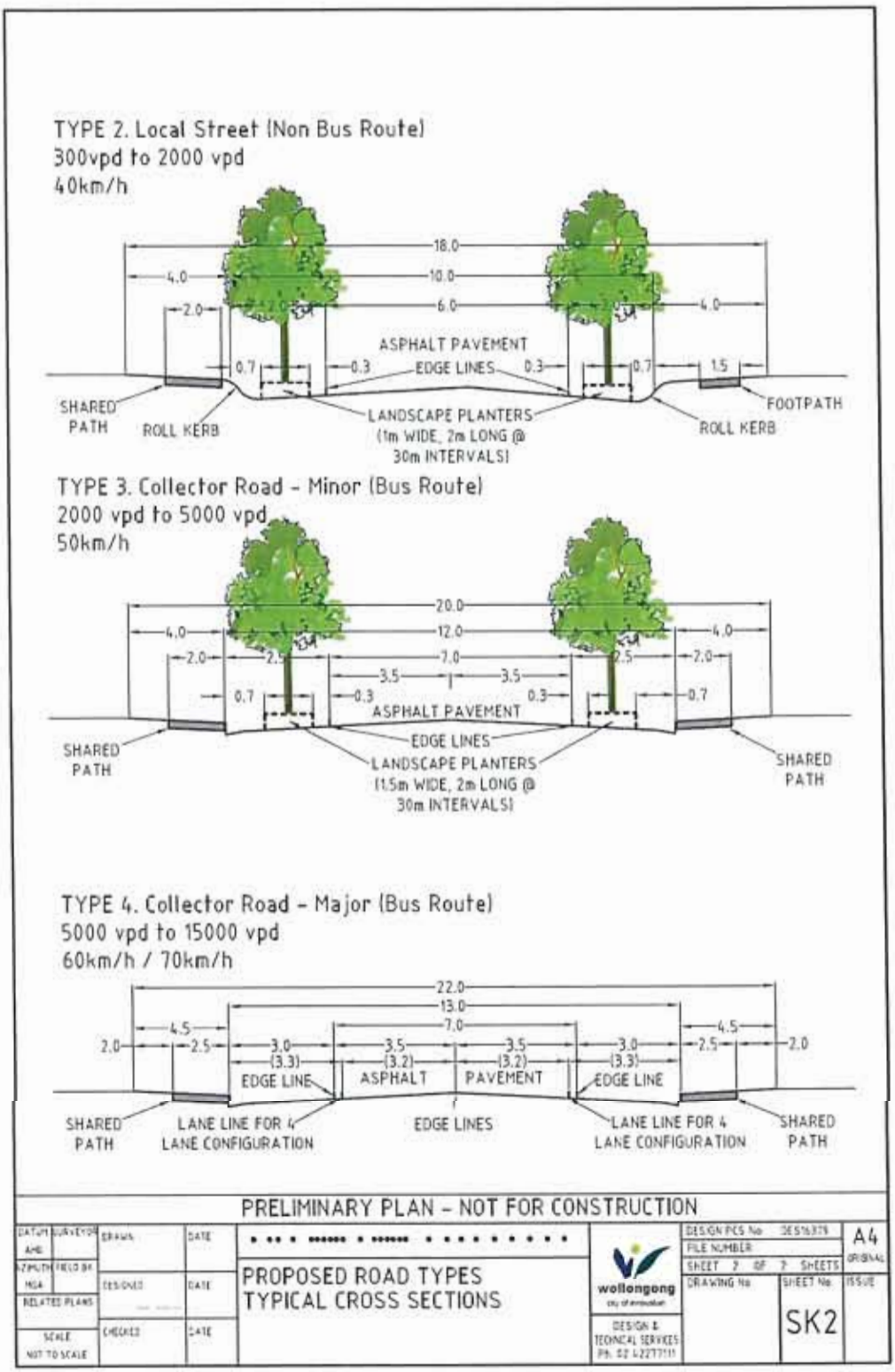


Figure 6.10 Road Cross Sections




TYPE 2. Local Street (Non Bus Route)
300vpd to 2000 vpd
40km/h
18.0
4.0
10.0
2.0
6.0
4.0
ASPHALT PAVEMENT
0.7
0.3
EDGE LINES
0.3
0.7
1.5
SHARED PATH
ROLL KERB
LANDSCAPE PLANTERS (1m WIDE, 2m LONG @ 30m INTERVALS)
FOOTPATH
ROLL KERB
TYPE 3. Collector Road - Minor (Bus Route)
2000 vpd to 5000 vpd
50km/h
20.0
4.0
12.0
4.0
2.0
2.5
7.0
2.5
2.0
3.5
3.5
0.7
0.3
0.3
0.7
ASPHALT PAVEMENT
EDGE LINES
SHARED PATH
LANDSCAPE PLANTERS (1.5m WIDE, 2m LONG @ 30m INTERVALS)
SHARED PATH
TYPE 4. Collector Road - Major (Bus Route)
5000 vpd to 15000 vpd
60km/h / 70km/h
22.0
13.0
4.5
7.0
4.5
2.0
2.5
3.0
3.5
3.5
3.0
2.5
2.0
(3.3)
(3.2)
(3.2)
(3.3)
EDGE LINE
ASPHALT
PAVEMENT
EDGE LINE
SHARED PATH
LANE LINE FOR 4 LANE CONFIGURATION
EDGE LINES
LANE LINE FOR 4 LANE CONFIGURATION
SHARED PATH
PRELIMINARY PLAN - NOT FOR CONSTRUCTION
DATUM AHD
SURVEYOR
AZIMUTH MGA
FIELD BK
RELATED PLANS
SCALE NOT TO SCALE
DRAWN
DATE
DESIGNED
DATE
CHECKED
DATE
PROPOSED ROAD TYPES
TYPICAL CROSS SECTIONS
wollongong
DESIGN & TECHNICAL SERVICES
DESIGN PCS No
FILE NUMBER
SHEET 2 OF 2 SHEETS
DRAWING No
SHEET No
SK2
A4
ORIGINAL
ISSUE

APPENDIX D

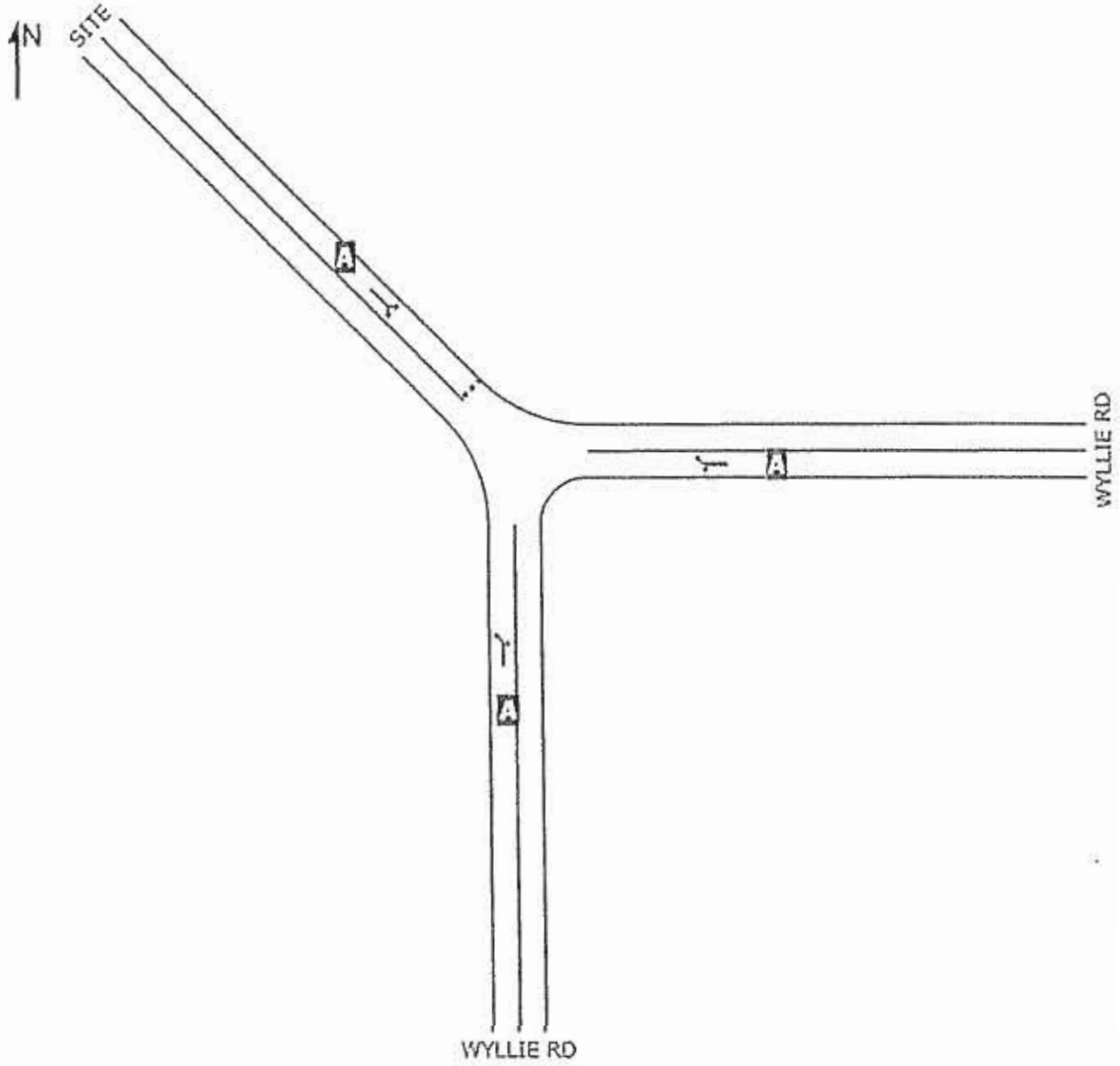
SITE ENTRY / WYLLIE ROAD INTERSECTION – SIDRA RESULTS

LEVEL OF SERVICE

E10

▽ Site: RECYCLING FACILITY

INTERSECTION
SITE ENTRY / WYLLIE RD
EXISTING SITE ENTRY
Giveway / Yield (Two-Way)



	South	East	Northwest	Intersection
LOS	NA	NA	A	NA

Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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DEGREE OF SATURATION

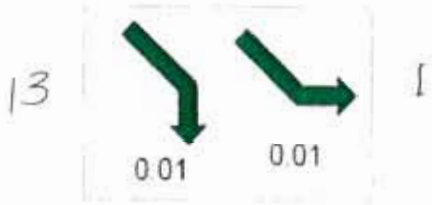
Ratio of Demand Volume to Capacity (v/c ratio)

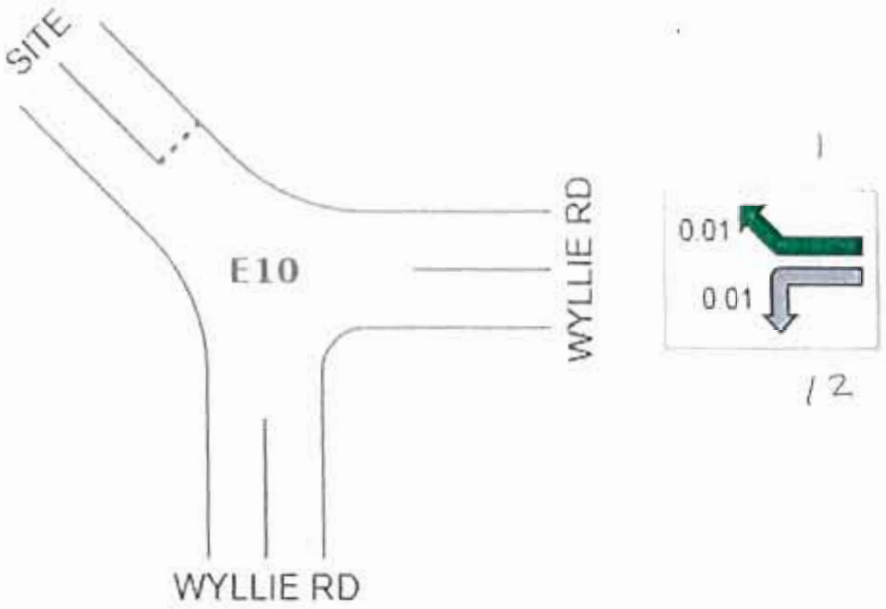
▽ Site: RECYCLING FACILITY

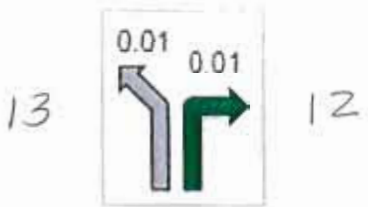
INTERSECTION
SITE ENTRY / WYLLIE RD
EXISTING SITE ENTRY
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	Northwest	Intersection
Degree of Saturation	0.01	0.01	0.01	0.01







Colour code based on Degree of Saturation

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0] Continuous

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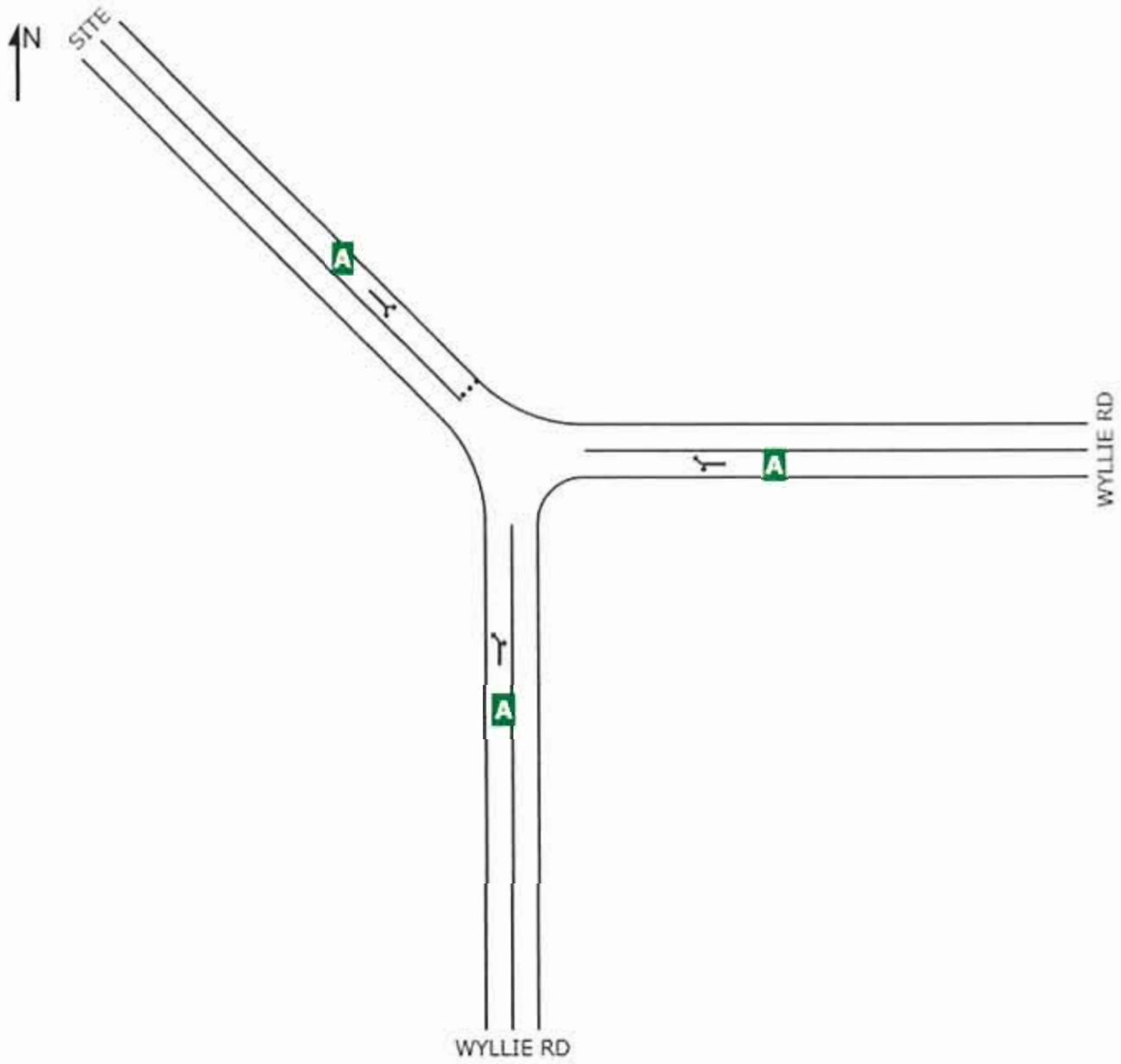
LEVEL OF SERVICE

▽ Site: RECYCLING FACILITY

INTERSECTION
SITE ENTRY / WYLLIE RD
PREDICTED TRAFFIC 100,000t
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	Northwest	Intersection
LOS	NA	NA	A	NA



Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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DEGREE OF SATURATION

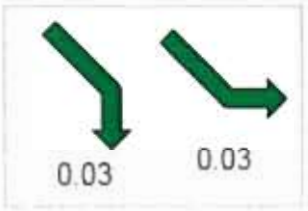
Ratio of Demand Volume to Capacity (v/c ratio)

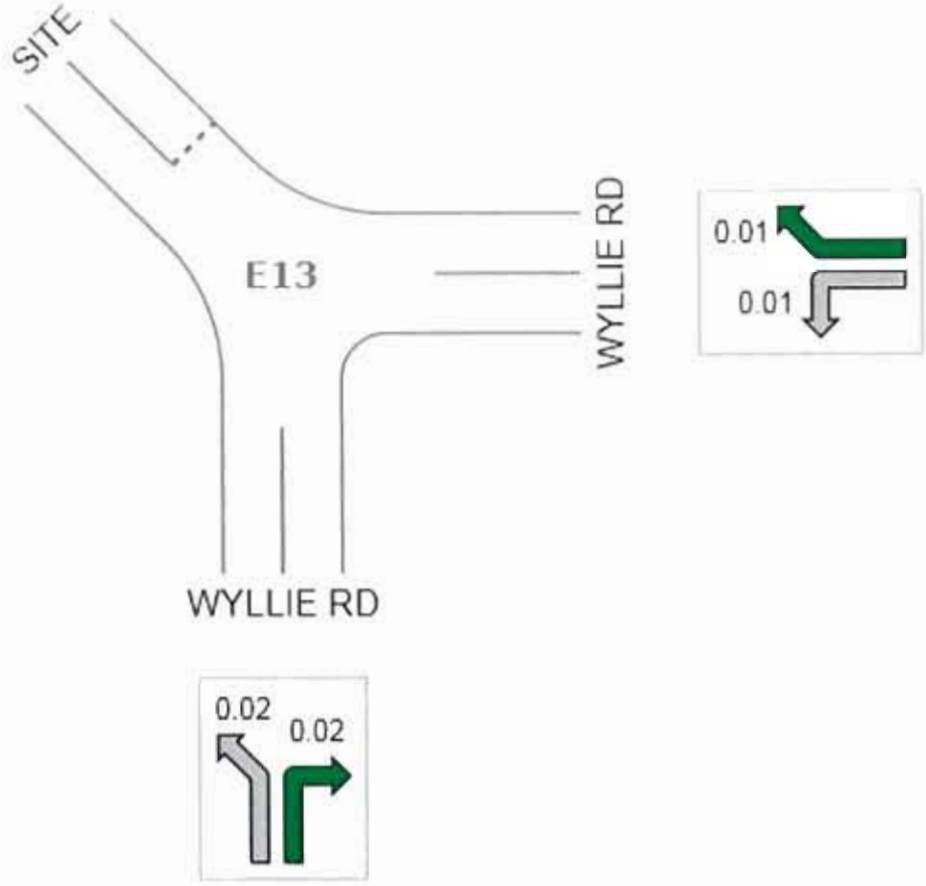
▽ Site: RECYCLING FACILITY

INTERSECTION
SITE ENTRY / WYLLIE RD
PREDICTED TRAFFIC 100,000t
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	Northwest	Intersection
Degree of Saturation	0.02	0.01	0.03	0.03





Colour code based on Degree of Saturation

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0] Continuous

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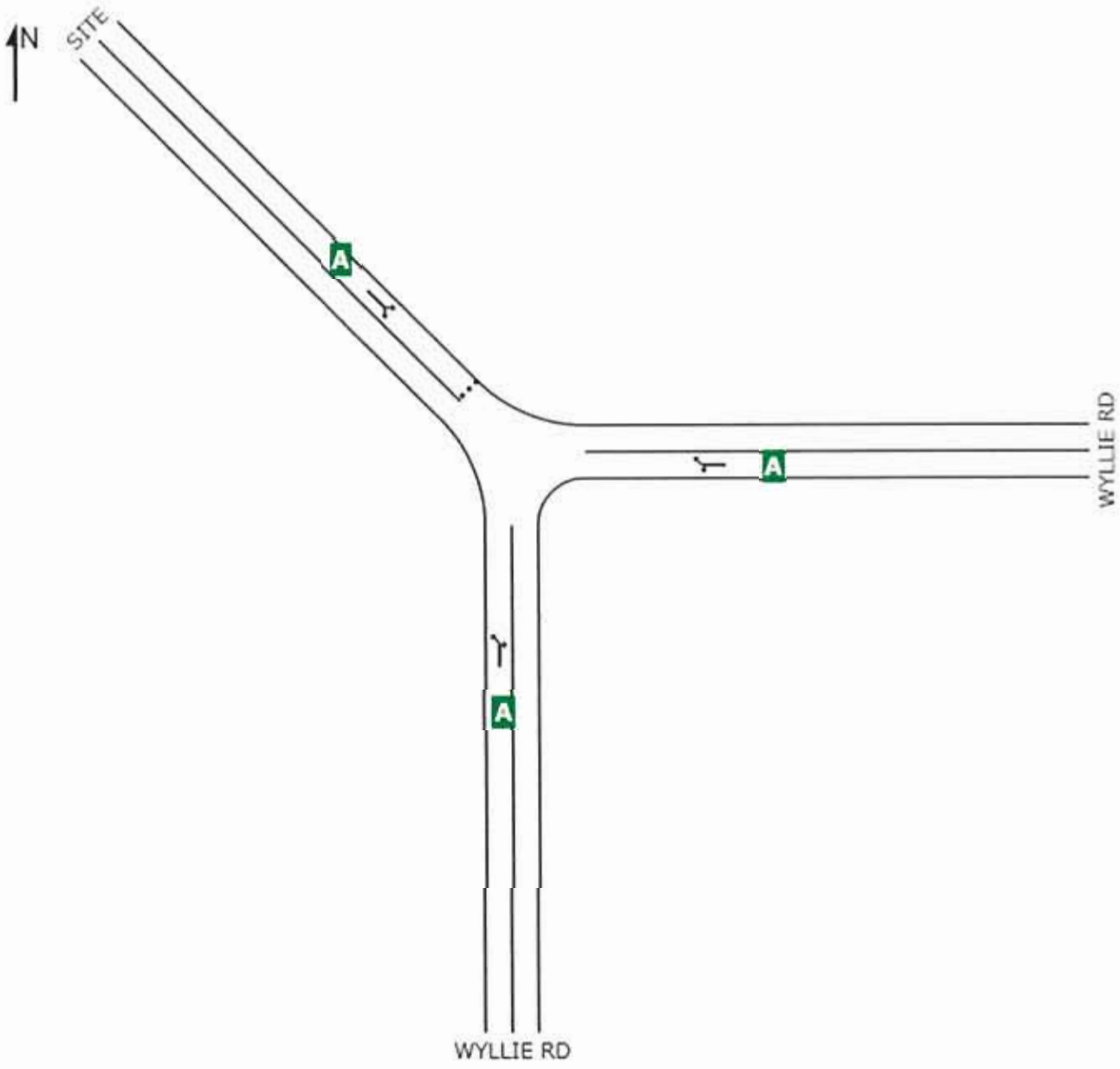
LEVEL OF SERVICE

▽ Site: RECYCLING FACILITY

INTERSECTION
SITE ENTRY / WYLLIE RD
PREDICTED TRAFFIC 150,000t
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	Northwest	Intersection
LOS	NA	NA	A	NA



Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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DEGREE OF SATURATION

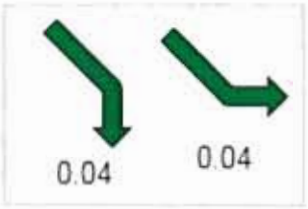
Ratio of Demand Volume to Capacity (v/c ratio)

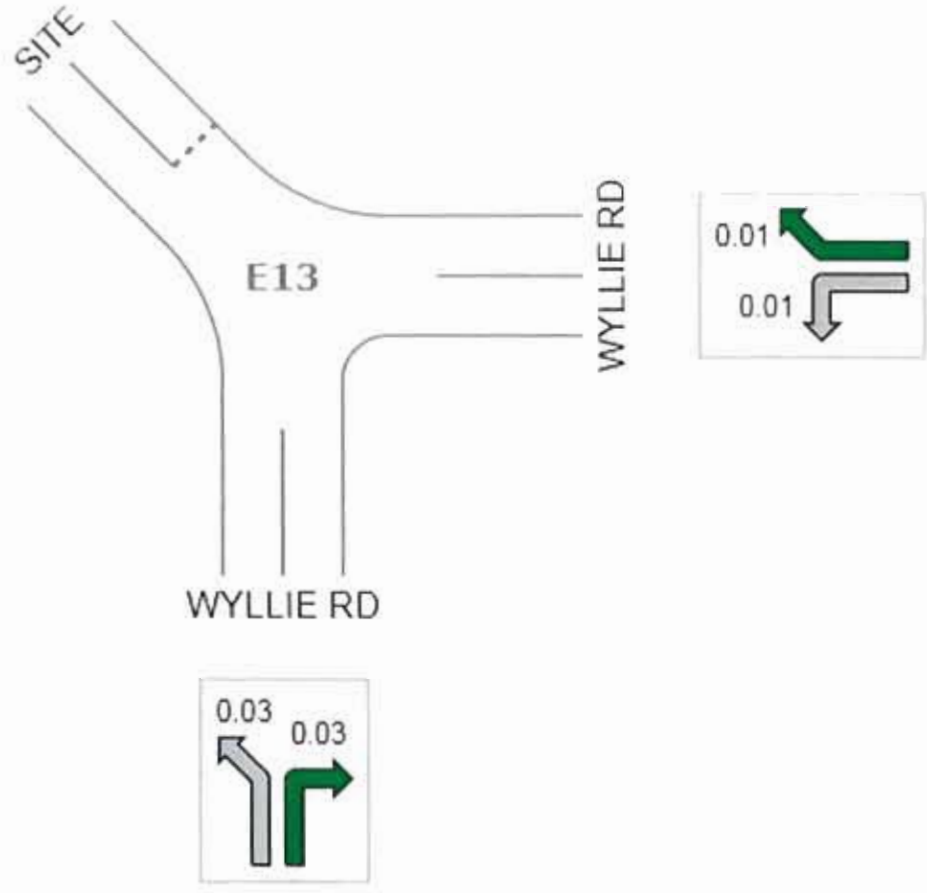
▽ Site: RECYCLING FACILITY

INTERSECTION
SITE ENTRY / WYLLIE RD
PREDICTED TRAFFIC 150,000t
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	Northwest	Intersection
Degree of Saturation	0.03	0.01	0.04	0.04





Colour code based on Degree of Saturation

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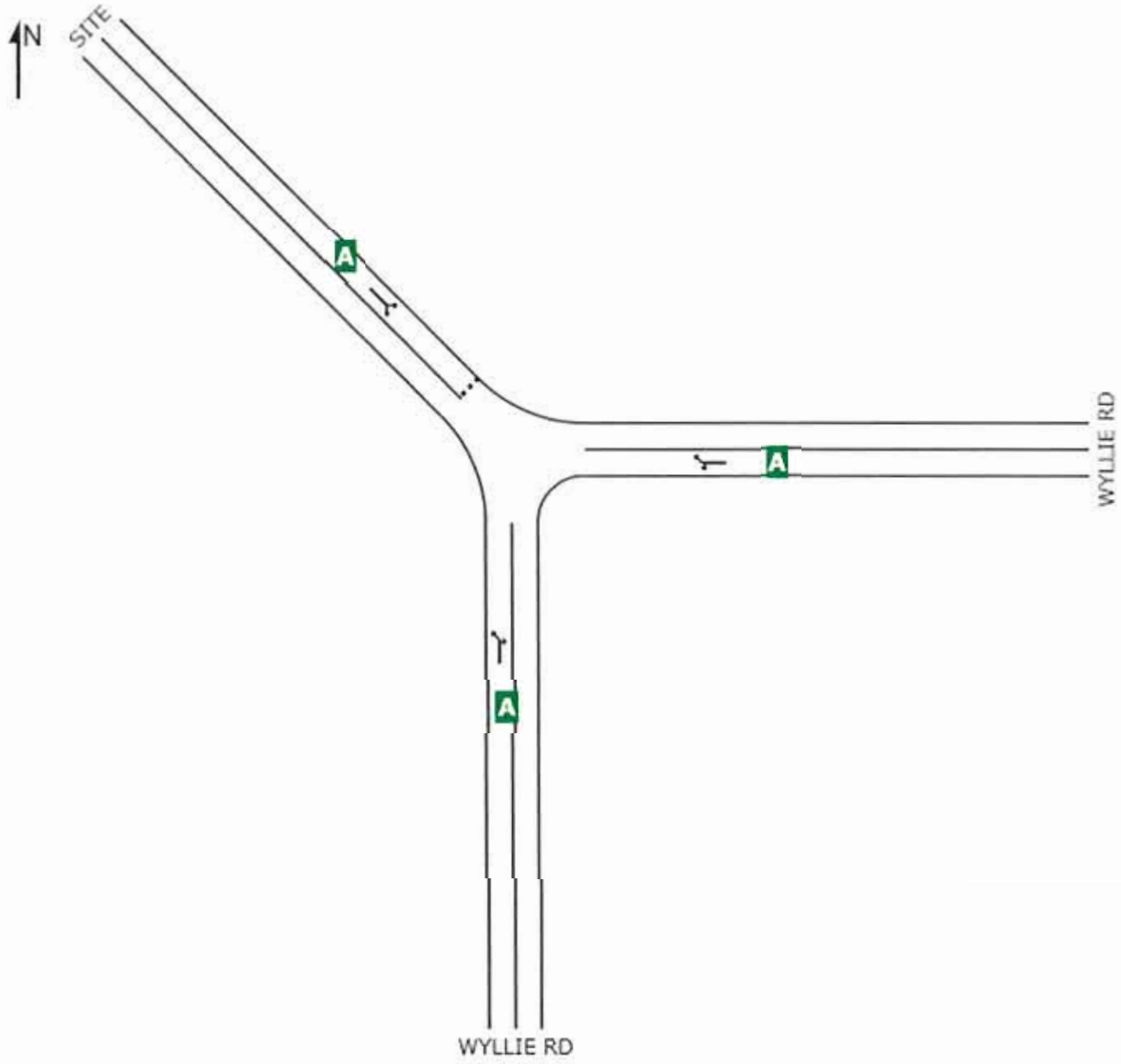
LEVEL OF SERVICE

▽ Site: RECYCLING FACILITY

INTERSECTION
SITE ENTRY / WYLLIE RD
PREDICTED TRAFFIC 230,000t
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	Northwest	Intersection
LOS	NA	NA	A	NA



Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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DEGREE OF SATURATION

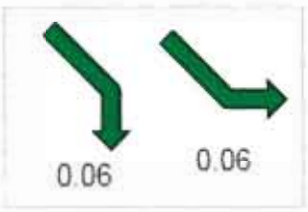
Ratio of Demand Volume to Capacity (v/c ratio)

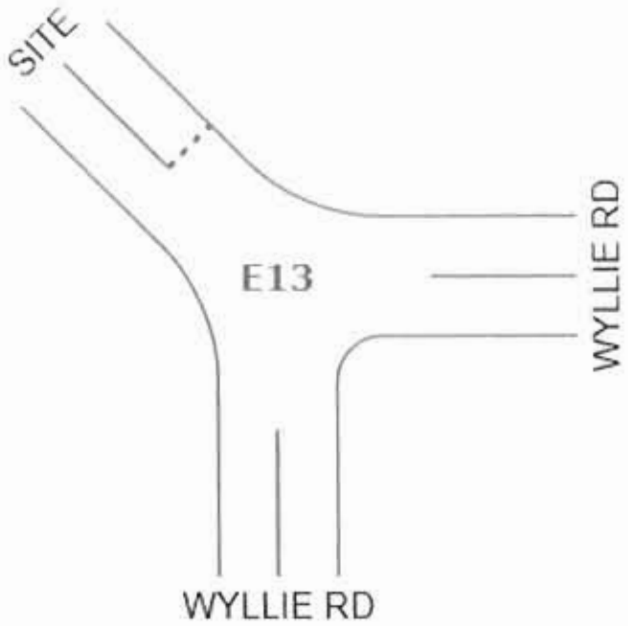
▽ Site: RECYCLING FACILITY

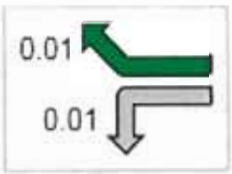
INTERSECTION
SITE ENTRY / WYLLIE RD
PREDICTED TRAFFIC 230,000t
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	Northwest	Intersection
Degree of Saturation	0.05	0.01	0.06	0.06







Colour code based on Degree of Saturation

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APPENDIX E

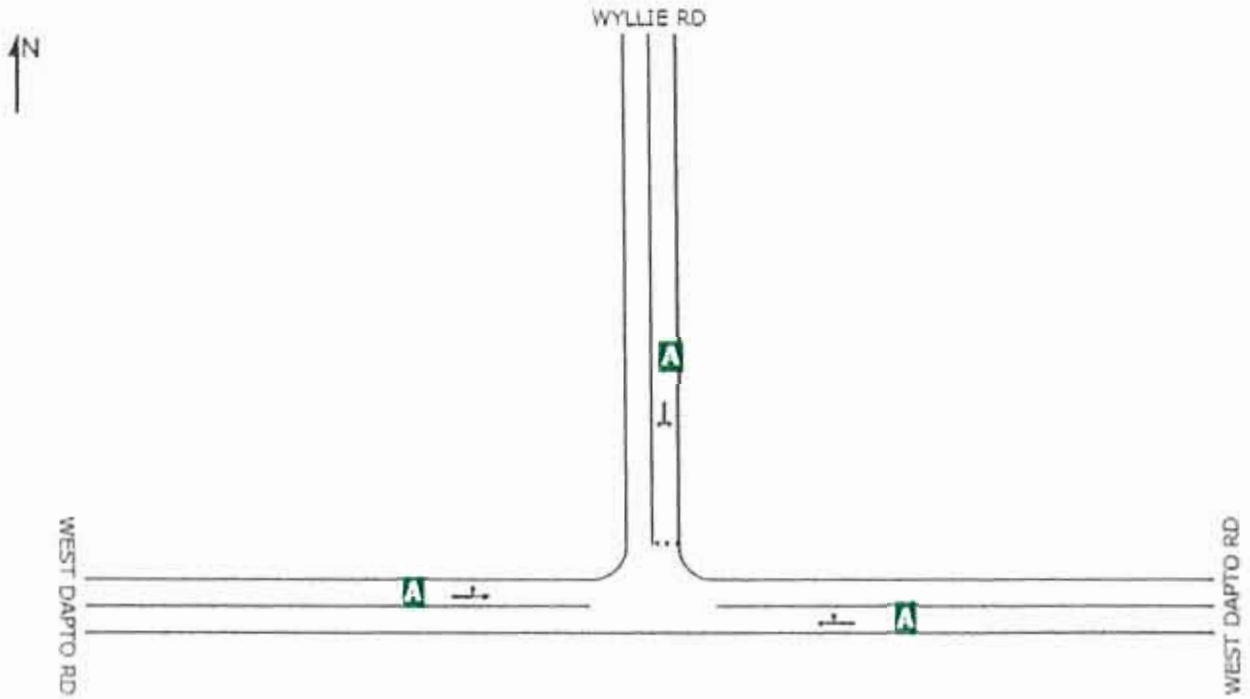
WYLLIE ROAD / WEST DAPTO ROAD INTERSECTION – SIDRA RESULTS

E 11

LEVEL OF SERVICE

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
EXISTING AM VOLUMES
Giveway / Yield (Two-Way)



	East	North	West	Intersection
LOS	NA	A	NA	NA

Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Processed: Thursday, 19 December 2013 10:53:11 AM
SIDRA INTERSECTION 6.0.15.4263
Project: Not Saved
8000078, K F WILLIAMS & ASSOCIATES PTY LTD, PLUS / 1PC

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SIDRA INTERSECTION 6

DEGREE OF SATURATION

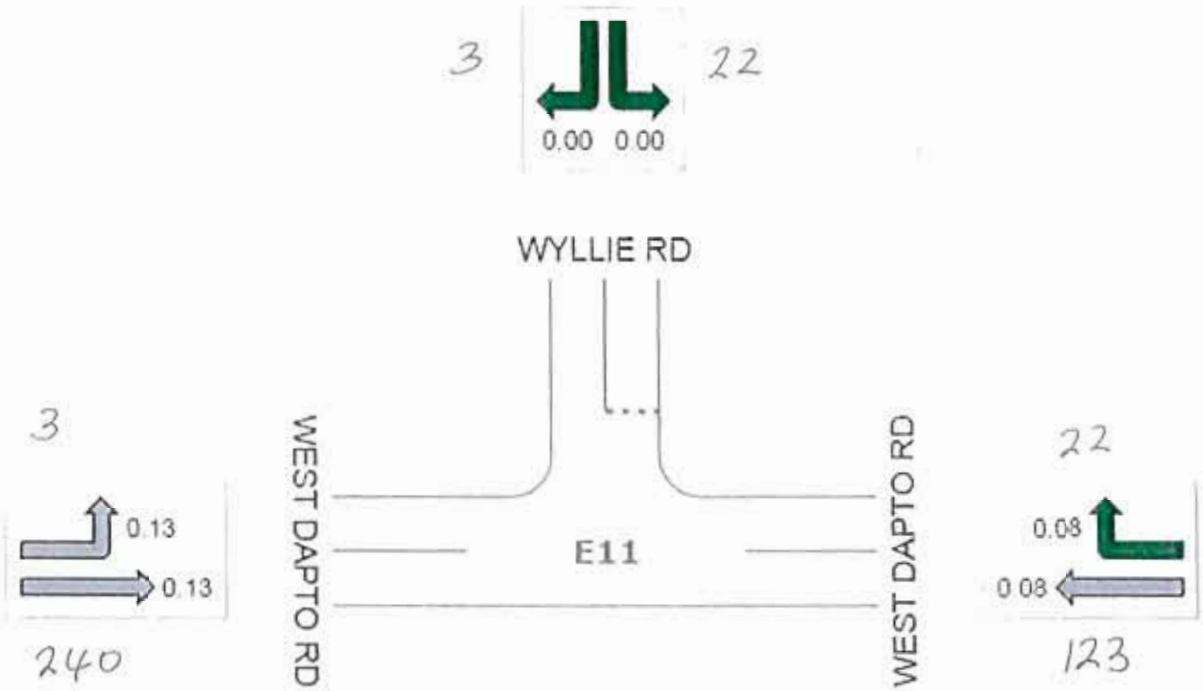
Ratio of Demand Volume to Capacity (v/c ratio)

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
EXISTING AM VOLUMES
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
Degree of Saturation	0.08	0.00	0.13	0.13



Colour code based on Degree of Saturation

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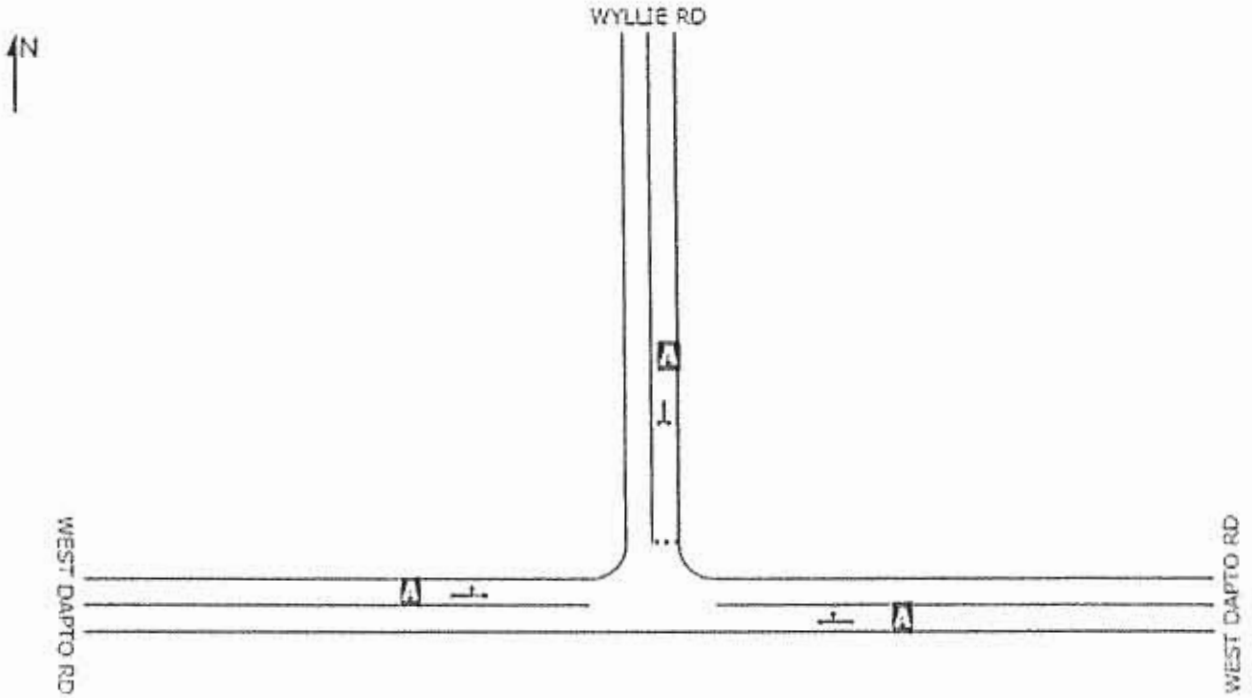
SIDRA INTERSECTION 6

LEVEL OF SERVICE

E14

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC AM VOLUMES
Giveway / Yield (Two-Way)



	East	North	West	Intersection
LOS	NA	A	NA	NA

Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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Project: X:\KF111332\Civil\Documents\KF110816-E14.sip6
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SIDRA INTERSECTION 6

DEGREE OF SATURATION

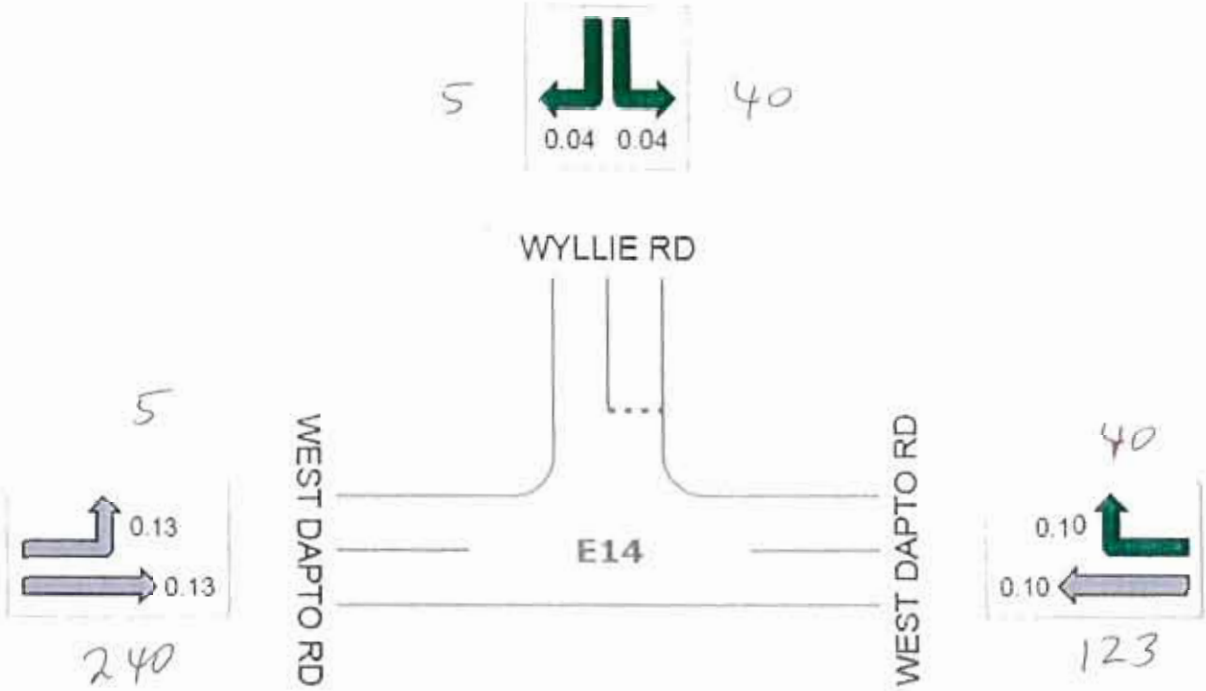
Ratio of Demand Volume to Capacity (v/c ratio)

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC AM VOLUMES
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
Degree of Saturation	0.10	0.04	0.13	0.13



Colour code based on Degree of Saturation

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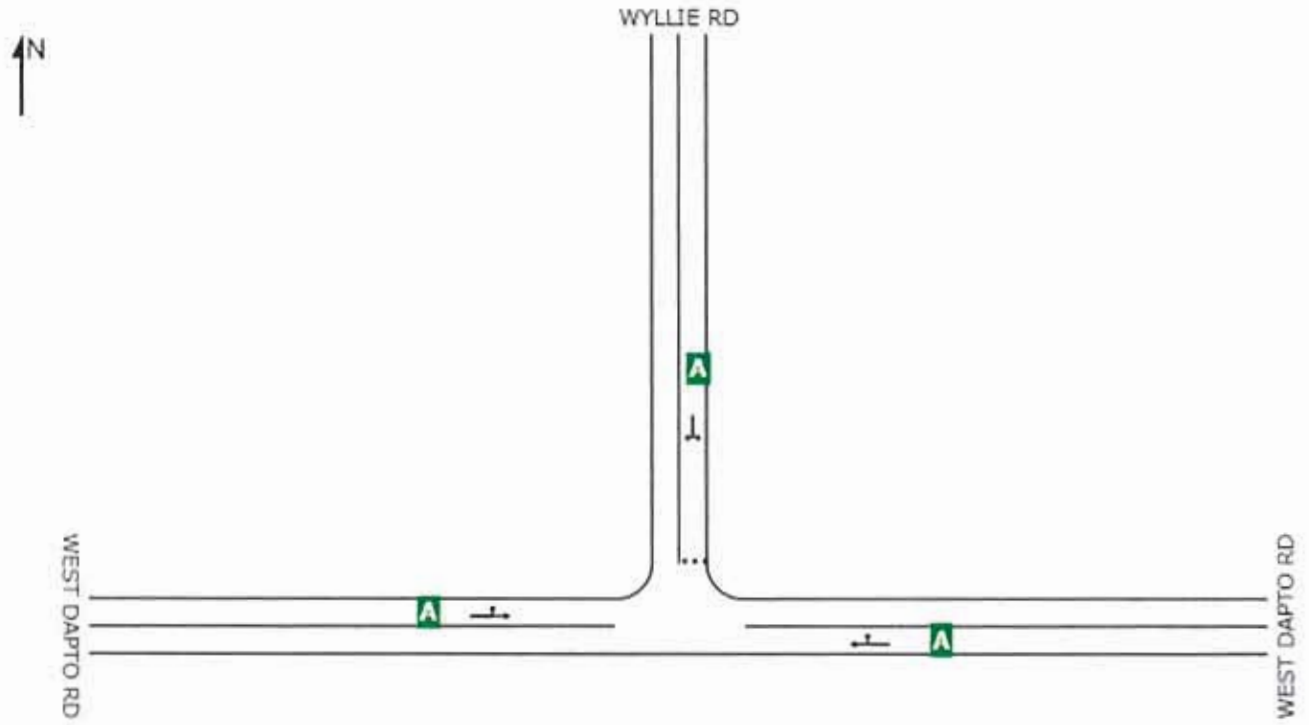
LEVEL OF SERVICE

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC AM VOLUMES 150,000t
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	A	NA	NA



Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
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SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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DEGREE OF SATURATION

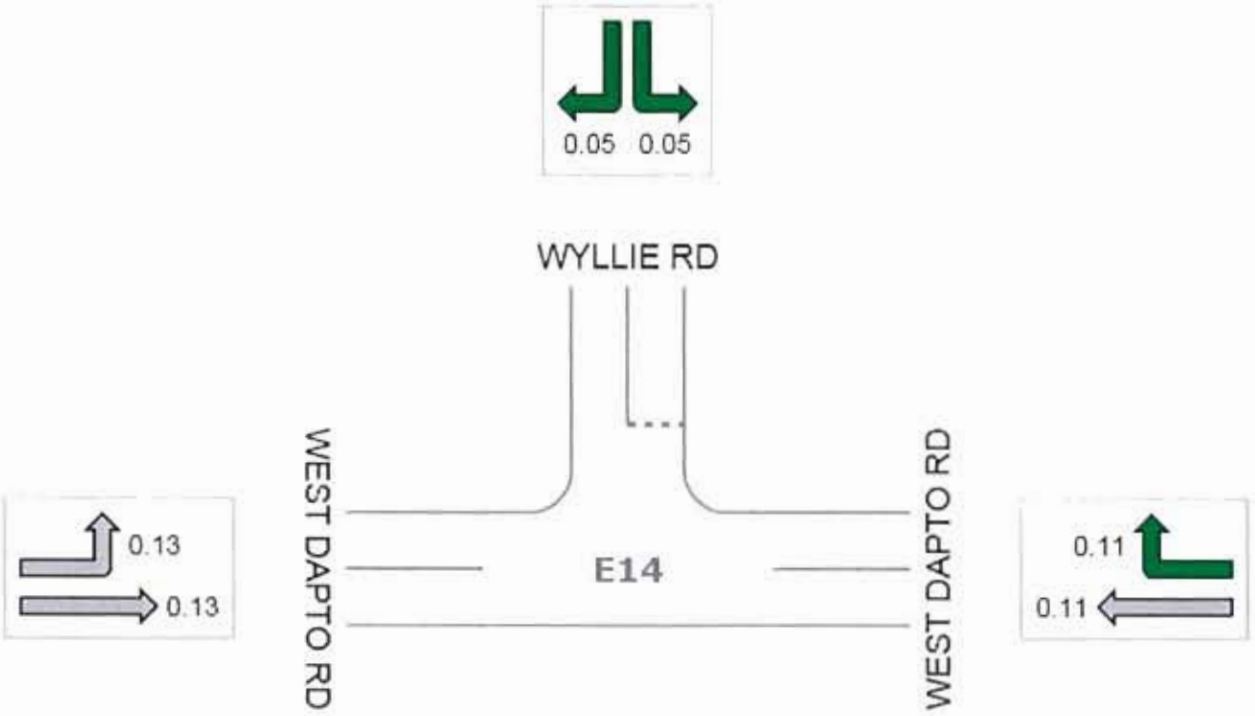
Ratio of Demand Volume to Capacity (v/c ratio)

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC AM VOLUMES 150,000t
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
Degree of Saturation	0.11	0.05	0.13	0.13



Colour code based on Degree of Saturation

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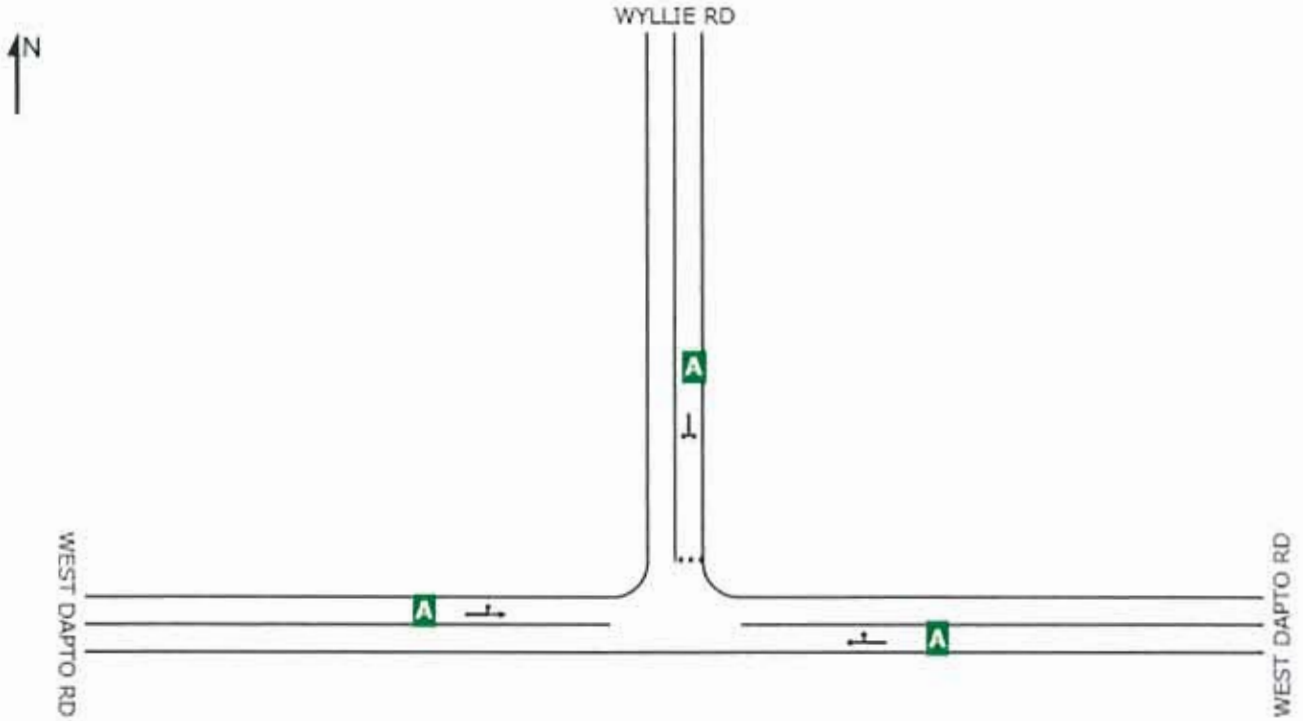
LEVEL OF SERVICE

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC AM VOLUMES 230,000t
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	A	NA	NA



Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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DEGREE OF SATURATION

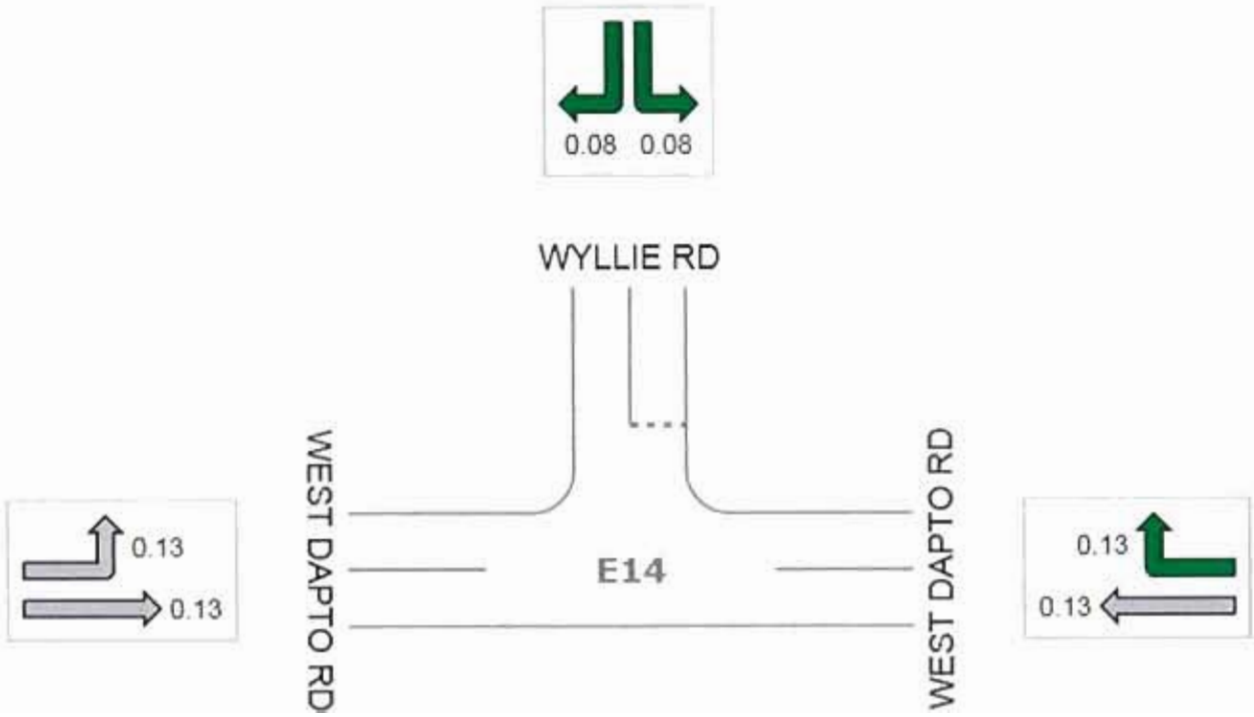
Ratio of Demand Volume to Capacity (v/c ratio)

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC AM VOLUMES 230,000t
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
Degree of Saturation	0.13	0.08	0.13	0.13



Colour code based on Degree of Saturation

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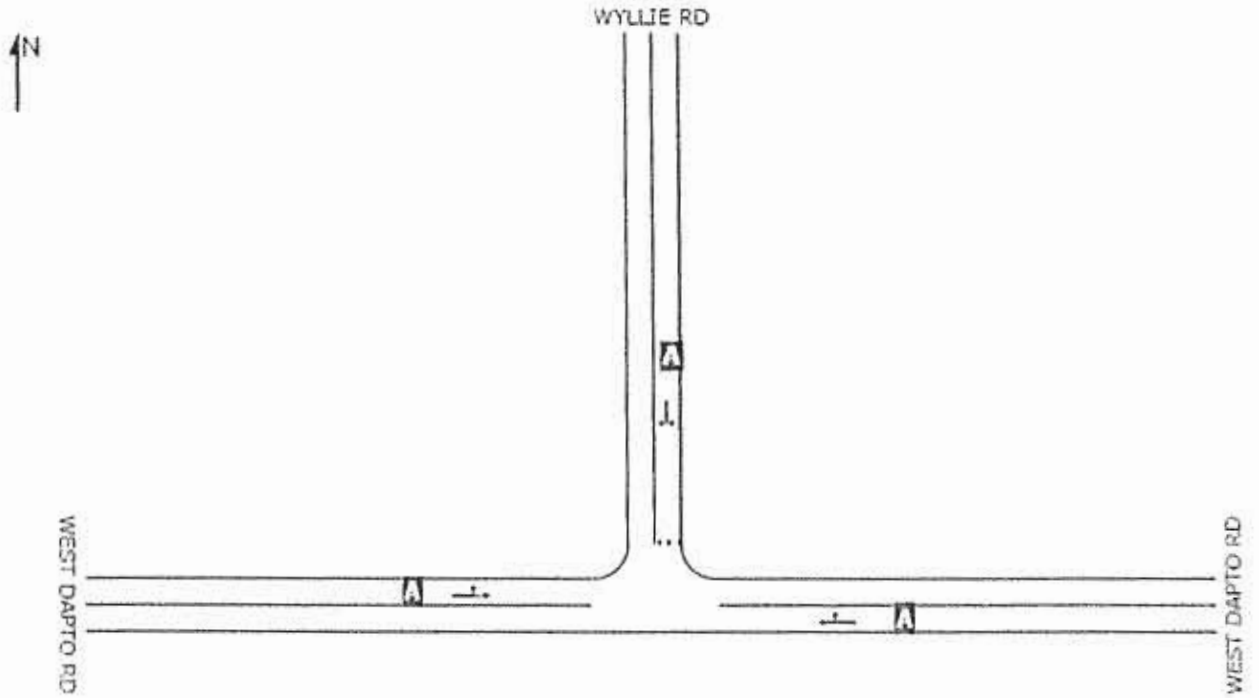
LEVEL OF SERVICE

E12

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
EXISTING PM VOLUMES
Giveway / Yield (Two-Way)



	East	North	West	Intersection
LOS	NA	A	NA	NA

Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Processed: Thursday, 19 December 2013 11:00:51 AM
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SIDRA INTERSECTION 6

DEGREE OF SATURATION

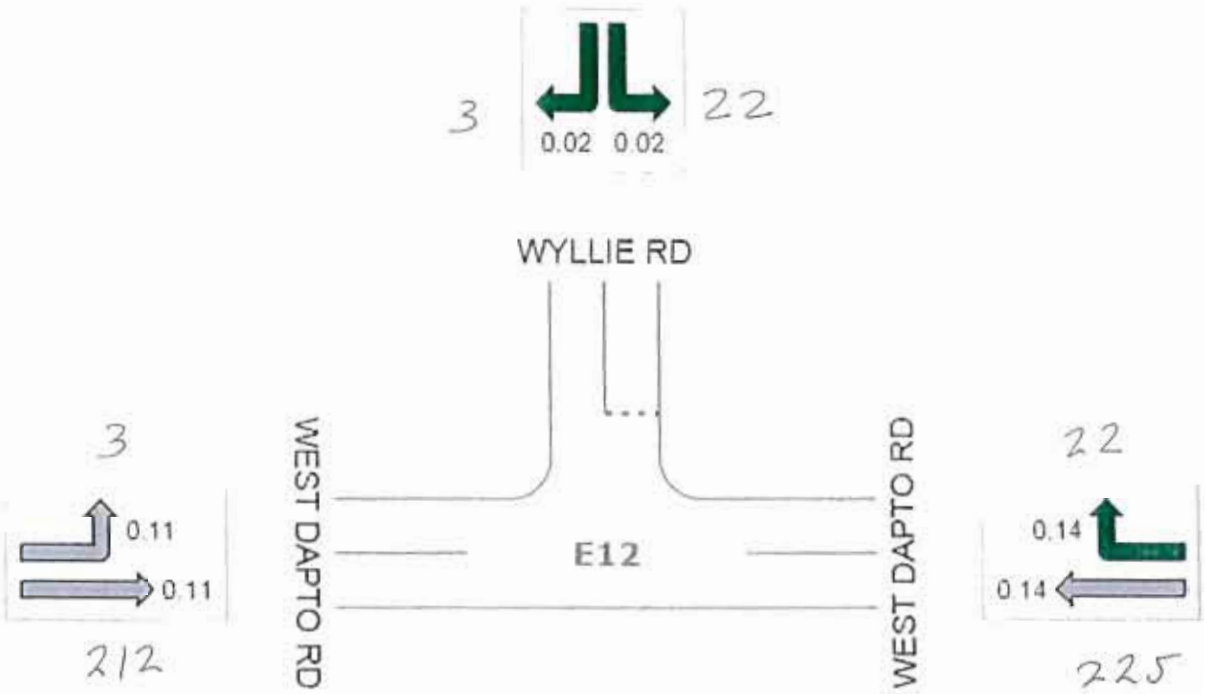
Ratio of Demand Volume to Capacity (v/c ratio)

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
EXISTING PM VOLUMES
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
Degree of Saturation	0.14	0.02	0.11	0.14



Colour code based on Degree of Saturation

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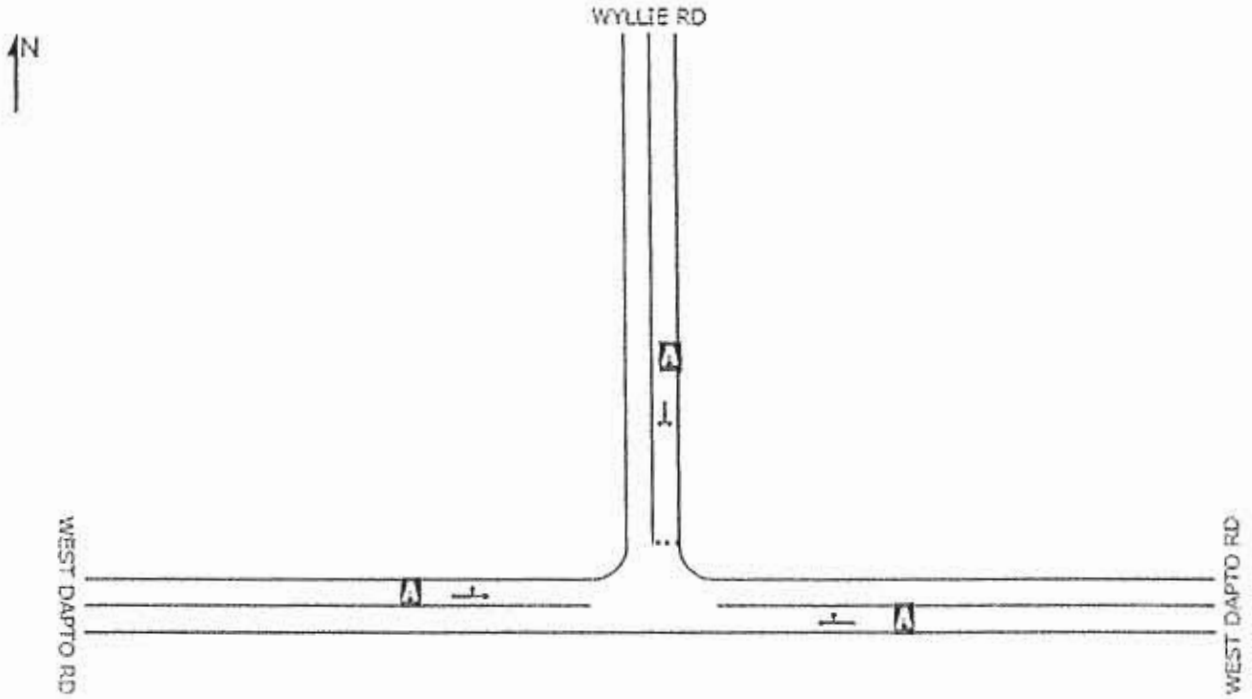
LEVEL OF SERVICE

E15.

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC PM VOLUMES
Giveway / Yield (Two-Way)



	East	North	West	Intersection
LOS	NA	A	NA	NA

Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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SIDRA INTERSECTION 6

DEGREE OF SATURATION

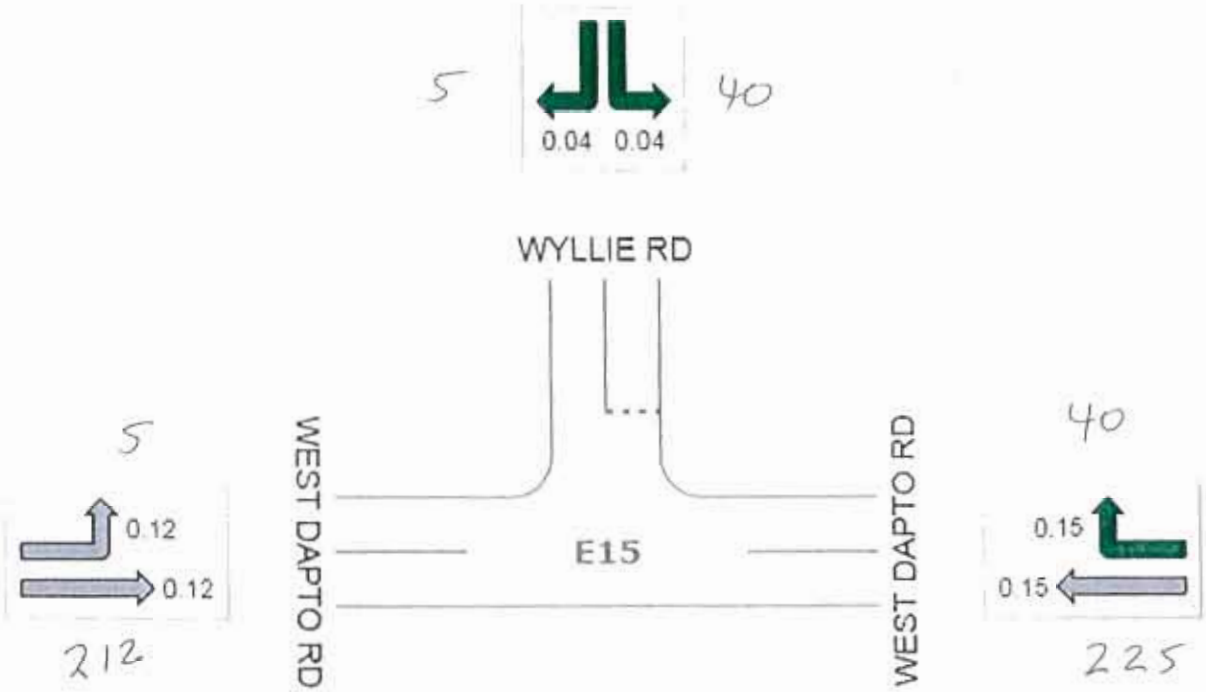
Ratio of Demand Volume to Capacity (v/c ratio)

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC PM VOLUMES
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
Degree of Saturation	0.15	0.04	0.12	0.15



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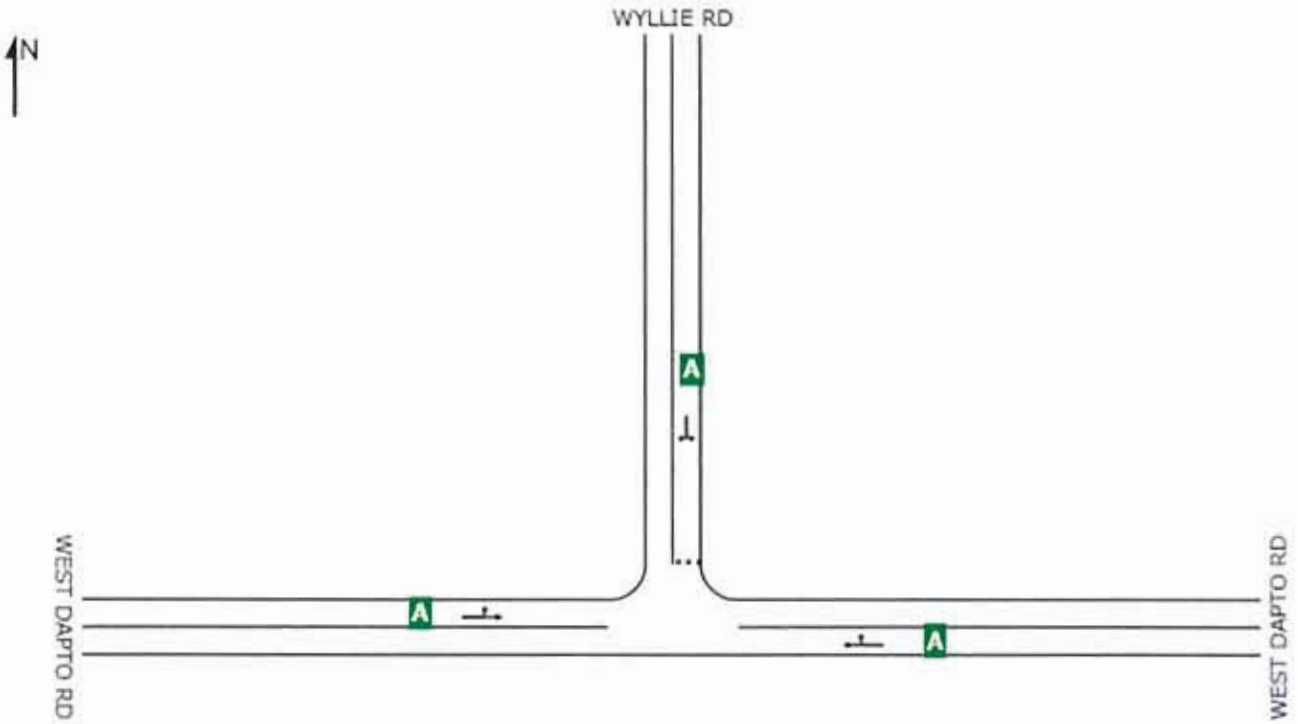
LEVEL OF SERVICE

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC PM VOLUMES 150,000t
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	A	NA	NA



Level of Service (LOS) Method: Delay (RTA NSW).
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Minor Road Approach LOS values are based on average delay for all lanes.
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SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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DEGREE OF SATURATION

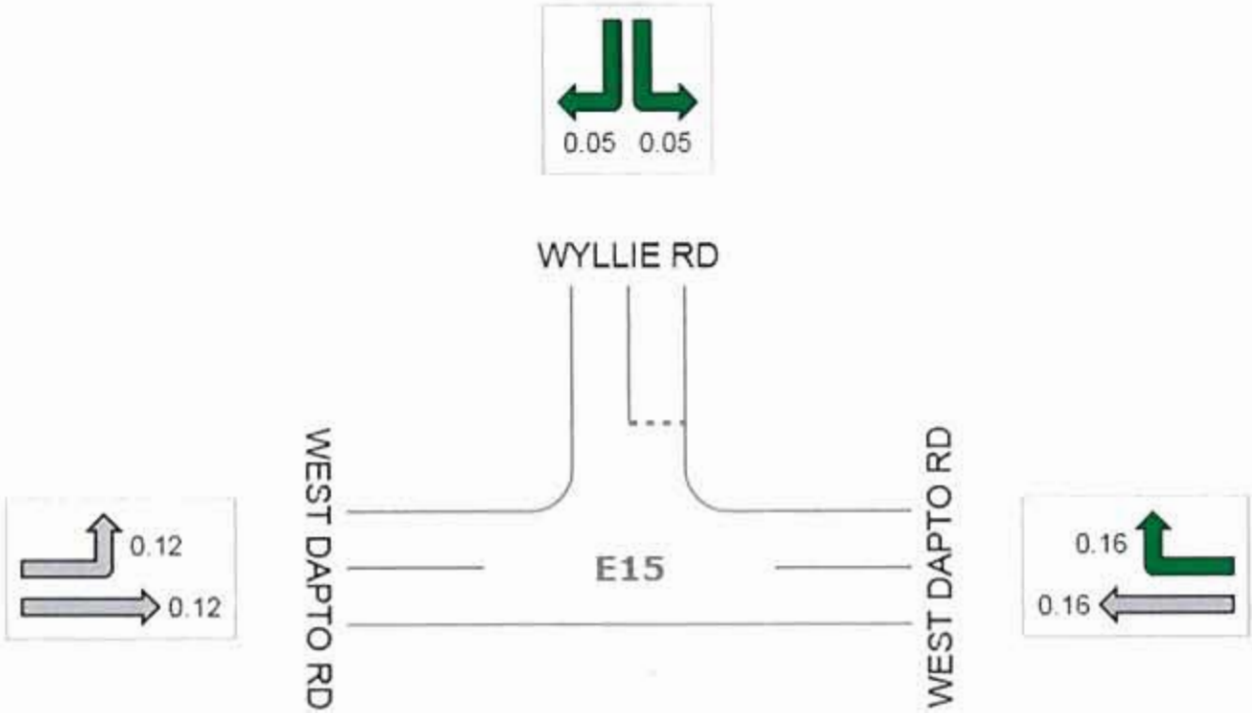
Ratio of Demand Volume to Capacity (v/c ratio)

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC PM VOLUMES 150,000t
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
Degree of Saturation	0.16	0.05	0.12	0.16



Colour code based on Degree of Saturation

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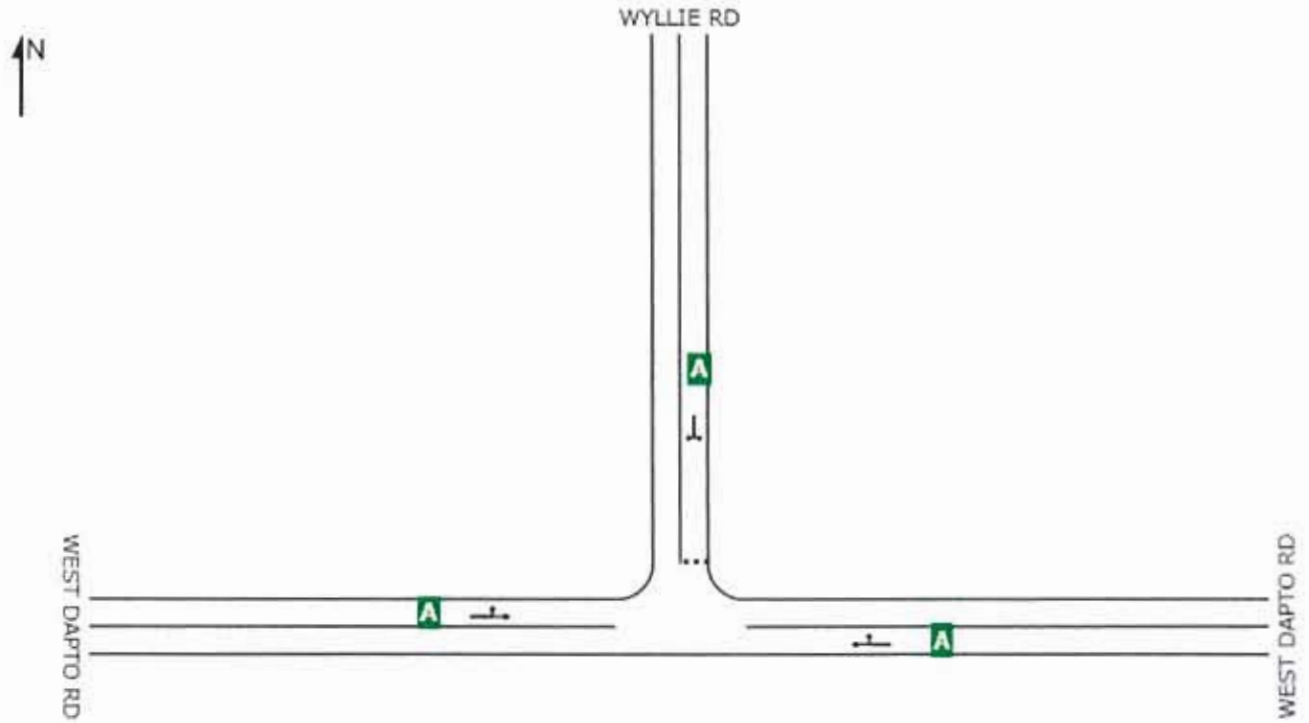
LEVEL OF SERVICE

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC PM VOLUMES 230,000t
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	A	NA	NA



Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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DEGREE OF SATURATION

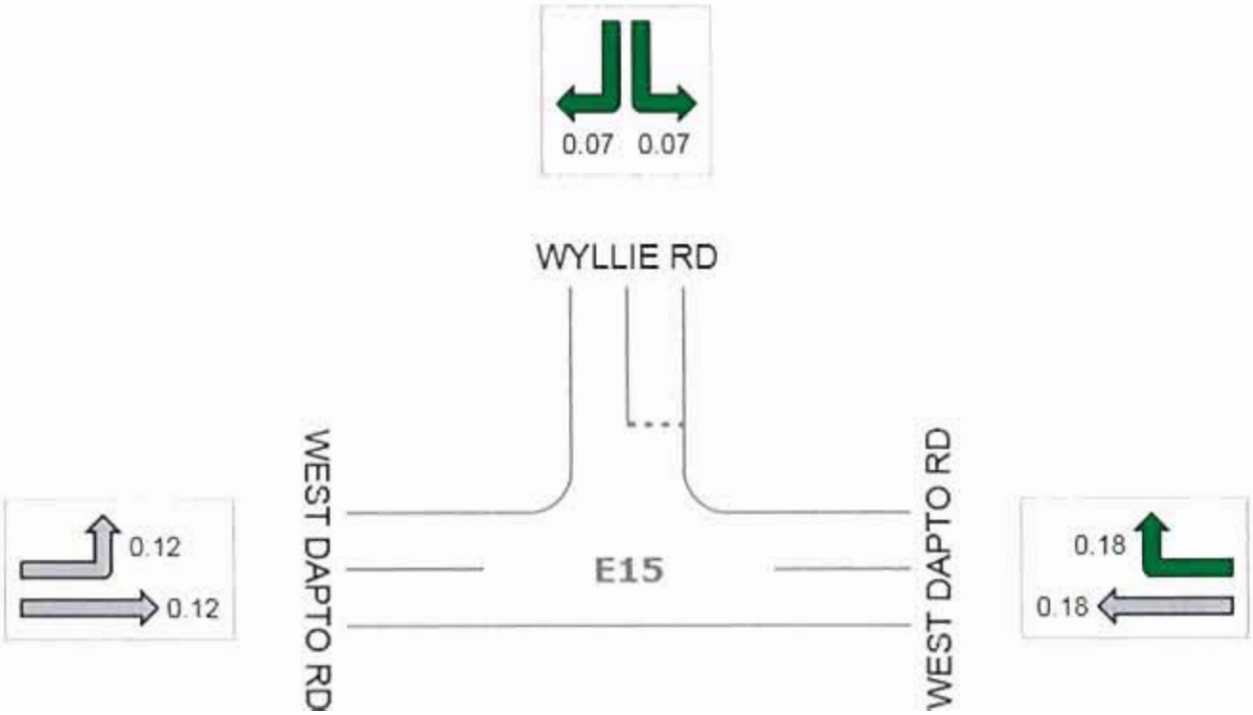
Ratio of Demand Volume to Capacity (v/c ratio)

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC PM VOLUMES 230,000t
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
Degree of Saturation	0.18	0.07	0.12	0.18



Colour code based on Degree of Saturation

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APPENDIX F

ADDITIONAL INFORMATION REQUESTS

Our Ref: STH09/02554
Contact: Daniel Talevski 4221 2771
Your Ref: 13/10464

Transport Roads & Maritime Services

The General Manager
Department of Planning & Infrastructure
GPO Box 39
Sydney NSW 2001

Attention: Andrew Hartcher

DEPARTMENT OF PLANNING & INFRASTRUCTURE – STATE SIGNIFICANT DEVELOPMENT 5300 – LOT 10 DP 878167 – RESOURCE RECOVERY FACILITY, KEMBLA GRANGE – DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Sir/Madam,

Reference is made to your letter dated 22 April 2014 regarding the Resource Recovery Facility, Kembla Grange development application forwarded to Roads and Maritime Services (RMS) for consideration.

RMS has reviewed the Draft Environmental Impact Statement (EIS) provided and does not object to the EIS going to public exhibition subject to the following information being addressed in the EIS:

- RMS has reviewed Appendix 19A and 19B of the submitted EIS (dated 16 April 2014) and notes no information has been provided regarding the impact of the development on the Princes Highway/West Dapto Road intersection. RMS requires the impact on this intersection to be included as part of the EIS before it is released at public exhibition.

Should you require any clarification on this matter please call Daniel Talevski on 4221 2771.

Yours faithfully

16 MAY 2014

Adam Berry
Network & Safety Manager
Network Management, Southern Region

wollongong
city of innovation

WOLLONGONG CITY COUNCIL

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R2013/435

016

2009/1153.

ATTN : Andrew Hartcher
Department of Planning & Environment
GPO BOX 39
SYDNEY NSW 2001

APPLICATION **DE-2012/84**
Date 14 May 2014

Dear Sir

REVIEW OF DRAFT ENVIRONMENTAL IMPACT STATEMENT – VERSION 2 - RESOURCE RECOVERY FACILITY – KEMBLA GRANGE (SSD 5300)

Thank you for providing Council with the opportunity to comment on the revised draft environmental impact statement (EIS) for the above State Significant Development proposal.

It is noted that the proponent has revised EIS in response to the issues outlined in Council's letter dated 5 December 2013 (copy attached).

Council has reviewed the draft revised EIS for the development as relates to the Director-General's environmental assessment requirement and the requirements of Clause 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

Please find attached detailed comments and recommendations in response to the revised draft EIS for the development.

Council understands there will be the opportunity to make a full submission on the proposal during public exhibition of the final EIS.

Should you have any enquiries or wish to discuss these matters further, please contact Vivian Lee, Senior Development Project Officer on (02) 4227 7314.

Yours faithfully

TCollins@wollongong.nsw.gov.

David Farmer
General Manager
Wollongong City Council
Telephone (02) 4227 7111

Borg 29/5/14
No traffic people
ie Charlie
Ted
Walker
?

Comments on the revised Draft Environmental Impact Statement for the Resource Recovery Facility, Kembla Grange

General

Reference is made within the project description that composting will occur in amounts previously approved for the facility in DA-2009/1153/A with no proposed increase in this application.

The intent of the type of 'compost' or 'composting' referred to in this consent for DA-2009/1153/A excluded any composting by methods such as bioconversion, biodigestion or vermiculture but includes by size reduction of organics by shredding, chipping, mulching or grinding as described in Schedule 1, Part 1, 12 of the Protection of the Environment Operations Act 1997.

Further clarification is sought on the details of the proposed type of composting intended for this application and if it would be categorised as a scheduled activity which would require an Environmental Protection Licence. Consultation with the Environmental Protection Authority is recommended for their comments on this matter.

An OHS training room/building is proposed within the north eastern corner of the IN2 Light Industrial zoned land. This building appears to be bounded by the watercourse and associated planting to the west and batter associated with the proposed workshop and internal road to the south. Consideration should be provided on how pedestrian access will be achieved to this OHS training room/building.

For your information, Council is currently carrying out investigation on whether the development occurring on site is operating in line with development consent DA-2009/1153/A. This is in respect to a number of matters relating to existing buildings/structures, parking areas, access, overall processing capacity and storage of materials on site. Council has been liaising with the operator/owner of the site during this process.

It is noted that the photographs provided in Figure 4-14 of the Environmental Impact Statement (EIS) whilst may reflect the site in its current form, may not reflect the approved plans of DA-2009/1153/A, the operational consent for the site and/or proposed plans that forms part of this EIS.

Environment

The Acid Sulphate Soil Assessment report prepared by Benviron Group dated March 2014 does not reflect the site elevation (15 to 30 m AHD). Acid sulphate soils are typical Holocene deposits and are confined to the coastal lowland area and are mainly restricted to areas with an elevation of less than 10 m Australian Height Datum (AHD). The recorded acidity might have been caused by other factors rather than ASS which is typically a Holocene age deposit.

The introduction section of the Acoustic Report prepared by GHD dated April 2014 states that Wollongong City Council is the proponent of the project. This is incorrect and needs to be amended.
This report has considered the NSW Industrial Noise Policy 2000 for establishing the background noise however; the background noise is also included current operational noise. The current operational noise requires to be excluded from background noise. In addition, when determining the operational noise for the development, the "modifying factor correction" as per Table 4.1 in the NSW Industrial Noise Policy 2000 and temperature inversion scenario is required to be considered.

A level 2 modelling assessment to predict odour, Total Suspended Particles (TSP), PM_{10} and PM_{25}, including a concentration contour map for five possible receivers within the site catchment has been provided in the Air Quality Assessment report prepared by GHD. According to the modelling results contained in the report, 24 hours concentration of particulate matter and odour (Figures 14, 15 & 16) in all locations are below the assessment criteria. It is recommended due to the nature of the operations, dust and odour are major environmental concerns and dust should be monitored 24/7 by installing an automated unattended particulate monitoring station.

The Vegetation Management Plan (VMP) prepared by Southern Habitat updated 15 April 2014 is a draft document and contains limited revisions from the original VMP dated January 2012. The current VMP accompanying the EIS does not reflect the current site conditions and works that have already been completed to date to implement the Vegetation Management Plan dated January 2012 which formed part of the consent DA-2009/1153/A. A finalised Vegetation Management Plan should be provided to reflect the current site conditions and the works that have already been completed to date to implement the VMP prepared Southern Habitat dated January 2012. This is to include an updated restoration plan of action and costing's required to meet the specified performance criteria.

The Water Sensitive Urban Design (WSUD) report was prepared KFW Consulting dated July 2013. The report has considered the objectives in Chapter E15 in Wollongong Development Control Plan 2009 and used Model for Urban Stormwater Improvement Conceptualisation (MUSIC) model for achieving the water quality objectives. The WSUD report has recommended a water quality treatment drain consisting of rainwater capturing, infiltration and gross pollution traps that is capable of removing pollutants, grease and grit. The WSUD report has concentrated on the removal of pollutants and there is an inconsistency in the volumes of inflow before water quality treatment devices and after treatment. These volumes need to be revised and reflect exact stormwater water flow calculations. The Figure 6 does not show all the proposed WSUD treatment devices.

Stormwater

The revised draft EIS has been reviewed in accordance with Chapters E13 and E14 of WDCP 2009 and the NSW Government's Floodplain Development Manual 2005 and the following comments are provided:

Flood data submitted in support of this application failed to include pre and post development flood extents for all flood events up to and including the PMF (Probable Maximum Flood). The flood study must also determine and clearly show any effects of filling in the floodplain for the 1% AEP (Annual Exceedence Probability) and PMF flood events.

Flood inundation plans prepared by KFW indicate that part of the stockpile area is inundated by flooding during a PMF flood event. In this respect documentation submitted in support of this application has not detailed measures to be implemented that will prevent these stockpiled materials from being transported from the development site during this flood event. The KFW soil and water management details are insufficient for this occurrence.

Concerning the KFW Water Sensitive Urban Design (WSUD) Strategy (KF110816) dated July 2013 it is noted that Figures 3 and 4 within the report are the same flood inundation maps with different titles i.e., "1% AEP and PMF Flood Inundation Map". This anomaly was mentioned in Council's previous correspondence dated 5 December 2013.

The DRAINS summary tables 8.1 and 8.2 for Basin 1(A) in the KFW WSUD Strategy Report failed to demonstrate that post development stormwater outflows from this On Site Stormwater Detention (OSD) basin maintains pre-development outflows or reduces them.

Linked to the above it is noted that the WSUD report references the DRAINS output being presented in "Annexure C", however an examination of the report shows the output in Appendix B. Previous correspondence also made mention of the fact that all open water storage facilities i.e., OSD, Water Quality and Shedding Runoff ponds must have at least one side with a batter slope of not steeper than 1 in 4 to facilitate easy egress from the pond following possible accidental entry. This requirement should also be coupled with lockable security fencing.

An examination of the stormwater layout on the Site, Pond Details and Soil & Water Management Plans in the KFW WSUD Strategy report has revealed that these plans are inconsistent with the stormwater layout on the Site Plan-Proposed Layout-Flood Lines and the Site Plan – Proposed Layout Plans in the KFW Flood analysis Review. All plans submitted in support of this development should have consistent stormwater management layout plans. In connection to this matter the method of stormwater connection into the watercourse must also be consistent throughout the full drawing set.

It is noted that in the WSUD Strategy report that OSD calculations were "cross checked" incorrectly using the Wollongong City Council method. This method should be used for tributary areas of 20000 m^2 or less in accordance with Section 12.1.1(2)(a) of Council's Wollongong DCP 2009.

It is recommended that a single, current, concise, integrated and cohesive technical flood study report containing copies of any related documents including a full set of plans consistent in layout and design detail to be provided. This report should include relevant summaries and conclusions in closing.

Geotechnical

The Geotechnical Investigation Report dated May 2013 prepared by Benviron Group contained within the EIS has been reviewed as is noted to be incomplete. The attachments listed in this report Appendix A –D were not included within the EIS.

It is considered that the report has a number of inconsistencies and errors. The report describes the site as being underlain by Hawkesbury Sandstone. Based on known geotechnical information and knowledge for the general area the site is located at the base of the Pheasants Nest Formation which lies over the Budgong Sandstone (Illawarra Coal Measures). Each of these geological strata has substantially different properties to Hawkesbury Sandstone.

Due to the incomplete report and concern over the accuracy of the description of the geology of the site, it has not been demonstrated that geotechnical and related structural matters have been appropriately investigated and documented and establish whether the proposed development is appropriate to be carried out.

Traffic

The proposal is listed in Column 2 of Schedule 3 of State Environmental Planning Policy (SEPP) Infrastructure (2007) as Traffic Generating Development which also requires consideration by Roads and Maritime Services. The following issues are raised:

Until the Northcliffe Drive Extension (major collector) is constructed (approximately year 2036 based on Wollongong City Council's TRACKS model), all development-generated traffic must access the site via the West Dapto Road/Wylie Road intersection. Therefore modelling of the impact of traffic generated from the production of 230,000t/per annum on the West Dapto Road/Wylie Road intersection up to year 2036 to show acceptable network operation prior to the Northcliffe Drive Extension being delivered is required.

Note: Wollongong City Council's Traffic Section can provide the 2031 TRACKS model which estimates traffic flows prior to the delivery of the Northcliffe Drive Extension.

The proposed off-set intersection treatment at 2036 (Connection to the Northcliffe Drive Extension) is not supported. Council's future road network proposes a significant consolidated intersection treatment in this location at Wylie Road (Chapter D16 of WDCP 2009). One consolidated intersection treatment would reduce the number of intersections onto a major collector road which is considered significantly safer and more efficient than two separate staggered intersections.

MTG

Model. Straight

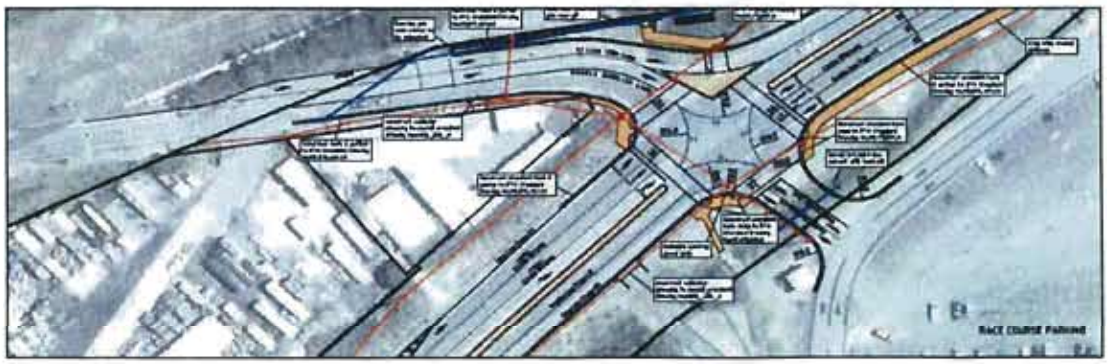
KFW

APPENDIX G

WCC REPORT ON INTERSECTION WEST DAPTO ROAD/PRINCES HIGHWAY

Intersection Signalisation
Princes Highway, West Dapto Road & Proposed Racecourse Entrance
Kembla Grange

TRAFFIC ANALYSIS & RISK ASSESSMENT OF POTENTIAL QUEUING TO RAILWAY LEVEL CROSSING



Wollongong City Council
Infrastructure - Strategy & Planning
30 November 2011 Ref: TC & AB

wollongong
city of innovation

Trim records Ref. Z11/268722

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1. Study Purpose, Existing Traffic Environment & Issues

1.1 Study Purpose and Objectives

The purpose of this study is to determine the suitability of signalising the intersection of Princes Highway and West Dapto Road together with a proposed fourth leg that would provide a new major access point to the Kembla Grange Racecourse. Subject to State Agency agreement to the proposal, it is Councils intention to commence intersection reconstruction and traffic signal installation early in 2012.

The study has two specific objectives, the first of which is to satisfy Roads and Maritime Services (RMS; previously RTA) that the proposed intersection layout and traffic signal operations are safe, geometrically appropriate and have the capacity to meet traffic increases arising from at least 10 + years growth. Secondly, this study must convincingly demonstrate to RailCorp that any traffic queues arising from the placement of the proposed traffic signals, in relatively close proximity to the South Coast Line railway level crossing at Kembla Grange, reduces the level of associated risk to such a level as to not require a link between rail track detectors and the traffic signal controller.

1.2 Existing T-junction location and description

West Dapto Road intersects Princes Highway at Kembla Grange approximately three kilometres north of Dapto. The intersection is channelized with priority control (stop sign) on the West Dapto Road approach. The intersection is situated on the apex of a slight curve, affording good driver sight distance in both directions for traffic entering and leaving the Highway.

At this location, the Princes Highway is a four lane divided carriageway with a sheltered right turn lane for traffic turning right into West Dapto Road. West Dapto Road consists of a single lane in each direction with some localised widening on the immediate approach to the intersection. (See attachment A)

1.3 Proximity to rail level crossing and rail station

The South Coast Rail Line crosses West Dapto Road at a level crossing some 150 metres west of the Princes Highway. There is approximately 130 metres of vehicle queuing length between the railway level crossing hold line and the Princes Highway stop line. Kembla Grange railway station is situated immediately north of the level crossing being used intermittently, mainly in association with major sporting and other recreational activities at the Kembla Grange Racecourse.

Data provided by RailCorp for a typical 24 hour period on 2 August 2011 has been analysed by Council which reveals the following: (See attachment G)

- Total of 88 train movements in 24hrs. on Tue 2/8/2011

- Minimum gap between trains = 4 min. 22 sec.
- Maximum gap between trains = 1 hr. 9 min. 13 sec.
- Average gap between trains = 15 min. 42 sec.

- Minimum duration of boom gate closure = 29 sec.
- Maximum duration of boom gate closure = 1 min. 41 sec.
- Average duration of boom gate closure = 47 sec.

1.4 Existing traffic volumes + %HVs

The following existing average daily traffic volumes have been recorded on each leg of the intersection: (See attachment F)

- Princes Highway (north of West Dapto Road) 14,000 vpd.
- Princes Highway (south of West Dapto Road) 10,000 vpd.
- West Dapto Road (west of rail level crossing) 4,000 vpd.

Intersection traffic turning volumes have been recently recorded and modelled to confirm existing good levels of service and some spare capacity in both the AM and PM peak periods. Current 2011 total entering volumes (average of AM and PM peak hours) of 1,069 vph have been used in the SIDRA intersection modelling. Percentage heavy vehicles of approximately 15% have been recorded in West Dapto Road and 10% on Princes Highway, north of the intersection.

1.5 Safety issues including pedestrian and traffic

Safety issues at the intersection can be classified as follows:

- Traffic operations / vehicle safety
- Other road users including pedestrian safety, and
- Specific issues relating to the railway level crossing.

The speed limit on all approach roads is 80 km/h and is generally considered to be appropriate for the environment and traffic conditions.

Some concerns have previously been raised regarding the number of accidents recorded at the intersection. In the 5 year period to 31 December 2009, ten crashes including seven casualty crashes were recorded. No record of any crashes at the level crossing were found.

The risk associated with pedestrians crossing at this location is considered to be high. The length of uncontrolled crossing over the Highway (approximately 20 metres) together with the relatively high speed environment are significant contributing factors. On race days, large numbers of pedestrians, some being alcohol affected, cross the Highway between the rail station and the race course further increasing the level of risk. Many bicycle users would also find this area difficult to negotiate and a threatening environment. It is also not uncommon for horses to be led across the Highway from stables on the western side to and from the racecourse.

As traffic volumes increase, so will the risk of traffic queues extending back from the West Dapto Road stop sign towards the railway level crossing. Depending on development growth rates, it would be only a matter of time before traffic queues in West Dapto Road reached the level crossing. Previous suggestions for the installation of either a roundabout or traffic signals to address this risk have been made. Traffic signals are considered to be the only practical means of ensuring priority is equitably shared between the conflicting traffic flows. Traffic signals would also include the means to clear any traffic queues that may extend back from the intersection over the rail lines. Pedestrian and cyclist access and safety is also greatly improved with controlled priority provided by traffic signals.

2. Future Traffic Environment & Issues

2.1 West Dapto growth (future traffic and HV volumes)

The NSW Department of Planning & Infrastructure (DP&I) has prepared a schedule of estimated growth in population and residential dwellings in West Dapto at yearly intervals up to 2051. In conjunction with NSW Transport – Roads and Maritime Services (RMS), Council has undertaken extensive traffic modelling to plan future transport infrastructure to meet the demands for the expected future development in this area. At around 2036, the average weekday traffic volume in West Dapto Road at the railway level crossing, currently some 4,000 vpd, is modelled to increase by approximately 220% to around 12,800 vpd. An increase in heavy vehicle numbers at a similar proportion to that currently existing is also predicted.

2.2 Strategic plans (future level crossing closure and alternatives)

The expected increase in traffic volumes on the road network will, over time, necessitate significant changes to the West Dapto area's transport infrastructure. In particular, for a number of reasons, the West Dapto Road railway level crossing is proposed to be closed and a new four lane arterial road referred to as the Northcliffe Drive extension will be constructed. Planning to date indicates that the level crossing closure and provision of the new east west arterial road will

occur around 2031 to 2036. The actual timeframe for this work is largely dependent on market forces driving demand for new development with resultant increases in traffic volumes.

Increasing traffic volumes therefore requires that road network performance be monitored. Consequently, a range of traffic related performance indicators are monitored that includes traffic accident data, traffic volumes, proportion of heavy vehicles, traffic delays and in this case, any interaction between road traffic and rail operations.

2.3 Increased train frequency and lengths

The West Dapto T-Map Extension Study (Connell Wagner, Oct. 2008) recommended eventual closure of road access at a number of existing railway level crossings and the provision of road bridges to grade separate traffic. This would not only greatly improve level crossing safety but permit an increase in train running speeds, longer trains and also rail line duplication for increased train frequency to and from Dapto. In addition to the increased risk associated with traffic volume increases, these future rail operational requirements will also drive the need to ultimately close the West Dapto Road (and others) railway level crossing.

2.4 Rationalisation of Racecourse entrance

The main entrance to the Kembla Grange Racecourse is on the Princes Highway some 150 metres north of West Dapto Road.

Whilst planning for an upgraded Princes Highway / West Dapto Road intersection, Council commenced negotiations with the Illawarra Turf Club with a view to consolidate Racecourse access and egress to a proposed four-way signalised intersection at West Dapto Road. Such an arrangement was subsequently seen as beneficial by the Turf Club with negotiations currently being formally finalised.

The existing right turn exit from the Racecourse is a difficult manoeuvre, with drivers entering a multi-lane arterial road having an 80 km/h speed limit. Therefore, this access is proposed to be modified to operate as a "left turn in" only with full access to and from each direction provided at the proposed four way signalised intersection. The proposed traffic signals would not only provide for the safe egress of racecourse traffic but also provide a safe crossing point for patrons using the Kembla Grange rail station.

2.5 Civil Design layout and station access

A civil design layout plan has been prepared by Council that provides for a four way signalised intersection at Princes Highway and West Dapto Road. (See attachment B, layout plan No. 4617 SK1 Issue 3) The key feature of this design is the provision of a "continuous left slip lane" for the east bound left turn traffic movement from West Dapto Road. This movement enters the Princes Highway without requiring a merge by utilising the existing northbound nearside through lane which, south of the intersection, has been changed to a "left turn only" lane and "dropped" at West Dapto Road.

The design layout also formalises vehicular and pedestrian access to the Kembla Grange Rail Station. A formalised vehicle crossing point is to be provided into the railway car park with pedestrian paths provided to and from the traffic signal crossing points. Discussions have been held between RailCorp Station personnel and Council management regarding these works which are now wholly situated within the public road reserve. Surface stormwater drainage is also addressed. A major gas main valve installation and a power pole also require relocation.

A small area of private land is required for a pedestrian path on the south west corner of the intersection for which negotiations are currently being finalised.

3. Proposed Traffic Signals

3.1 Four way intersection and lane configuration

Council has had a number of meetings with RMS and been advised that RMS acknowledge the road safety benefits for all road users including pedestrians and therefore supports this project subject to design and traffic operations satisfying its requirements.

The existing Princes Highway and West Dapto Road priority controlled junction is proposed to be converted into a channelized four way signalised intersection. (See layout plan No. 4617 SK1 Issue 3 attached.) Dedicated right turn storage lanes are proposed on both Princes Highway approaches with shared through and right lanes on the other approaches. On the Princes Highway, two southbound through lanes are provided and south of the intersection, only one northbound through lane. This lane configuration permits the continuous left slip lane from West Dapto Road to enter the single northbound through traffic stream in its own lane without the need for road widening or a traffic merge.

However, whilst the provision of a continuous left slip lane addresses the potential queuing back to the level crossing issue, it introduces a weave traffic movement on Princes Highway. Vehicles turning left from West Dapto Road and wishing to make the right turn from Princes Highway to Northcliffe Drive would be required to weave across northbound through traffic on the Princes Highway.

Council assessed this matter to RMS satisfaction prior to proceeding with the design layout finalisation and SIDRA intersection signalisation analysis. (See attachment E)

The existing "back to back" right turn bays (65 metres each in length) on Princes Highway north of West Dapto Road are proposed to be replaced by a single right turn bay of 115 metres storage length to accommodate the heavy southbound right turn traffic volumes into West Dapto Road. Also, due to the high intermittent demand generated by the Racecourse, a right turn bay will be constructed on Princes Highway, south of West Dapto Road, for vehicles entering from the south.

A signalised pedestrian crossing feature is proposed between the left slip traffic island and the north western corner of the intersection adjacent to the Kembla Grange Railway Station (across the slip lane).

The 130 metres between the railway level crossing and the Princes Highway intersection provides for a lane diverge taper plus some 50 metres of dedicated storage on the West Dapto Road approach for through and right turning vehicles. Unlimited queuing is available within the Racecourse for traffic wishing to exit on that eastern approach.

3.2 Pedestrian crossings on all approaches

The proposed intersection layout makes provision for signalised pedestrian crossing movements across all approaches, including across the left slip lane from West Dapto Road. A concrete footpath will be provided from the left slip crossing on the north western corner towards the Kembla Grange railway station.

3.3 Proposed signal phasing arrangement and cycle time

It is proposed that the traffic signals operate as a 5 phase "single diamond overlap" arrangement with Highway right turn phases called up according to demand. The West Dapto Road and Racecourse approaches operate under separate "split approach" phasing for improved safety and traffic capacity.

3.4 SIDRA intersection modelling

SIDRA intersection computer modelling software was used to evaluate the signalisation of the proposed intersection layout. The five phase signal arrangement described above was used with traffic volumes derived from a number of sources.

The SIDRA traffic modelling is appended to this report as a separate document and provides a complete and detailed record of model inputs, outputs, analysis and conclusions. (See attachment C)

Intersection performance and operational outputs such as degree of saturation (v/c ratio), average delay (seconds), level of service (LOS) and traffic (95% ile) queue lengths were produced for a number of scenarios including;

- 2011 average weekday AM peak,
- 2011 average weekday PM peak,
- 2036 average weekday AM peak, and
- 2036 average weekday PM peak..

In addition, a number of Saturday race day traffic scenarios were modelled including; (See attachment D)

- 2011 Saturday Racecourse Max. inflow (11AM to 12 Noon),
- 2011 Saturday Racecourse Max. outflow (5PM to 6PM),
- 2036 Saturday Racecourse Max. inflow (11AM to 12 Noon), and
- 2036 Saturday Racecourse Max. outflow (5PM to 6PM).

Traffic volume and vehicle classification "tube" counts were undertaken by RMS and WCC on Princes Highway (south of the intersection) and on West Dapto Road (just west of the railway level crossing) in 2010 and 2011 which were used to derive counts for Princes Highway, north of the intersection. Intersection turning movement counts for weekday AM and PM peaks were undertaken by Council's contractor using video technology. These counts were used as the basis for the "existing" 2011 modelled traffic volumes and to "split" the tube count approach and departure volumes.

TRACKS strategic land use and traffic modelling software was used to produce 2036 traffic turning movement counts. Future heavy vehicle movement percentages were kept constant in line with future proportional growth in residential and industrial development in the local area.

Information was also provided by the Illawarra Turf Club for all traffic movements to and from the racecourse by direction of approach and departure for a typical Saturday race day. Historic data was also provided and an estimate of future growth which resulted in the application of a 50% growth factor in race day traffic at 2036. Saturday background traffic volumes were derived from the "tube" counts with the small (< 10%) left and right turn movements to and from West Dapto Road split on the same proportions as week days. The traffic associated with the racecourse was then added to the Saturday background traffic. The Saturday background traffic was then scaled up to 2036 and the future racecourse traffic again added.

Default minimum racecourse traffic volumes were modelled for weekday traffic to allow modelled traffic evaluation with split approach phases called up. Likewise, pedestrian volumes were assumed to increase to the point where the minimum phase times allowed for a pedestrian call for each phase.

Traffic signal cycle times used in the SIDRA modelling are as follows:

- 2011 AM Weekday; 70 seconds,
- 2011 PM Weekday; 80 seconds,
- 2036 AM Weekday; 120 seconds,
- 2036 PM Weekday; 120 seconds.

- 2011 Saturday Racecourse Max. inflow (AM); 90 seconds,
- 2011 Saturday Racecourse Max. outflow (PM); 80 seconds,
- 2036 Saturday Racecourse Max. inflow (AM); 110 seconds,
- 2036 Saturday Racecourse Max. outflow (PM); 120 seconds.

A summary of the SIDRA results are provided below.

Weekday Analysis

	AM Peak			PM Peak		
	LOS	**Av.D**	**DS**	**LOS**	**Av.D**	**DS**
2011	**B**	20	0.70	**B**	22	0.73
2036	**C**	32	0.96	**C**	36	1.00

Saturday Race day

	11am to 12 noon			5pm to 6pm		
	LOS	**Av.D**	**DS**	**LOS**	**Av.D**	**DS**
2011	**B**	27	0.73	**C**	35	0.87
2036	**C**	30	0.90	**D**	50	0.93

NB: LOS = Level Of service
Av.D = Average intersection delay (in seconds)
DS = Degree of Saturation (V/C ratio)

4. Analysis of Traffic Queuing Impacts

4.1 West Dapto Road approach – queuing back to rail level crossing

Previous intersection designs adopted a layout that brought the West Dapto Road approach up to the signalised hold line before permitting a left turn on green signal at a small radius left turn. A short through/right turn lane to accommodate only some 3 or 4 cars was provided The traffic signal phasing required for this layout resulted in the heavy left turn volume queued in 2 lanes back towards the railway level crossing during the Highway through movement phase.

The current proposed road layout incorporating the continuous left slip eliminates the probability of queues extending back to the railway level crossing. It is only when the pedestrian feature crossing the left slip lane is called that the continuous slip movement is halted. Under those circumstances, a 12 second delay per cycle (when demanded) is necessary which, with a future maximum traffic volume of 615 vph, results in an average queue of 2 vehicles (15 metres). Clearly the clearance back to the level crossing with capacity for up to 20 vehicles (130 metres) makes the likelihood of a significant queue a very unlikely occurrence. The longest queues modelled on the West Dapto Road approach are the through/right turn movements. These volumes are currently extremely small and even at 2036, the future scaled up volumes result in weekday PM queues of only 2.1 vehicles (15.0 metres) and for the 2036 race day AM, only 3.8 vehicles (26.8 metres). Again, the probability of these queues scaled up for a race day some 25 years away, extending even close to the railway level crossing is extremely small.

4.2 West Dapto Road departure – queuing back to Princes Highway

There is some potential for traffic queuing back from the level crossing towards the Princes Highway in the event of the train actuated level crossing boom gate closure. A simple pavement loop timed presence detector immediately west of the intersection in the West Dapto Road departure lane could be used to prevent additional vehicles entering the westbound departure lane which could queue across the intersection and block the northbound Highway traffic. The detector would force the traffic signal controller to skip the right turn "B" signal phase until the queue dissipates following the raising of the level crossing boom gates.

4.3 Princes Highway northbound

Traffic queues on Princes Highway northbound (south of the intersection) are potentially quite extensive, due to the relatively high traffic volumes (particularly at 2036) and a road layout that allocates only a single through lane to that movement. Queues of 76 and 64 metres for the 2011 AM and PM respectively increase to 268 and 299 metres for the 2036 AM and PM respectively. The 2036

Saturday race day queues increase to a slightly lesser length of 254 and 258 metres in the AM and PM respectively.

In no case does the modelling indicate the right turn bay storage length is exceeded with a maximum queue length of 14 metres produced during a Saturday race day at 2036 AM maximum traffic inflow. The 90 metre right turn storage bay length allows right turning vehicles access to the right turn bay under heavy through traffic queuing without adding further to that through queue length.

4.4 Princes Highway southbound

The heavy south bound right turn traffic movement exceeds the through volumes by a ratio of up to some 2.73 times (2036 AM peak). The proposed 115 metre length of right turn bay is more than adequate for the 2011 PM right turn volumes which would require storage for 8 vehicles (62 metres). A worst case eventuates by the 2036 weekday AM and PM both of which generate a right turn demand of 24 vehicles (188 metres). This queue would spill over into one of the through lanes with minimal traffic operational and intersection capacity impacts.

The SIDRA modelling shows that the two through lanes have adequate capacity, with a worst case queue length of 54 metres on a Saturday PM race day at 2036.

4.5 Racecourse approach

Minimum default traffic volumes in and out of the Racecourse for the week day peak traffic scenarios enabled the modelling to include the split approach signal phase applicable to the racecourse. Therefore, under those circumstances, the queue lengths within the racecourse are irrelevant with the impact on the peak traffic flows resulting from the extra phase being called up of interest.

However, the gate counts used for the Saturday racecourse peak modelling add substantially to the background Saturday traffic. There are no significant on site traffic queues resulting from the racecourse generated traffic in the 2011 Saturday modelling other than a peak exit traffic queue within the racecourse property of some 141 metres. The 2036 PM exit queue is proportionately longer and is modelled as being 337 metres in length. The modelling also indicates that the racecourse generated traffic in 2036 demands longer green time which in turn is partly responsible for some of the extended queuing on other approaches.

5. Conclusions

5.1 Probability of traffic queuing back towards rail level crossing

The signalisation of the proposed intersection is considered to be the most appropriate means of addressing the medium term growth in West Dapto traffic.

For this study, significant effort has been made to ascertain, not only future 2036 weekday peak traffic volumes, but peak Saturday traffic volumes at 2036 plus the added traffic generated by the adjacent Kembla Grange Racecourse. SIDRA traffic modelling was undertaken to test these traffic volumes which are considered to represent a "worst case" future scenario.

The extremely low weekday through/right traffic volumes out of West Dapto Road were found to produce almost negligible queues in the 2011 scenarios and a maximum of only 2.1 queued vehicles (15 metres) by 2036. However, there was seen to be a Saturday 2011 AM vehicle queue of 1.8 vehicles (14.7 metres) for the through/right turn traffic movement out of West Dapto Road, increasing to some 3.8 vehicles (27 metres) in 2036. This future maximum queue is still well short of the available 130 metres back to the level crossing boom gate. Furthermore, taking into account the proposed traffic signal future Saturday AM cycle time of 110 seconds together with the RailCorp recorded maximum boom gate closure time of 101 seconds and minimum recorded gap between trains of 4 minutes 22 seconds, any vehicles held by the boom gates and added to an "abnormal" through/right traffic queue would dissipate well before the next train arrival.

Therefore, the traffic analysis and computer modelling documented above in this report clearly shows that the civil design intersection layout (Plan No. 4617 SK1 Issue 3) having a continuous left slip lane from West Dapto Road, effectively eliminates the risk of any traffic queuing back from the intersection towards the railway level crossing. (NB; 95% ile traffic queues determined from modelling)

5.2 Probability of traffic queuing back towards Princes Highway

There is a low to moderate probability that in the event of the level crossing boom gate closure, a westbound traffic queue on West Dapto Road may form that extends back from the boom gate towards Princes Highway and into the intersection. This potential queuing raises the possibility that the queue (depending on individual driver awareness of the traffic rule "not to get caught in an intersection when the lights change --- Road Rules 2008 No. 128") may block north bound Princes Highway traffic. Such occurrences could be addressed by the placement of a pavement vehicle detector on the westbound departure lane that is presence timed to instruct the traffic signal controller to skip the right turn "B" phase until the queue is cleared. This technology is reasonably straight forward and is relatively common practice. "Do Not Queue Across Intersection" signage could also be placed to further address this issue.

5.3 Detectors as safety backup

The installation of train actuated detectors linked to adjacent traffic signals are commonly used where a traffic stream stopped by a red traffic signal is likely to queue back across a railway level crossing as a result. Given the results of the analysis and modelling undertaken in this study, it is considered that the risk of such a queue forming is so low as not to warrant such an arrangement.

However, the low to moderate probability within 10+ years of a traffic queue extending back to Princes Highway from the closed railway crossing boom gate combined with the likelihood of a driver's non-observance of the "blocking intersection" road rule would warrant measures to mitigate this risk. Therefore, the need for a West Dapto Road westbound departure lane detector supplemented by the appropriate signage is considered warranted.

5.4 Traffic Signal - rail level crossing visual separation

The visual interaction of the level crossing flashing red lights and the traffic signal lantern displays beyond has also been considered. In particular, the presentation of a traffic signal green lantern display in combination with the level crossing flashing red lights has, under some circumstances, been known to be hazardous. However, in this case the separation of these lights by some 140 metres presents an opportunity to provide louvered traffic signal lanterns angled slightly down to adequately address this issue. The curved alignment of West Dapto Road also assists in addressing this issue.

6. Recommendations

6.1 Agency consultation

It is recommended that the relevant NSW Government State Agencies including RailCorp and Transport for NSW; Roads and Maritime Services (RMS) be forwarded this report for their consideration and comment as previously agreed.

6.2 RMS Endorsement

It is recommended that RMS endorsement be sought for the work associated with the traffic signal modelling as detailed in this report together with associated civil and traffic signal design plans.

6.3 Advice to RailCorp

It is recommended that RailCorp be advised that it is Council's opinion that:

i) The existing "Stop Sign" traffic management arrangement on the West Dapto Road approach to its junction with Princes Highway will, with increases in traffic volumes arising from planned development, give rise to increasing levels of risk associated with traffic queues extending back to the railway level crossing in an uncontrolled manner.

ii) The signalisation of the proposed intersection layout incorporating the "continuous left slip lane" reduces the probability of traffic queuing back to the railway level crossing to a negligible or very low level of risk.

iii) There is seen to be no reason as to why (subject to RMS concurrence) construction of the proposed intersection and installation of traffic signals should not proceed in the near future without linked train actuated detectors.

==========

7. Attachments

A. Locality map and site photographs.

B. Civil design layout plan (left slip lane); Plan No. 4617 SK1 Issue 3

C. Traffic Modelling Evaluation (SIDRA Report), J Bates, 29 Nov. 2011

D. Racecourse Vehicle Survey and Advice. Illawarra Turf Club. Nov. 2011

E. Princes Highway weave analysis and RMS concurrence.

F. Intersection Movement and Tube Count Traffic Data.

G. Train Frequency and Level Crossing Closure Data. RailCorp Aug. 2011

==========

KFW

APPENDIX H

WCC TRACKS DATA 2031

David Dowey

From: Andrew Byers <AByers@wollongong.nsw.gov.au>
Sent: Wednesday, 11 June 2014 12:37 PM
To: David Dowey
Cc: Ted Collins
Subject: Wylie-West Dapto Rd intersection turning volumes
Attachments: Wylie-WD 2031 PMP.pdf; Wylie-WD 2031 AMP.pdf

Hi Dave,

As discussed, please see attached TRACKS 2031 intersection turning movements at Wylie Rd-West Dapto Rd.

There is only 1 small zone that connects to Wylie Rd and at this stage it appears the land use assigned to it may be a bit light-on. Therefore you could possibly make some assumptions about growth in this area and add on your anticipated generation to get a more realistic flow to/from Wylie Rd.

Regards,

Andrew Byers
Traffic & Transportation Engineer
Infrastructure
P: (02) 4227 7183
F: (02) 4226 9796
E: abyers@wollongong.nsw.gov.au
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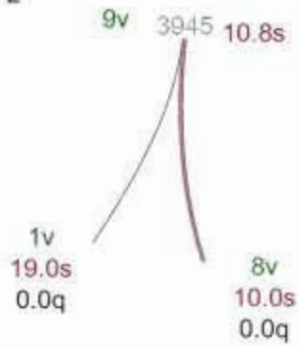

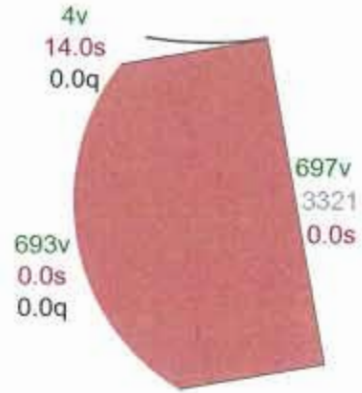

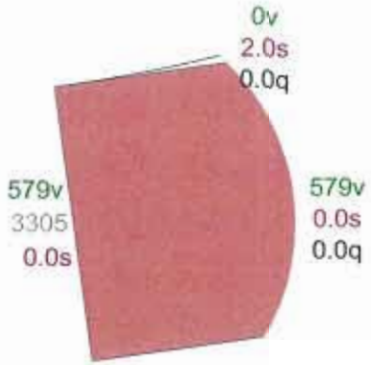

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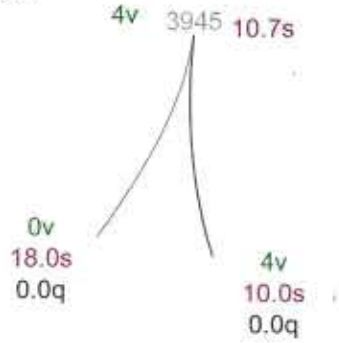
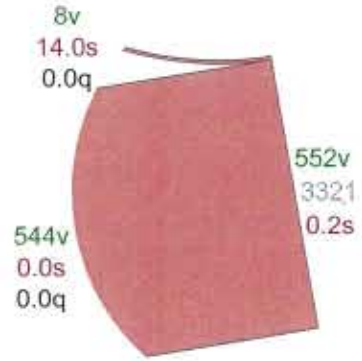
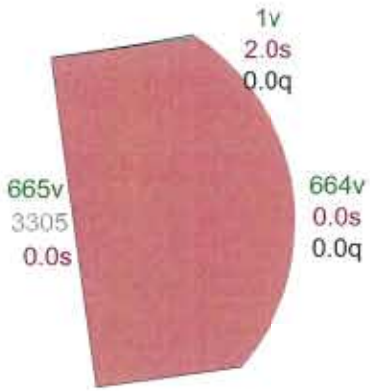






3317

APPENDIX I

WYLLIE ROAD/WEST DAPOT ROAD 2031 SIDRA RESULTS

LEVEL OF SERVICE

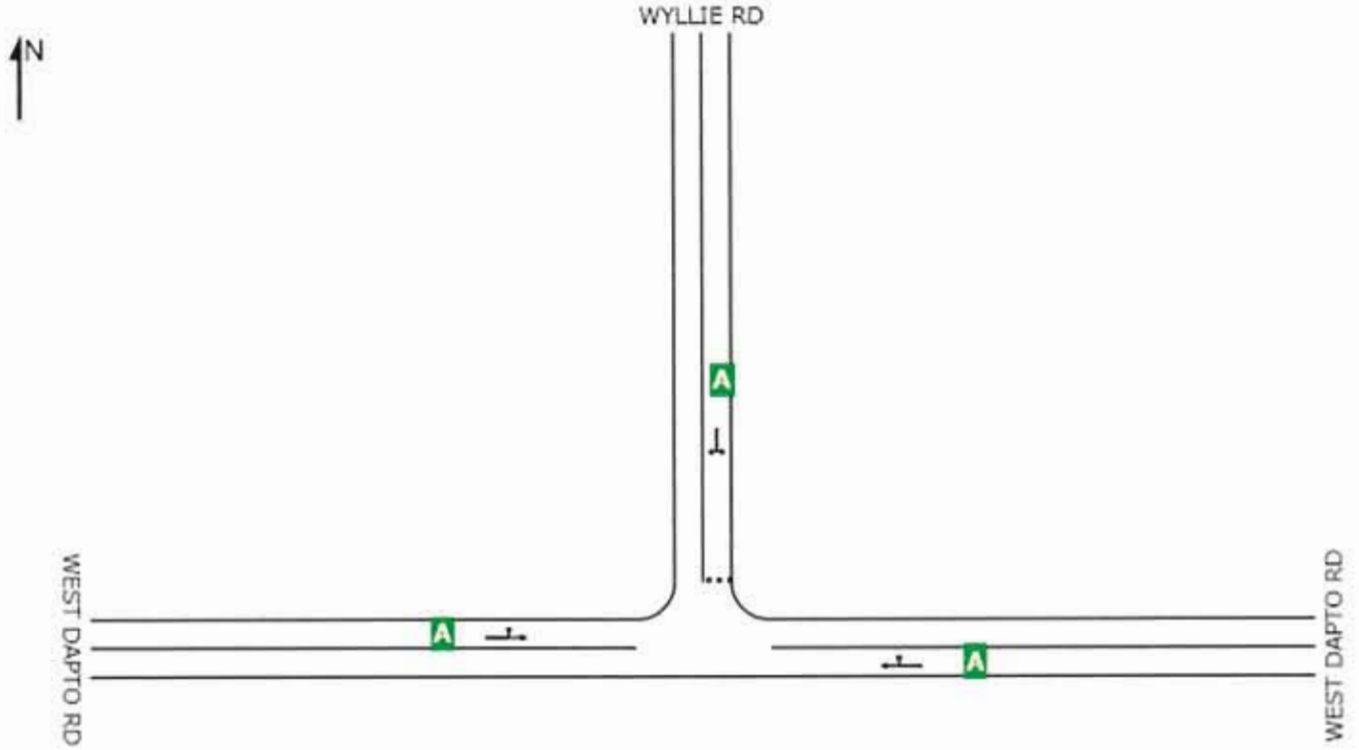
▽ Site: RECYCLING FACILITY

E16

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC AM VOLUMES YEAR 2031
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	A	NA	NA



Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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DEGREE OF SATURATION

Ratio of Demand Volume to Capacity (v/c ratio)

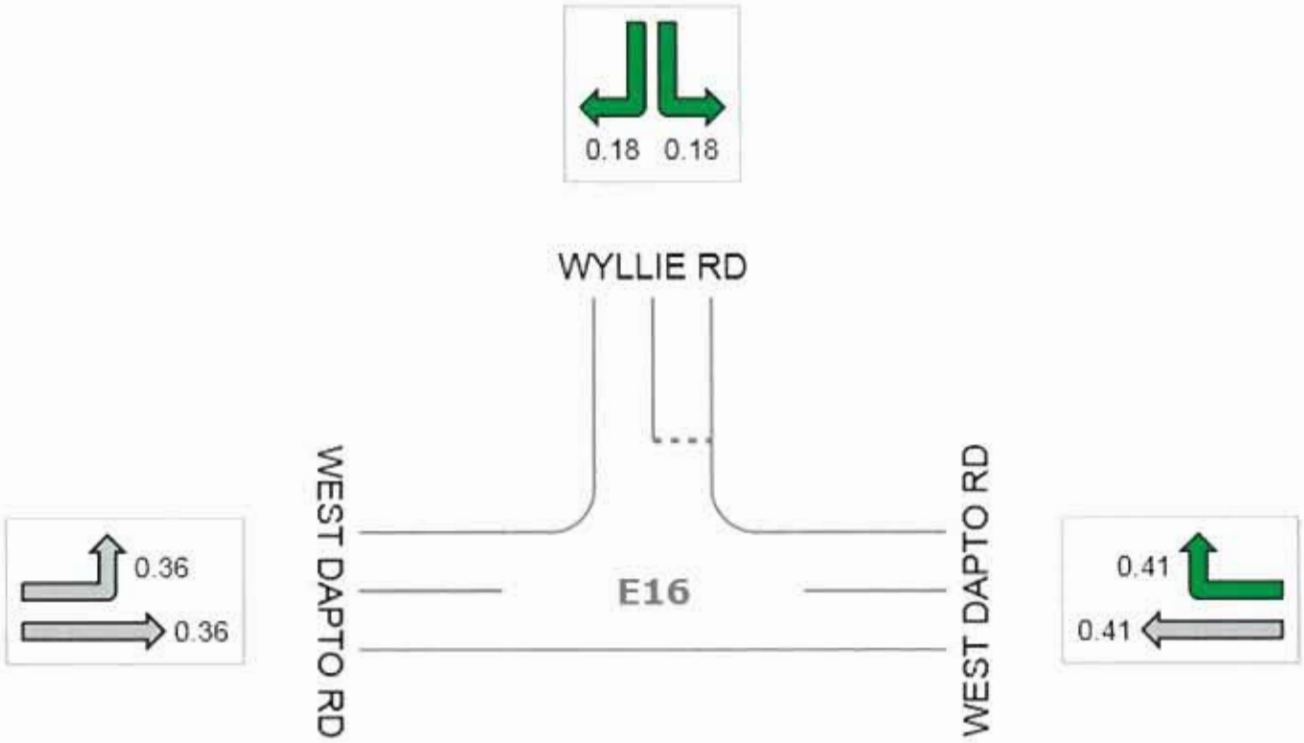
E16

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC AM VOLUMES YEAR 2031
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
Degree of Saturation	0.41	0.18	0.36	0.41



Colour code based on Degree of Saturation

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LEVEL OF SERVICE

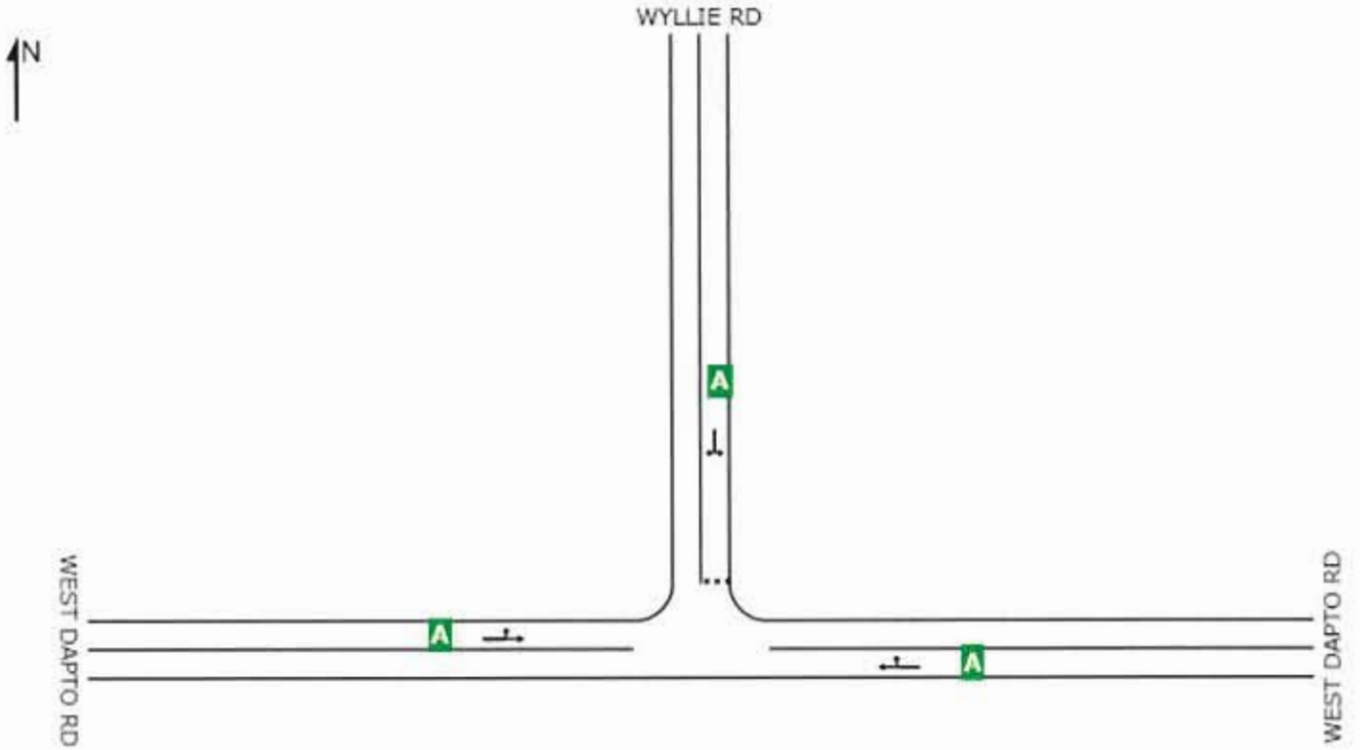
▽ Site: RECYCLING FACILITY

E17

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC PM VOLUMES YEAR 2031
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	A	NA	NA



Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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DEGREE OF SATURATION

Ratio of Demand Volume to Capacity (v/c ratio)

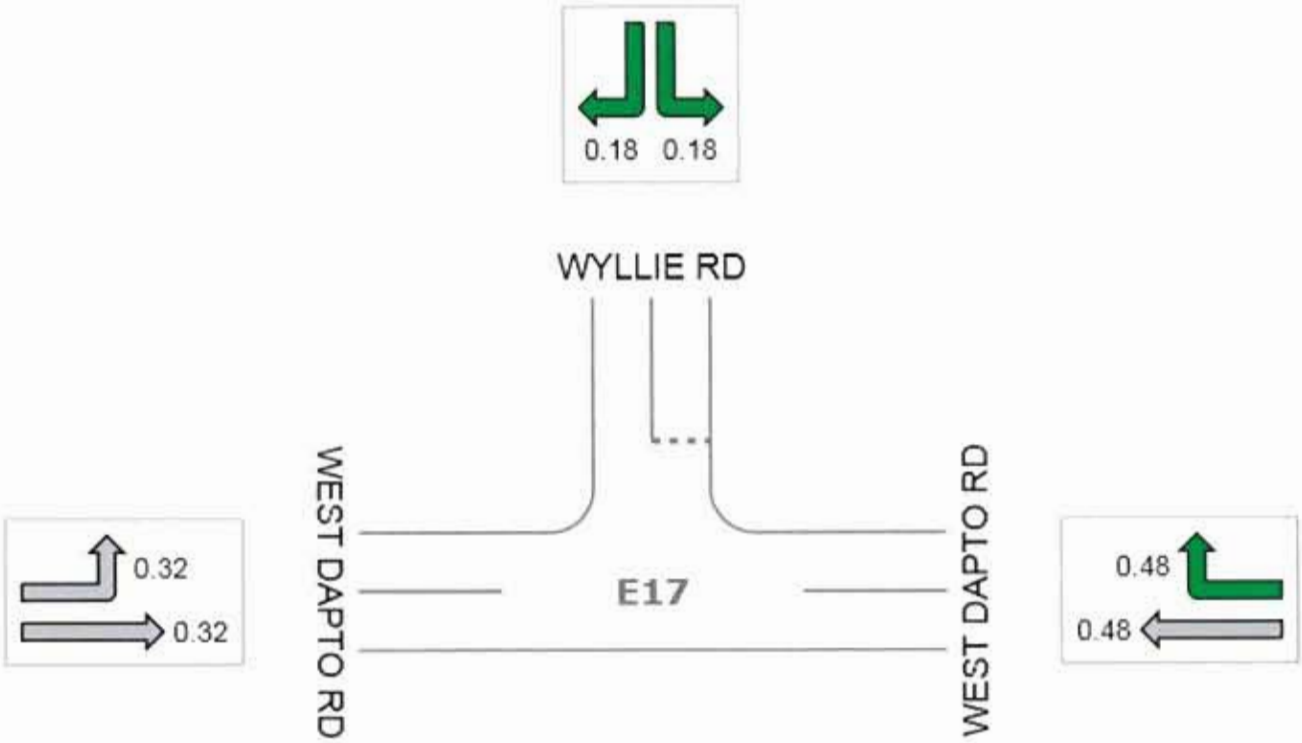
E17

▽ Site: RECYCLING FACILITY

INTERSECTION
WEST DAPTO RD / WYLLIE RD
PREDICTED TRAFFIC PM VOLUMES YEAR 2031
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
Degree of Saturation	0.48	0.18	0.32	0.48



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APPENDIX J

WCC DCP2009 – Ch E3 Schedule 1

Schedule 1 – Car Parking, Bicycle, Motorcycle and Delivery Vehicle Parking Requirements

Land Use	Car Parking Requirements	Bicycle Parking Requirements	Motorcycle Parking Requirement	Delivery / Service Truck Requirement
Boarding house	*City wide:* 0.5 car parking space per staff plus 1 car parking space per 5 beds	1 bicycle space per bed		NA
Dwelling house	*City wide:* 2 car parking spaces per dwelling *Wollongong city centre:* 1 car parking space per dwelling	NA	NA	NA
Dual occupancy	*City wide:* 1 car parking space per dwelling (<125m^2) or 2 car parking spaces per dwelling (125m^2 or greater)	NA	NA	NA
Residential flat building / Multi-dwelling housing / Shop top housing / Attached Dwelling	*City wide:* 1 car parking space per dwelling (<70m^2) or 1.5 car parking spaces per dwelling (70-110m^2) or 2 car parking spaces per dwelling (>110m^2), plus 0.2 car parking spaces per dwelling for visitors *Urban consolidation:* 0.75 car parking space per dwelling (<70m^2) or 1 car parking space per dwelling (70-110m^2) or 1.25 car parking spaces per dwelling (>110m^2) , plus 0.2 car parking spaces per dwelling for visitors *Wollongong City Centre:* 1 car parking space per 1 bedroom dwelling or 1.2 car parking spaces per 2 bedroom dwelling or 2 car parking spaces per 3 bedroom dwelling, plus 0.2 car parking spaces per dwelling for visitors	1 bicycle space per 3 dwellings (residents) and 1 bicycle space per 12 dwellings (visitors)	1 motorcycle space per 15 dwellings	Large Rigid Vehicle (Waste Contractor)
Seniors housing (including housing for	*Residential care facilities:*	NA	NA	Large Rigid Vehicle

Land Use	Car Parking Requirements	Bicycle Parking Requirements	Motorcycle Parking Requirement	Delivery / Service Truck Requirement
people with a disability)	1 car parking space per 10 beds (or 1 car parking space per 15 beds if the facility provides care for dementia patients only) plus 1 car parking space per 2 employees plus 1 ambulance space. *Hostels:* 1 car parking space per 5 dwellings plus 1 car parking space per 2 employees plus 1 ambulance space *Self contained dwellings:* 0.5 car parking space per bedroom or 1 car parking space per 5 dwellings where social housing Note: The parking rates are based on the maximum rates indicated in SEPP (Housing for Seniors or People with a Disability) 2004			
Hospitals	*City wide:* I car parking space per medical practitioner plus 1 car parking space plus 2 employee plus 1 car parking space per 2 beds.			
Backpackers accommodation	*City wide:* 1 car parking space per 2 staff plus 1 car parking space per 5 beds	1 bicycle space per 5 beds plus 1 car parking space per staff member	1 motor cycle space per 25 car parking spaces	NA
Bed and breakfast accommodation	*City wide:* As per dwelling house plus 1 car parking space per guest bedroom	NA	1 motor cycle space per 10 guest bedrooms	NA
Tourist and visitor accommodation	*City wide:* 1 car parking space per 2 staff members plus 1 car parking space per apartment / unit	NA	1 motor cycle space per 10 apartments / units	Small Rigid Vehicle
Office premises	*City wide (excluding Wollongong City Centre B3 Commercial Core and B4*	1 bicycle space per 200m^2 GFA	1 motorcycle space per 25 car parking	Large Rigid Vehicle

Land Use	Car Parking Requirements	Bicycle Parking Requirements	Motorcycle Parking Requirement	Delivery / Service Truck Requirement
	Mixed Use zones): 1 car parking space per 40m^2 of GFA (applies to majority of Business centres, excluding Wollongong City Centre) *Zones B3 Commercial Core and B4 Mixed Use in Wollongong City centre (as per WLEP 2009):* 1 car parking space per 30m^2 of GFA for ground floor level office premises; and 1 car parking space per 50m^2 of GFA for upper floor level office premises, (ie above ground floor)	for staff plus 1 bicycle space per 750m^2 GFA for visitors	spaces	
Business premises / Retail premises	*City wide (excluding Wollongong City Centre B3 Commercial Core and B4 Mixed Use zones)*: 1 car parking space per 40m^2 of GFA – business premises (applies to majority of Business centres, excluding Wollongong City Centre) 1 car parking space per 25m^2 of GFA – retail premises (applies to majority of Business centres, excluding Wollongong City Centre) *Zones B3 Commercial Core and B4Mixed Use in Wollongong City Centre (as per WLEP2009):* 1 car parking space per 30m^2 of GFA for ground floor level business or retail premises 1 car parking space per 50m^2 of GFA for upper floor level business or retail premises (ie above ground floor level) *Note 1:* Where there is an inconsistency between the parking rates specified for uses within the "Business premises" and "Retail premises" groups, the specific parking rates shall prevail except in	1 bicycle space per 200m^2 GFA for staff plus 1 bicycle space per 750m^2 GFA for visitors – business premises. 1 bicycle space per 750m^2 GFA for staff plus 1 bicycle space per 1000m^2 GFA for shoppers – retail premises.	1 motorcycle space per 25 car parking spaces	Large Rigid Vehicle – Articulated Vehicle (Semi-Trailer)*

Land Use	Car Parking Requirements	Bicycle Parking Requirements	Motorcycle Parking Requirement	Delivery / Service Truck Requirement
	Zones B3 and B4 in Wollongong city centre. For example, the specific parking rate for Medical Centre is 4/consulting room plus 1/3 employees. This rate would prevail over the general Business Premises rate of 1/40m^2, except if the development is located in Zones B3 or B4 in Wollongong city centre.			
Bulky goods premises	*City wide*: 1 car parking space per 30m^2 GFA (<500m^2) or 2 car parking spaces per 100m^2 (500-3000m^2) or 2 car parking spaces per 150m^2 (>3000m^2)	1 bicycle space per 200m^2 GFA	1 motor cycle space per 25 car spaces	Large Rigid Vehicle – Articulated Vehicle (Semi-Trailer)*
Vehicle sales or hire premises	*City wide*: 0.75 car parking spaces per 100m^2 GFA plus 3 car parking spaces per work bay where servicing is undertaken	1 bicycle space per 200m^2 GFA	1 motor cycle space per 25 car parking spaces	Articulated Vehicle (Semi-Trailer)
Car tyre fitting centres	*City wide*: 3 car parking spaces per work bay	1 bicycle space	1 motor cycle space per 3 work bays	Large Rigid Vehicle
Food and drink premises	*City wide*: 1 car parking space per 25m^2 GFA	1 bicycle space per 200m^2 GFA	1 motor cycle space per 25 car parking spaces	Small Rigid Vehicle
Restaurant	*City wide*: 1 car parking space per 4 staff, plus 1 car parking space per 6m^2 or 1 car parking space per 4 seats whichever is the greater	1 bicycle space per 200m^2 GFA	1 motor cycle space per 25 car parking spaces	Small Rigid Vehicle
Take-away food premises	*City wide*: 1 car parking space per 25m^2 GFA	1 bicycle space per 100m^2 GFA	1 motor cycle space per 25 car parking spaces	Large Rigid Vehicle
Neighbourhood shop	*City wide*: 1 car parking space per 25m^2 GFA	1 bicycle space per 25m^2 GFA	1 motorcycle space per 25 car parking	Large Rigid Vehicle

Land Use	Car Parking Requirements	Bicycle Parking Requirements	Motorcycle Parking Requirement	Delivery / Service Truck Requirement
			spaces	
Kiosk	*City wide*: 1 car parking space per 25m^2 GFA	1 bicycle space per 25m^2 GFA	1 motorcycle space per 25 car parking spaces	Small Rigid Vehicle
Function centre	*City wide*: 1 car parking space per 2 staff plus 1 car parking space per 5m^2	1 bicycle space per 25m^2 GFA	1 motor cycle space per 25 car parking spaces	Large Rigid Vehicle
Market	*City wide*: 1 car parking space per 20m^2 of each stall area Note: Major retail markets may require additional car parking as well as provision for an emergency vehicle	1 bicycle space per 10 stalls	1 motor cycle space per 25 car parking spaces	Small Rigid Vehicle
Medical centre / Health consulting room	*City wide*: 4 car parking spaces per consulting room plus 1 car parking space per 3 employees	1 bicycle space per medical centre	1 motorcycle space per 25 car parking spaces	Small Rigid Vehicle
Hotel or motel accommodation	*City wide:* 1 car parking space per 2 staff members plus 1 car parking space per unit / apartment *Wollongong City Centre:* 1 car parking space per 4 staff plus 1 car parking space per motel unit or 0.5 car parking space per hotel unit / apartment *Zones B3 Commercial Core and B4Mixed Use in Wollongong city centre (as per WLEP):* 1 car parking space per 40m^2 GFA, where the hotel or motel accommodation is not strata subdivided If a restaurant is included in the hotel	NA	1 motor cycle space per 25 car parking spaces	Large Rigid Vehicle

Land Use	Car Parking Requirements	Bicycle Parking Requirements	Motorcycle Parking Requirement	Delivery / Service Truck Requirement
	/ motel which is available to the general public, then an additional 15 car parking spaces per 100m^2 GFA of the restaurant shall be included			
Pub / Registered Club	*City wide:* 1 car parking space per 2 staff plus 1 car parking space per 5m^2 GFA or 1 car parking space per 6 seats (whichever is the greater)	1 bicycle space per 25m^2 GFA	1 motorcycle space per 25 car parking spaces	Large Rigid Vehicle
Funeral home / Funeral chapel	*City wide:* 1 car parking space per 4 seats plus 1 car parking space per funeral service area	NA	1 motor cycle space per 25 car parking spaces	Small Rigid Vehicle
Restricted premises	*City wide:* 1 car parking space per 40m^2	1 bicycle space per 200m^2 GFA	1 motor cycle space per 25 car parking spaces	Small Rigid Vehicle
Video stores	*City wide:* 6 car parking spaces per 100m^2 GFA	1 bicycle space per 200m^2 GFA	1 motor cycle space per 25 car parking spaces	Small Rigid Vehicle
Service station / convenience store / fast food restaurant	*City wide:* 1 car parking space per 2 staff plus 3 car parking space per work bay plus 1 car parking space per 25m^2 of retail convenience store plus 10 car parking spaces for any ancillary fast food restaurant component	2 bicycle spaces	1 motor cycle space per 10 car parking spaces	Articulated Vehicle (Semi-Trailer)
Timber and building supplies	*City wide:* 1 car parking space per 45m^2 GFA	1 bicycle space per 200m^2 GFA of factory building	1 motor cycle space per 25 car parking spaces	Large Rigid Vehicle – Articulated Vehicle (Semi-Trailer)*
Veterinary hospital	*City wide:* 3 car parking spaces per consulting room plus a loading / unloading area to cater for horse trailers etc (If the veterinary hospital involves care for larger animals)	NA	NA	Small Rigid Vehicle plus trailer parking / manoeuvring

Land Use	Car Parking Requirements	Bicycle Parking Requirements	Motorcycle Parking Requirement	Delivery / Service Truck Requirement
Industry	*City wide:* 1 car parking space per 75m^2 GFA; or 1 car parking space per 150m^2 GFA for buildings greater than 5,000m^2 where the facility is purpose built for a particular business and where it can demonstrated that staff car parking is satisfactorily catered for	1 bicycle space per 200m^2 GFA	1 motor cycle space per 25 car parking spaces	Large Rigid Vehicle – Articulated Vehicle (Semi-Trailer)*
Warehouse / Distribution centre	*City wide:* 1 car parking space per 75m^2 GFA; or 1 car parking space per 150m^2 GFA for buildings greater than 10,000 square metres of gross floor area where the facility is purpose built for a particular business and where it can be demonstrated that employee car parking is satisfactorily catered for	1 bicycle space per 200m^2 GFA	1 motor cycle space 25 car parking spaces	Large Rigid Vehicle – Articulated Vehicle (Semi-Trailer)*
Light Industrial Retail Outlets	*City wide:* 1 car parking space per 25m^2 GFA of gross floor area	1 bicycle space per 200m^2 GFA	1 motorcycle space per 25 car spaces or part thereof	Large Rigid Vehicle
Landscape and garden supplies	*City wide:* 1 car parking space per 30m^2 GFA of any building used for retailing plus 1 car parking space per 45m^2 for outdoor areas used for retail display purposes plus 1 car parking space per 200m^2 for areas used exclusively for propagation or storage, whether indoor or outdoor.	NA	1 motorcycle space per 25 car parking spaces	Large Rigid Vehicle – Articulated Vehicle (Semi-Trailer)*
Retail Plant Nursery	*City wide:* 10 car parking spaces plus 1 additional car parking space per 100m^2 of building GFA or land area used for the retailing of plants	NA	1 motorcycle space per 25 car parking spaces	Large Rigid Vehicle – Articulated Vehicle (Semi-Trailer)*
Vehicle body repair shop /	*City wide:*	1 bicycle space per	1 motor cycle space per 25	Large Rigid

Land Use	Car Parking Requirements	Bicycle Parking Requirements	Motorcycle Parking Requirement	Delivery / Service Truck Requirement
Vehicle repair station	1 car parking space per 2 employees plus 3 car parking spaces per work bay	200m^2 GFA	car parking spaces	Vehicle
Manufactured home estate	*City wide:* Car Parking as per Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2005	NA	NA	Large Rigid Vehicle
Caravan park	*City wide:* 1 car parking space per site Note: In accordance with Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2005	NA	NA	Large Rigid Vehicle (Waste collection trucks and Coaches)
Educational establishment	*1 car parking space per staff member plus 1 car parking space per 10 Year 12 students.*	1 bicycle space per 100 students	1 motor cycle space per 25 car parking spaces	Large Rigid Vehicle

Note*: The determination as to the standard truck size for a particular development will be dependent upon the nature and scale of the development and will be determined by Council at the pre-lodgement meeting stage.