Intersection movement summary in 2026 Base + Other Development with upgrades

Parker St / Coreen Ave / Richmond Rd

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	146	5.0	0.253	9.3	LOS A	0.9	6.9	0.06	0.58	51.9
2	T	1202	5.7	0.908	55.2	LOS D	31.1	228.4	1.00	0.96	23.4
3	R	229	1.8	1.039	130.7	LOS F	21.5	152.7	1.00	1.09	13.1
Approach		1578	5.1	1.039	60.7	LOS E	31.1	228.4	0.91	0.94	22.2
East: Oxford St (E)											
4	L	94	6.7	1.000 [3]	76.8	LOS F	7.1	52.8	0.98	0.76	19.1
5	T	200	1.6	1.052	149.4	LOS F	24.5	174.5	1.00	1.28	10.7
6	R	68	4.6	0.549	75.9	LOS F	6.3	45.9	0.97	0.76	19.5
Approach		362	3.5	1.052	119.8	LOS F	24.5	174.5	0.99	1.07	13.2
North: Richmond Rd (N)											
7	L	1	0.0	0.858	111.3	LOS F	88.9	645.2	1.00	1.34	16.5
8	T	2675	4.3	1.069	102.7	LOS F	100.3	728.4	1.00	1.33	15.3
9	R	547	1.7	0.896	49.2	LOS D	29.8	211.6	0.82	0.86	26.2
Approach		3223	3.9	1.069	93.6	LOS F	100.3	728.4	0.97	1.25	16.5
West: Coreen Ave (W)											
10	L	51	4.2	0.122	13.6	LOS A	1.5	11.2	0.34	0.64	40.2
11	T	109	0.0	0.301	56.6	LOS E	8.6	60.3	0.91	0.72	21.6
12	R	162	5.2	0.485	66.4	LOS E	12.3	89.9	0.94	0.81	21.0
Approach		322	3.3	0.485	54.8	LOS D	12.3	89.9	0.84	0.75	23.0
All Vehicles		5485	4.2	1.069	83.6	LOS F	100.3	728.4	0.95	1.12	17.8

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	138	3.8	0.183	8.5	LOS A	0.6	4.3	0.06	0.59	53.0
2	T	2512	3.1	1.142	166.9	LOS F	99.4	713.8	1.00	1.76	10.4
3	R	77	8.2	0.376	56.8	LOS E	5.5	41.1	0.91	0.75	23.4
Approach		2726	3.2	1.142	155.8	LOS F	99.4	713.8	0.95	1.67	11.0
East: Oxford St (E)											
4	L	71	6.0	0.793	75.0	LOS F	6.0	44.3	1.00	0.88	19.5
5	T	121	1.7	1.076	151.2	LOS F	13.7	97.0	1.00	1.25	10.7
6	R	74	1.4	0.687	72.5	LOS F	6.1	43.4	1.00	0.82	20.2
Approach		265	2.8	1.076	109.1	LOS F	13.7	97.0	1.00	1.03	14.5
North: Richmond Rd (N)											
7	L	1	0.0	0.542	44.9	LOS D	25.0	181.5	0.71	1.16	29.6
8	T	1461	4.3	0.723	23.8	LOS B	25.0	181.5	0.72	0.64	36.6
9	R	408	1.5	1.168	198.1	LOS F	31.4	222.6	0.98	1.28	9.1
Approach		1871	3.7	1.168	51.1	LOS D	31.4	222.6	0.76	0.74	24.8
West: Coreen Ave (W)											
10	L	615	1.9	0.653	26.6	LOS B	24.6	174.8	0.79	0.83	32.7
11	T	192	1.1	0.409	41.4	LOS C	24.6	174.8	0.89	0.74	25.8
12	R	218	3.9	0.499	49.8	LOS D	12.7	91.6	0.91	0.81	24.7
Approach		1024	2.2	0.653	34.3	LOS C	24.6	174.8	0.83	0.81	29.3
All Vehicles		5886	3.2	1.168	99.3	LOS F	99.4	713.8	0.87	1.20	15.8

Intersection movement summary in 2026 Base + Other Development with upgrades

Parker St / Copeland St

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	43	4.9	0.360	10.7	LOS A	3.3	24.0	0.08	1.36	51.4
2	T	1979	4.2	0.658	2.2	LOS A	9.1	66.0	0.13	0.12	64.3
3	R	308	4.2	1.133	141.1	LOS F	24.3	176.0	0.98	1.07	12.2
Approach		2331	4.2	1.133	20.8	LOS B	24.3	176.0	0.24	0.27	42.3
East: Copeland St (E)											
4	L	526	3.6	0.753	48.9	LOS D	32.2	232.6	0.93	0.88	24.8
5	T	107	3.9	0.292	53.9	LOS D	8.2	59.3	0.90	0.72	21.1
6	R	65	3.2	0.297	66.7	LOS E	5.6	40.5	0.92	0.77	20.9
Approach		699	3.6	0.753	51.3	LOS D	32.2	232.6	0.93	0.84	23.8
North: Parker St (N)											
7	L	55	3.8	1.000 [3]	43.1	LOS D	18.1	131.1	1.00	0.87	30.7
8	T	2847	3.8	1.233	245.7	LOS F	205.3	1483.3	1.00	1.86	8.2
9	R	45	4.7	0.609	88.4	LOS F	4.7	34.5	1.00	0.77	17.6
Approach		2947	3.8	1.233	239.6	LOS F	205.3	1483.3	1.00	1.82	8.4
West: Copeland St (W)											
10	L	22	4.8	0.111	8.4	LOS A	0.3	2.3	0.18	0.62	44.3
11	T	98	3.2	1.293	88.0	LOS F	19.0	136.6	0.90	0.80	15.6
12	R	92	3.4	1.293	362.4	LOS F	19.0	136.6	1.00	1.58	5.7
Approach		212	3.5	1.292	198.5	LOS F	19.0	136.6	0.87	1.12	9.1
All Vehicles		6188	3.9	1.293	134.5	LOS F	205.3	1483.3	0.70	1.10	13.4

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	77	4.1	0.487	11.0	LOS A	5.3	38.2	0.10	1.29	51.1
2	T	2656	3.6	0.890	4.0	LOS A	26.6	192.2	0.31	0.29	60.4
3	R	496	3.8	0.938	46.8	LOS D	21.1	152.5	0.94	0.89	27.0
Approach		3228	3.7	0.938	10.8	LOS A	26.6	192.2	0.40	0.41	51.3
East: Copeland St (E)											
4	L	291	2.9	0.342	34.6	LOS C	14.7	105.2	0.68	0.80	29.3
5	T	55	3.8	0.160	55.8	LOS D	4.7	33.9	0.88	0.68	20.7
6	R	64	3.3	0.392	75.3	LOS F	6.0	43.2	0.97	0.77	19.4
Approach		409	3.1	0.392	43.8	LOS D	14.7	105.2	0.75	0.78	25.9
North: Parker St (N)											
7	L	45	2.3	0.924	53.1	LOS D	18.2	130.4	0.93	0.93	26.6
8	T	1887	3.2	0.926	55.4	LOS D	64.5	463.7	0.99	1.00	25.0
9	R	27	3.8	0.227	82.7	LOS F	2.9	20.9	0.98	0.72	18.4
Approach		1960	3.2	0.926	55.7	LOS D	64.5	463.7	0.99	1.00	25.0
West: Copeland St (W)											
10	L	61	1.7	0.304	13.7	LOS A	2.4	16.9	0.40	0.69	40.2
11	T	165	1.3	0.624	61.0	LOS E	13.4	94.9	0.95	0.77	19.5
12	R	47	2.2	0.623	70.3	LOS E	13.4	94.9	0.98	0.82	20.5
Approach		274	1.5	0.624	52.1	LOS D	13.4	94.9	0.84	0.76	22.5
All Vehicles		5872	3.4	0.938	30.0	LOS C	64.5	463.7	0.64	0.65	34.6

Intersection movement summary in 2026 Base + Other Development without upgrades

Parker St / Great Western Hwy

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	500	4.0	0.448	24.2	LOS B	16.6	119.9	0.57	0.85	39.2
2	T	1212	4.0	0.746	37.1	LOS C	35.8	259.3	0.91	0.82	31.4
3	R	199	4.0	1.067	168.1	LOS F	23.3	168.4	1.00	1.21	11.0
Approach		1912	4.0	1.068	47.4	LOS D	35.8	259.3	0.83	0.87	27.6
East: Great Western Hwy (E)											
4	L	194	3.8	0.107	7.7	NA[9]	NA[9]	NA[9]	0.00	0.60	49.8
5	T	1092	4.0	1.155	195.0	LOS F	63.5	459.5	0.99	1.45	9.2
6	R	187	3.9	1.074	172.6	LOS F	22.2	160.8	1.00	1.26	11.0
Approach		1473	3.9	1.155	167.5	LOS F	63.5	459.5	0.86	1.31	10.6
North: Parker St (N)											
7	L	1373	4.0	0.760	9.8	NA[9]	NA[9]	NA[9]	0.00	0.65	54.3
8	T	1832	4.0	1.132	158.0	LOS F	118.0	854.6	1.00	1.57	11.9
9	R	210	4.1	1.124	196.7	LOS F	26.4	191.6	1.00	1.21	9.6
Approach		3415	4.0	1.131	100.8	LOS F	118.0	854.6	0.60	1.18	17.0
West: Great Western Hwy (W)											
10	L	225	4.2	0.125	7.7	NA[9]	NA[9]	NA[9]	0.00	0.60	49.8
11	T	699	4.1	0.889	72.2	LOS F	27.7	200.4	1.00	1.02	19.5
12	R	157	4.0	0.900	92.9	LOS F	14.1	101.9	1.00	0.99	17.8
Approach		1081	4.1	0.900	61.7	LOS E	27.7	200.4	0.79	0.93	21.9
All Vehicles		7880	4.0	1.155	94.9	LOS F	118.0	854.6	0.73	1.09	17.3

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	369	3.1	0.427	37.0	LOS C	17.0	122.4	0.70	0.90	31.9
2	T	1676	3.0	1.369	411.3	LOS F	163.8	1176.3	1.00	2.32	5.2
3	R	137	3.1	1.130	221.1	LOS F	19.1	137.3	1.00	1.26	8.7
Approach		2182	3.0	1.369	336.0	LOS F	163.8	1176.3	0.95	2.02	6.2
East: Great Western Hwy (E)											
4	L	343	3.1	0.189	7.7	NA[9]	NA[9]	NA[9]	0.00	0.60	49.8
5	T	2075	3.0	1.410	264.3	LOS F	199.8	1434.2	0.97	0.62	15.2
6	R	154	3.0	1.157	244.2	LOS F	22.4	160.6	1.00	1.39	8.2
Approach		2573	3.0	1.410	228.9	LOS F	199.8	1434.2	0.84	0.66	16.2
North: Parker St (N)											
7	L	519	3.0	0.285	9.6	NA[9]	NA[9]	NA[9]	0.00	0.65	54.6
8	T	1548	3.0	1.270	293.7	LOS F	129.8	932.0	1.00	1.96	7.0
9	R	155	2.9	1.278	340.9	LOS F	26.7	191.4	1.00	1.41	5.9
Approach		2222	3.0	1.278	230.7	LOS F	129.8	932.0	0.77	1.62	8.7
West: Great Western Hwy (W)											
10	L	498	3.0	0.274	7.7	NA[9]	NA[9]	NA[9]	0.00	0.60	49.7
11	T	1014	3.0	0.705	41.9	LOS C	31.7	227.5	0.91	0.81	26.6
12	R	147	3.1	1.101	196.8	LOS F	19.2	137.9	1.00	1.29	9.9
Approach		1659	3.0	1.101	45.3	LOS D	31.7	227.5	0.65	0.79	26.1
All Vehicles		8636	3.0	1.410	221.1	LOS F	199.8	1434.2	0.81	1.27	9.8

Intersection movement summary in 2026 Base + Other Development with upgrades

Coreen Ave / Coombes Dr

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Coreen Ave (E)											
22	T	672	2.5	0.350	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
23	R	95	2.2	0.302	18.7	LOS B	1.6	11.3	0.73	0.92	39.7
Approach		766	2.5	0.350	2.3	LOS B	1.6	11.3	0.09	0.11	56.4
North East: Coombes Dr Stage 2 (N)											
26	R	21	10.0	0.099	24.4	LOS B	0.4	3.1	0.77	0.93	36.1
Approach		21	10.0	0.099	24.4	LOS B	0.4	3.1	0.77	0.93	36.1
North: Coombes Dr (N)											
7	L	53	12.0	0.113	12.3	LOS A	0.5	3.8	0.62	0.84	38.8
9	R	21	10.0	0.086	21.8	LOS B	0.4	2.8	0.73	0.92	34.1
Approach		74	11.4	0.113	15.0	LOS B	0.5	3.8	0.65	0.86	37.3
North West: Coreen Ave (W)											
27	L	42	12.5	0.025	9.6	LOS A	0.0	0.0	0.00	0.69	48.1
28	T	617	1.7	0.320	1.2	LOS A	0.0	0.0	0.00	0.12	57.0
Approach		659	2.4	0.320	1.7	LOS A	0.0	0.0	0.00	0.15	56.3
All Vehicles		1520	3.0	0.350	3.0	NA	1.6	11.3	0.09	0.18	54.6

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Coreen Ave (E)											
22	T	623	2.9	0.326	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
23	R	46	4.5	0.241	26.9	LOS B	1.1	7.9	0.83	0.95	34.6
Approach		669	3.0	0.326	1.9	LOS B	1.1	7.9	0.06	0.07	57.1
North East: Coombes Dr Stage 2 (N)											
26	R	24	13.0	0.107	23.3	LOS B	0.4	3.5	0.75	0.92	36.8
Approach		24	13.0	0.107	23.3	LOS B	0.4	3.5	0.75	0.92	36.8
North: Coombes Dr (N)											
7	L	136	0.8	0.346	15.9	LOS B	1.8	12.6	0.76	0.96	36.1
9	R	24	13.0	0.168	33.8	LOS C	0.7	5.3	0.85	0.96	28.8
Approach		160	2.6	0.346	18.6	LOS C	1.8	12.6	0.77	0.96	34.7
North West: Coreen Ave (W)											
27	L	19	5.6	0.011	9.3	LOS A	0.0	0.0	0.00	0.69	48.1
28	T	899	1.6	0.466	1.2	LOS A	0.0	0.0	0.00	0.12	57.0
Approach		918	1.7	0.466	1.4	LOS A	0.0	0.0	0.00	0.13	56.7
All Vehicles		1772	2.4	0.466	3.4	NA	1.8	12.6	0.10	0.19	53.4

Intersection movement summary in 2026 Base + Other Development without upgrades

Coreen Ave / Commuter Car Park Access

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Penrith Car Park Access											
1	L	23	0.0	0.067	10.5	LOS A	0.5	3.2	0.60	0.70	46.3
3	R	31	0.0	0.067	13.5	LOS A	0.5	3.2	0.60	0.75	44.0
Approach		54	0.0	0.067	12.2	LOS A	0.5	3.2	0.60	0.73	44.9
East: Coreen Ave (E)											
4	L	132	3.2	0.528	9.5	LOS A	5.7	40.7	0.55	0.65	47.3
5	T	484	2.8	0.529	8.7	LOS A	5.7	40.7	0.55	0.61	47.3
6	R	1	0.0	0.526	13.9	LOS A	5.7	40.7	0.55	0.77	44.3
Approach		617	2.9	0.529	8.8	LOS A	5.7	40.7	0.55	0.62	47.3
West: Coreen Ave (W)											
11	T	466	2.9	0.422	7.3	LOS A	4.7	33.8	0.23	0.52	49.1
12	R	155	2.7	0.422	11.1	LOS A	4.7	33.8	0.23	0.74	46.1
Approach		621	2.9	0.422	8.2	LOS A	4.7	33.8	0.23	0.57	48.3
All Vehicles		1292	2.8	0.529	8.7	LOS A	5.7	40.7	0.40	0.60	47.7

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Penrith Car Park Access											
1	L	132	0.8	0.326	12.2	LOS A	2.5	17.4	0.72	0.83	44.7
3	R	115	0.9	0.327	15.1	LOS B	2.5	17.4	0.72	0.87	42.7
Approach		246	0.9	0.327	13.6	LOS B	2.5	17.4	0.72	0.85	43.8
East: Coreen Ave (E)											
4	L	34	3.1	0.437	8.2	LOS A	5.0	35.7	0.28	0.60	48.4
5	T	589	2.3	0.439	7.4	LOS A	5.0	35.7	0.28	0.53	48.8
6	R	1	0.0	0.526	12.6	LOS A	5.0	35.7	0.28	0.79	45.1
Approach		624	2.4	0.439	7.4	LOS A	5.0	35.7	0.28	0.53	48.8
West: Coreen Ave (W)											
11	T	778	2.3	0.660	8.5	LOS A	9.5	67.8	0.64	0.58	47.0
12	R	43	2.4	0.664	12.4	LOS A	9.5	67.8	0.64	0.69	45.7
Approach		821	2.3	0.660	8.7	LOS A	9.5	67.8	0.64	0.58	46.9
All Vehicles		1692	2.1	0.664	8.9	LOS A	9.5	67.8	0.52	0.60	47.1

Intersection movement summary in 2026 Base + Other Development with upgrades

Castlereagh Rd / Coreen Ave

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Castlereagh Rd (S)											
1	L	85	8.6	0.419	24.9	LOS B	18.6	137.5	0.54	0.94	36.8
2	T	1459	6.0	0.419	13.8	LOS A	18.8	138.5	0.54	0.48	40.7
3	R	293	6.1	0.872	52.6	LOS D	12.7	93.5	0.99	0.88	24.5
Approach		1837	6.1	0.872	20.5	LOS B	18.8	138.5	0.61	0.57	36.4
East: Coreen Ave (E)											
4	L	145	18.1	0.801	81.3	LOS F	12.5	100.8	1.00	0.89	18.3
5	T	104	3.0	0.494	66.9	LOS E	8.8	63.3	0.99	0.78	19.4
6	R	163	11.0	0.859	85.2	LOS F	14.1	108.1	1.00	0.95	18.0
Approach		413	11.5	0.859	79.2	LOS F	14.1	108.1	1.00	0.88	18.4
North: Castlereagh Rd (N)											
7	L	455	4.4	0.399	9.6	LOS A	8.0	57.9	0.27	0.63	47.1
8	T	2594	5.5	0.869	36.3	LOS C	55.5	406.6	0.96	0.91	27.5
9	R	51	18.8	0.720	88.1	LOS F	5.3	43.1	1.00	0.82	17.4
Approach		3099	5.6	0.869	33.3	LOS C	55.5	406.6	0.86	0.86	29.1
West: Mullins Rd (W)											
10	L	41	5.1	0.475	84.8	LOS F	4.2	31.0	1.00	0.74	17.9
11	T	32	6.7	0.862	85.1	LOS F	7.5	56.9	1.00	0.92	15.7
12	R	42	12.5	0.862	92.3	LOS F	7.5	56.9	1.00	0.92	17.3
Approach		115	8.3	0.862	87.6	LOS F	7.5	56.9	1.00	0.86	17.1
All Vehicles		5463	6.3	0.872	33.6	LOS C	55.5	406.6	0.79	0.77	29.3

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Castlereagh Rd (S)											
1	L	98	3.2	0.878	51.0	LOS D	53.8	385.6	0.97	0.97	26.8
2	T	2456	2.8	0.879	38.8	LOS C	54.0	387.3	0.97	0.94	26.4
3	R	269	7.8	0.801	43.9	LOS D	9.1	67.6	0.99	0.85	27.1
Approach		2823	3.3	0.879	39.7	LOS C	54.0	387.3	0.97	0.93	26.5
East: Coreen Ave (E)											
4	L	226	3.3	0.833	69.4	LOS E	16.4	117.9	0.97	0.91	20.5
5	T	127	6.6	0.341	50.1	LOS D	8.9	66.1	0.90	0.73	23.2
6	R	318	4.0	0.880	75.3	LOS F	23.8	172.2	1.00	0.97	19.6
Approach		672	4.2	0.880	68.5	LOS E	23.8	172.2	0.97	0.90	20.5
North: Castlereagh Rd (N)											
7	L	251	2.9	0.214	9.7	LOS A	4.3	30.9	0.26	0.63	47.2
8	T	1544	3.3	0.717	39.5	LOS C	29.4	211.4	0.93	0.82	26.4
9	R	58	5.5	0.703	82.6	LOS F	5.6	40.8	1.00	0.81	18.3
Approach		1853	3.4	0.717	36.8	LOS C	29.4	211.4	0.84	0.80	27.7
West: Mullins Rd (W)											
10	L	102	2.1	0.628	74.9	LOS F	8.5	60.5	1.00	0.80	19.5
11	T	85	2.5	0.872	76.2	LOS F	12.2	87.9	1.00	0.97	17.1
12	R	60	3.5	0.872	84.6	LOS F	12.2	87.9	1.00	0.97	18.7
Approach		247	2.6	0.872	77.7	LOS F	12.2	87.9	1.00	0.90	18.5
All Vehicles		5595	3.4	0.880	43.9	LOS D	54.0	387.3	0.93	0.88	25.4

Intersection movement summary in 2026 Base + Other Development with upgrades

Castlereagh Rd / Peachtree Rd

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Castlereagh Rd (S)											
1	L	118	5.4	0.619	20.1	LOS B	15.0	110.1	0.35	0.99	39.7
2	T	1646	5.4	0.618	8.8	LOS A	15.2	111.1	0.35	0.32	46.0
Approach		1764	5.4	0.618	9.6	LOS A	15.2	111.1	0.35	0.36	45.4
East: Peachtree Rd (E)											
4	L	12	0.0	0.156	87.3	LOS F	1.3	9.3	0.99	0.68	17.6
Approach		12	0.0	0.156	87.3	LOS F	1.3	9.3	0.99	0.68	17.6
North: Castlereagh Rd (N)											
7	L	23	0.0	0.038	13.5	LOS A	0.7	4.7	0.27	0.69	43.7
8	T	2824	3.8	0.750	18.0	LOS B	45.4	327.9	0.73	0.69	37.1
9	R	122	3.4	0.595	77.5	LOS F	10.4	75.0	1.00	0.80	19.1
Approach		2969	3.8	0.750	20.5	LOS B	45.4	327.9	0.74	0.69	35.7
West: Peachtree Rd (W)											
10	L	38	8.3	0.254	62.9	LOS E	3.4	25.2	0.87	0.72	21.8
12	R	40	7.9	0.126	62.9	LOS E	3.5	26.4	0.87	0.73	21.9
Approach		78	8.1	0.254	62.9	LOS E	3.5	26.4	0.87	0.72	21.8
All Vehicles		4823	4.4	0.750	17.3	LOS B	45.4	327.9	0.60	0.57	38.2

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Castlereagh Rd (S)											
1	L	77	2.7	0.871	28.1	LOS B	35.5	254.9	0.72	1.04	36.0
2	T	2304	3.0	0.872	15.8	LOS B	35.6	255.9	0.72	0.69	38.6
Approach		2381	3.0	0.872	16.2	LOS B	35.6	255.9	0.72	0.70	38.5
East: Peachtree Rd (E)											
4	L	12	0.0	0.135	75.8	LOS F	1.2	8.1	0.99	0.68	19.4
Approach		12	0.0	0.135	75.8	LOS F	1.2	8.1	0.99	0.68	19.4
North: Castlereagh Rd (N)											
7	L	23	0.0	0.041	15.3	LOS B	0.7	5.1	0.34	0.69	42.2
8	T	1860	2.9	0.554	17.5	LOS B	24.4	174.8	0.66	0.60	37.7
9	R	91	2.3	0.805	80.3	LOS F	7.9	56.6	1.00	0.89	18.7
Approach		1974	2.8	0.805	20.4	LOS B	24.4	174.8	0.68	0.62	35.9
West: Peachtree Rd (W)											
10	L	163	2.6	0.869	67.2	LOS E	11.9	85.1	0.89	0.91	21.0
12	R	146	2.9	0.348	52.9	LOS D	9.5	68.1	0.88	0.79	24.4
Approach		309	2.7	0.868	60.4	LOS E	11.9	85.1	0.89	0.85	22.5
All Vehicles		4676	2.9	0.872	21.1	LOS B	35.6	255.9	0.71	0.68	35.5

Intersection movement summary in 2026 Base + Other Development without upgrades

Castlereagh Rd / Jane St

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Jane St (E)											
4	L	123	6.0	0.096	20.1	LOS B	3.7	27.0	0.51	0.66	34.9
6	R	148	5.7	0.191	41.7	LOS C	5.8	42.2	0.79	0.75	26.0
Approach		272	5.8	0.191	31.9	LOS C	5.8	42.2	0.66	0.71	29.4
North: Castlereagh Rd (N)											
7	L	532	5.9	0.917	25.4	LOS B	12.7	93.2	0.24	0.73	34.5
8	T	1962	6.0	1.426	427.4	LOS F	182.9	1346.0	1.00	2.10	4.7
Approach		2494	6.0	1.426	341.7	LOS F	182.9	1346.0	0.84	1.81	5.7
South West: Castlereagh Rd (S)											
31	T	1693	6.0	0.731	9.4	LOS A	9.7	71.3	0.18	0.65	47.9
32	R	472	6.0	0.662	46.4	LOS D	13.5	99.7	0.91	0.81	24.5
Approach		2164	6.0	0.731	17.5	LOS B	13.5	99.7	0.34	0.69	39.6
All Vehicles		4929	6.0	1.426	182.3	LOS F	182.9	1346.0	0.61	1.25	9.9

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Jane St (E)											
4	L	445	3.1	0.339	22.0	LOS B	12.4	89.0	0.59	0.72	33.8
6	R	603	3.0	0.763	50.5	LOS D	22.5	161.7	0.94	0.88	23.5
Approach		1048	3.0	0.763	38.4	LOS C	22.5	161.7	0.79	0.81	27.0
North: Castlereagh Rd (N)											
7	L	363	2.9	0.724	8.7	LOS A	3.6	25.8	0.12	0.62	47.3
8	T	1546	3.0	1.102	141.6	LOS F	82.8	594.3	1.00	1.35	12.2
Approach		1909	3.0	1.102	116.3	LOS F	82.8	594.3	0.83	1.21	14.2
South West: Castlereagh Rd (S)											
31	T	2021	3.0	0.857	10.8	LOS A	17.8	128.1	0.29	0.70	46.4
32	R	285	3.0	0.392	43.7	LOS D	8.2	58.6	0.81	0.76	25.3
Approach		2306	3.0	0.857	14.8	LOS B	17.8	128.1	0.36	0.70	42.0
All Vehicles		5264	3.0	1.102	56.3	LOS D	82.8	594.3	0.62	0.91	23.1

Intersection movement summary in 2026 Base + Other Development without upgrades

Castlereagh Rd / Great Western Hwy / Mulgoa Rd

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Mulgoa Rd (S)											
1	L	202	5.2	0.405	43.0	LOS D	11.9	87.2	0.75	0.78	27.8
2	T	995	5.0	0.706	42.6	LOS D	31.0	226.4	0.92	0.81	26.5
3	R	166	4.8	1.066	168.5	LOS F	20.0	145.7	1.00	1.21	10.2
Approach		1363	5.0	1.066	58.0	LOS E	31.0	226.4	0.90	0.86	22.5
East: Great Western Hwy (E)											
4	L	63	5.0	0.275	55.4	LOS D	9.5	69.7	0.82	0.91	22.6
5	T	216	4.9	0.275	47.7	LOS D	9.5	69.7	0.83	0.72	23.1
6	R	77	5.5	1.075	175.1	LOS F	10.6	77.6	1.00	1.20	10.1
Approach		356	5.0	1.075	76.6	LOS F	10.6	77.6	0.87	0.86	18.0
North: Castlereagh Rd (N)											
7	L	100	5.3	1.258	283.5	LOS F	144.7	1056.6	1.00	1.91	6.6
8	T	1658	5.0	1.257	275.9	LOS F	144.7	1056.6	1.00	1.90	6.9
9	R	360	5.0	1.158	231.4	LOS F	25.2	183.9	1.00	1.31	8.2
Approach		2118	5.0	1.257	268.7	LOS F	144.7	1056.6	1.00	1.80	7.1
North West: Bus Lane											
28	T	5	100.0	0.111	88.8	LOS F	0.6	8.2	0.99	0.66	18.5
Approach		5	100.0	0.111	88.8	LOS F	0.6	8.2	0.99	0.66	18.5
West: Great Western Hwy (W)											
10	L	1065	5.0	1.241	232.8	LOS F	126.5	923.6	1.00	1.38	8.2
11	T	736	5.1	1.152	220.3	LOS F	105.9	773.4	1.00	1.69	8.0
12	R	215	5.1	1.000 [3]	115.1	LOS F	21.0	153.3	1.00	1.05	14.5
Approach		2016	5.1	1.241	215.7	LOS F	126.5	923.6	1.00	1.46	8.5
All Vehicles		5858	5.1	1.258	189.6	LOS F	144.7	1056.6	0.97	1.40	9.5

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Mulgoa Rd (S)											
1	L	421	3.0	0.859	61.9	LOS E	29.7	212.9	0.91	0.92	22.4
2	T	1566	3.0	1.181	243.6	LOS F	118.8	853.2	1.00	1.81	7.7
3	R	177	3.0	0.973	112.0	LOS F	17.5	125.8	1.00	1.06	14.2
Approach		2164	3.0	1.181	197.5	LOS F	118.8	853.2	0.98	1.57	9.2
East: Great Western Hwy (E)											
4	L	211	3.0	1.168	197.5	LOS F	76.1	546.4	1.00	1.34	9.2
5	T	944	3.0	1.167	218.0	LOS F	82.8	594.1	1.00	1.58	8.2
6	R	128	2.9	1.168	252.0	LOS F	19.2	137.9	1.00	1.44	7.5
Approach		1282	3.0	1.168	218.0	LOS F	82.8	594.1	1.00	1.53	8.3
North: Castlereagh Rd (N)											
7	L	106	3.0	1.184	221.4	LOS F	112.9	810.7	1.00	1.69	8.2
8	T	1436	3.0	1.183	214.0	LOS F	112.9	810.7	1.00	1.62	8.5
9	R	405	2.9	1.114	191.1	LOS F	25.6	183.7	1.00	1.23	9.7
Approach		1947	3.0	1.183	209.6	LOS F	112.9	810.7	1.00	1.54	8.7
North West: Bus Lane											
28	T	1	100.0	0.022	86.8	LOS F	0.1	1.6	0.98	0.60	18.8
Approach		1	100.0	0.022	86.8	LOS F	0.1	1.6	0.98	0.60	18.8
West: Great Western Hwy (W)											
10	L	302	3.1	0.329	46.7	LOS D	12.4	89.0	0.78	0.78	26.5
11	T	649	2.9	1.039	130.2	LOS F	72.8	522.7	1.00	1.29	12.3
12	R	254	3.1	1.000 [3]	89.1	LOS F	21.3	153.1	1.00	0.90	17.5
Approach		1205	3.1	1.039	100.6	LOS F	72.8	522.7	0.94	1.08	15.4
All Vehicles		6600	3.0	1.184	187.3	LOS F	118.8	853.2	0.98	1.46	9.5

Intersection movement summary in 2026 Base + Other Development + North Penrith Development with upgrades

Parker St / Coreen Ave / Richmond Rd

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	204	4.6	0.603	9.9	LOS A	1.4	10.3	0.07	0.63	51.7
2	T	1232	5.7	0.990	78.7	LOS F	36.3	266.2	1.00	1.09	20.0
3	R	200	1.8	1.054	139.8	LOS F	21.5	152.7	1.00	1.13	12.5
Approach		1636	5.0	1.054	77.6	LOS F	36.3	266.2	0.88	1.04	20.0
East: Oxford St (E)											
4	L	81	6.7	1.000[3]	76.1	LOS F	7.1	52.8	0.98	0.76	19.4
5	T	213	1.6	1.073	162.8	LOS F	24.9	177.5	1.00	1.32	10.8
6	R	68	4.6	0.535	74.8	LOS F	6.2	44.9	0.97	0.76	19.8
Approach		362	3.5	1.073	126.9	LOS F	24.9	177.5	0.99	1.09	13.2
North: Richmond Rd (N)											
7	L	1	0.0	0.857	117.1	LOS F	91.1	661.4	1.00	1.40	14.8
8	T	2675	4.3	1.082	113.7	LOS F	101.7	738.5	1.00	1.40	15.4
9	R	618	2.0	0.996	43.8	LOS D	31.3	222.7	0.91	0.86	28.1
Approach		3294	3.9	1.082	100.6	LOS F	101.7	738.5	0.98	1.29	16.7
West: Coreen Ave (W)											
10	L	93	4.5	0.117	13.8	LOS A	2.7	19.9	0.35	0.68	40.1
11	T	109	0.0	0.291	53.9	LOS D	8.3	58.2	0.90	0.72	23.4
12	R	240	4.8	0.692	66.9	LOS E	17.2	125.7	0.99	0.84	21.0
Approach		442	3.6	0.692	52.5	LOS D	17.2	125.7	0.83	0.78	24.0
All Vehicles		5734	4.2	1.082	92.0	LOS F	101.7	738.5	0.94	1.17	17.7

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	204	3.6	0.270	8.8	LOS A	0.9	6.7	0.06	0.63	53.0
2	T	2512	3.1	1.142	166.9	LOS F	99.4	713.8	1.00	1.76	11.4
3	R	77	8.2	0.376	57.8	LOS E	5.5	41.1	0.91	0.76	23.4
Approach		2793	3.2	1.142	152.4	LOS F	99.4	713.8	0.93	1.65	12.2
East: Oxford St (E)											
4	L	71	6.0	0.793	75.7	LOS F	6.0	44.3	1.00	0.88	19.5
5	T	121	1.7	1.076	151.2	LOS F	13.7	97.0	1.00	1.25	11.4
6	R	74	1.4	0.687	72.7	LOS F	6.1	43.4	1.00	0.82	20.2
Approach		265	2.8	1.076	109.3	LOS F	13.7	97.0	1.00	1.03	14.9
North: Richmond Rd (N)											
7	L	1	0.0	0.544	41.1	LOS C	26.7	193.6	0.73	0.98	29.8
8	T	1633	4.3	0.749	24.5	LOS B	26.7	193.6	0.74	0.66	38.0
9	R	293	1.6	1.168	198.2	LOS F	31.4	222.6	0.98	1.28	9.1
Approach		1927	3.6	1.168	50.9	LOS D	31.4	222.6	0.78	0.75	26.4
West: Coreen Ave (W)											
10	L	674	1.9	0.716	27.6	LOS B	28.0	199.4	0.83	0.85	32.3
11	T	220	1.1	0.469	42.1	LOS C	28.0	199.4	0.91	0.76	26.6
12	R	282	3.7	0.645	51.8	LOS D	16.3	117.6	0.96	0.84	24.3
Approach		1176	2.2	0.716	37.2	LOS C	28.0	199.4	0.87	0.81	28.9
All Vehicles		6161	3.1	1.168	96.6	LOS F	99.4	713.8	0.87	1.18	17.0

Intersection movement summary in 2026 Base + Other Development + North Penrith Development with upgrades

Parker St / Copeland St

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	43	4.9	0.375	10.7	LOS A	3.4	24.4	0.08	1.36	51.4
2	T	2044	4.2	0.685	2.3	LOS A	9.6	69.7	0.14	0.13	64.2
3	R	302	4.2	1.146	148.0	LOS F	24.2	175.8	0.98	1.09	11.7
Approach		2388	4.2	1.146	20.8	LOS B	24.2	175.8	0.25	0.27	42.2
East: Copeland St (E)											
4	L	526	3.6	0.753	47.6	LOS D	31.2	225.3	0.93	0.88	25.1
5	T	107	3.9	0.293	52.2	LOS D	8.0	57.7	0.90	0.72	21.5
6	R	65	3.2	0.297	64.9	LOS E	5.5	39.4	0.93	0.77	21.2
Approach		699	3.6	0.754	49.9	LOS D	31.2	225.3	0.93	0.84	24.1
North: Parker St (N)											
7	L	55	3.8	0.996	42.1	LOS C	18.1	131.1	1.00	0.87	31.2
8	T	2925	3.8	1.273	275.6	LOS F	220.1	1590.4	1.00	2.00	7.4
9	R	45	4.7	0.588	85.3	LOS F	4.6	33.3	1.00	0.76	18.0
Approach		3025	3.8	1.273	268.5	LOS F	220.1	1590.4	1.00	1.96	7.6
West: Copeland St (W)											
10	L	22	4.8	0.106	8.5	LOS A	0.3	2.3	0.19	0.62	44.3
11	T	98	3.2	1.318	74.2	LOS F	19.0	137.1	0.90	0.77	17.4
12	R	95	3.3	1.319	382.6	LOS F	19.0	137.1	1.00	1.61	5.4
Approach		215	3.4	1.319	203.5	LOS F	19.0	137.1	0.87	1.12	8.9
All Vehicles		6327	3.9	1.319	148.7	LOS F	220.1	1590.4	0.70	1.17	12.4

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	78	4.1	0.500	11.0	LOS A	5.5	39.8	0.10	1.29	51.1
2	T	2722	3.6	0.912	6.1	LOS A	33.3	239.9	0.35	0.35	57.1
3	R	496	3.8	0.938	46.8	LOS D	21.1	152.5	0.94	0.89	27.0
Approach		3296	3.6	0.938	12.3	LOS A	33.3	239.9	0.43	0.45	49.4
East: Copeland St (E)											
4	L	291	2.9	0.342	34.6	LOS C	14.7	105.2	0.68	0.80	29.3
5	T	55	3.8	0.160	55.8	LOS D	4.7	33.9	0.88	0.68	20.7
6	R	64	3.3	0.392	75.3	LOS F	6.0	43.2	0.97	0.77	19.4
Approach		409	3.1	0.392	43.8	LOS D	14.7	105.2	0.75	0.78	25.9
North: Parker St (N)											
7	L	45	2.3	0.960	51.8	LOS D	18.2	130.4	0.97	0.89	27.1
8	T	1952	3.2	0.957	65.4	LOS E	73.3	526.9	0.99	1.06	22.6
9	R	27	3.8	0.227	82.7	LOS F	2.9	20.9	0.98	0.72	18.4
Approach		2024	3.2	0.957	65.3	LOS E	73.3	526.9	0.99	1.05	22.6
West: Copeland St (W)											
10	L	61	1.7	0.305	15.6	LOS B	2.7	18.9	0.44	0.70	39.0
11	T	165	1.3	0.624	61.0	LOS E	13.4	94.9	0.95	0.77	19.5
12	R	47	2.2	0.623	70.3	LOS E	13.4	94.9	0.98	0.82	20.5
Approach		274	1.5	0.624	52.5	LOS D	13.4	94.9	0.84	0.76	22.4
All Vehicles		6003	3.3	0.960	34.2	LOS C	73.3	526.9	0.66	0.69	32.6

Intersection movement summary in 2026 Base + Other Development + North Penrith Development without upgrades

Parker St / Great Western Hwy

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	500	4.0	0.448	24.2	LOS B	16.6	119.9	0.57	0.85	39.2
2	T	1250	4.0	0.770	37.6	LOS C	37.5	271.3	0.92	0.83	31.1
3	R	190	4.0	1.088	184.5	LOS F	23.3	168.4	1.00	1.24	10.2
Approach		1940	4.0	1.089	48.5	LOS D	37.5	271.3	0.84	0.88	27.2
East: Great Western Hwy (E)											
4	L	194	3.8	0.107	7.7	NA[9]	NA[9]	NA[9]	0.00	0.60	49.8
5	T	1121	4.0	1.149	190.4	LOS F	64.6	467.2	0.99	1.43	9.4
6	R	187	3.9	1.074	172.6	LOS F	22.2	160.8	1.00	1.26	11.0
Approach		1502	3.9	1.149	164.6	LOS F	64.6	467.2	0.86	1.30	10.8
North: Parker St (N)											
7	L	1408	4.0	0.780	9.8	NA[9]	NA[9]	NA[9]	0.00	0.65	54.2
8	T	1885	4.0	1.164	186.5	LOS F	130.3	943.5	1.00	1.69	10.4
9	R	199	4.1	1.144	216.2	LOS F	26.4	191.5	1.00	1.25	8.9
Approach		3493	4.0	1.164	116.9	LOS F	130.3	943.5	0.60	1.24	15.2
West: Great Western Hwy (W)											
10	L	225	4.2	0.125	7.7	NA[9]	NA[9]	NA[9]	0.00	0.60	49.8
11	T	699	4.1	0.860	67.4	LOS E	26.7	193.1	1.00	0.98	20.3
12	R	157	4.0	0.900	92.9	LOS F	14.1	101.9	1.00	0.99	17.8
Approach		1081	4.1	0.900	58.7	LOS E	26.7	193.1	0.79	0.90	22.6
All Vehicles		8016	4.0	1.164	101.5	LOS F	130.3	943.5	0.73	1.12	16.4

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	369	3.1	0.427	37.0	LOS C	17.0	122.4	0.70	0.90	31.9
2	T	1712	3.0	1.398	437.6	LOS F	172.4	1238.1	1.00	2.39	4.9
3	R	137	3.1	1.255	330.1	LOS F	23.4	168.0	1.00	1.40	6.1
Approach		2218	3.0	1.398	364.2	LOS F	172.4	1238.1	0.95	2.08	5.7
East: Great Western Hwy (E)											
4	L	343	3.1	0.189	7.7	NA[9]	NA[9]	NA[9]	0.00	0.60	49.8
5	T	2107	3.0	1.430	270.7	LOS F	210.4	1510.7	0.97	0.59	16.3
6	R	154	3.0	1.157	244.2	LOS F	22.4	160.6	1.00	1.39	8.2
Approach		2604	3.0	1.430	234.5	LOS F	210.4	1510.7	0.84	0.64	17.1
North: Parker St (N)											
7	L	552	3.1	0.303	9.6	NA[9]	NA[9]	NA[9]	0.00	0.65	54.6
8	T	1590	3.0	1.305	324.6	LOS F	139.9	1004.4	1.00	2.05	6.4
9	R	145	2.9	1.327	385.9	LOS F	26.7	191.4	1.00	1.44	5.3
Approach		2286	3.0	1.327	252.5	LOS F	139.9	1004.4	0.76	1.67	8.0
West: Great Western Hwy (W)											
10	L	498	3.0	0.274	7.7	NA[9]	NA[9]	NA[9]	0.00	0.60	49.7
11	T	1014	3.0	0.693	41.0	LOS C	31.4	225.0	0.90	0.80	26.9
12	R	147	3.1	1.101	196.8	LOS F	19.2	137.9	1.00	1.29	9.9
Approach		1659	3.0	1.101	44.8	LOS D	31.4	225.0	0.64	0.78	26.3
All Vehicles		8767	3.0	1.430	236.1	LOS F	210.4	1510.7	0.81	1.30	9.3

Intersection movement summary in 2026 Base + Other Development + North Penrith Development with upgrades

Coreen Ave / Coombes Dr

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Coreen Ave (E)											
22	T	800	2.6	0.417	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
23	R	95	2.2	0.377	24.0	LOS B	2.0	14.4	0.81	0.98	36.2
Approach		895	2.6	0.417	2.5	LOS B	2.0	14.4	0.09	0.10	56.1
North East: Coombes Dr Stage 2 (N)											
26	R	21	10.0	0.149	33.7	LOS C	0.6	4.5	0.86	0.96	31.3
Approach		21	10.0	0.149	33.7	LOS C	0.6	4.5	0.86	0.96	31.3
North: Coombes Dr (N)											
7	L	53	12.0	0.135	14.1	LOS A	0.6	4.4	0.68	0.87	37.6
9	R	21	10.0	0.109	26.3	LOS B	0.5	3.5	0.79	0.94	31.8
Approach		74	11.4	0.135	17.6	LOS B	0.6	4.4	0.71	0.89	35.7
North West: Coreen Ave (W)											
27	L	42	12.5	0.025	9.6	LOS A	0.0	0.0	0.00	0.69	48.1
28	T	738	2.0	0.383	1.2	LOS A	0.0	0.0	0.00	0.12	57.0
Approach		780	2.6	0.383	1.6	LOS A	0.0	0.0	0.00	0.15	56.4
All Vehicles		1769	3.0	0.417	3.1	NA	2.0	14.4	0.08	0.17	54.4

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Coreen Ave (E)											
22	T	747	2.7	0.390	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
23	R	46	4.5	0.331	37.6	LOS C	1.5	10.7	0.89	0.99	29.5
Approach		794	2.8	0.390	2.2	LOS C	1.5	10.7	0.05	0.06	56.6
North East: Coombes Dr Stage 2 (N)											
26	R	24	13.0	0.156	31.5	LOS C	0.6	4.9	0.84	0.95	32.3
Approach		24	13.0	0.156	31.5	LOS C	0.6	4.9	0.84	0.95	32.3
North: Coombes Dr (N)											
7	L	136	0.8	0.430	20.1	LOS B	2.2	15.8	0.83	1.02	33.6
9	R	24	13.0	0.237	47.5	LOS D	1.0	7.5	0.90	0.99	24.4
Approach		160	2.6	0.429	24.3	LOS D	2.2	15.8	0.84	1.02	31.7
North West: Coreen Ave (W)											
27	L	19	5.6	0.011	9.3	LOS A	0.0	0.0	0.00	0.69	48.1
28	T	1052	1.7	0.545	1.2	LOS A	0.0	0.0	0.00	0.12	57.0
Approach		1071	1.8	0.545	1.3	LOS A	0.0	0.0	0.00	0.13	56.8
All Vehicles		2048	2.4	0.545	3.8	NA	2.2	15.8	0.10	0.18	53.0

Intersection movement summary in 2026 Base + Other Development + North Penrith Development without upgrades

Coreen Ave / Commuter Car Park Access

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Penrith Car Park Access											
1	L	23	0.0	0.071	10.9	LOS A	0.5	3.5	0.64	0.72	45.9
3	R	31	0.0	0.071	13.9	LOS A	0.5	3.5	0.64	0.77	43.7
Approach		54	0.0	0.071	12.6	LOS A	0.5	3.5	0.64	0.74	44.6
East: Coreen Ave (E)											
4	L	132	3.2	0.572	9.6	LOS A	6.5	46.3	0.58	0.66	47.2
5	T	537	2.9	0.572	8.8	LOS A	6.5	46.3	0.58	0.61	47.2
6	R	1	0.0	0.526	14.0	LOS A	6.5	46.3	0.58	0.76	44.3
Approach		669	3.0	0.571	8.9	LOS A	6.5	46.3	0.58	0.62	47.2
West: Coreen Ave (W)											
11	T	473	2.9	0.426	7.3	LOS A	4.8	34.6	0.23	0.52	49.0
12	R	155	2.7	0.426	11.1	LOS A	4.8	34.6	0.23	0.74	46.1
Approach		627	2.9	0.426	8.2	LOS A	4.8	34.6	0.23	0.57	48.3
All Vehicles		1351	2.8	0.572	8.8	LOS A	6.5	46.3	0.42	0.60	47.6

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Penrith Car Park Access											
1	L	132	0.8	0.329	12.3	LOS A	2.5	17.6	0.72	0.83	44.7
3	R	115	0.9	0.329	15.2	LOS B	2.5	17.6	0.72	0.87	42.7
Approach		246	0.9	0.329	13.6	LOS B	2.5	17.6	0.72	0.85	43.7
East: Coreen Ave (E)											
4	L	34	3.1	0.443	8.2	LOS A	5.1	36.8	0.28	0.60	48.4
5	T	598	2.3	0.444	7.4	LOS A	5.1	36.8	0.28	0.53	48.8
6	R	1	0.0	0.526	12.6	LOS A	5.1	36.8	0.28	0.79	45.1
Approach		633	2.3	0.444	7.4	LOS A	5.1	36.8	0.28	0.53	48.8
West: Coreen Ave (W)											
11	T	823	2.3	0.694	8.6	LOS A	10.6	75.4	0.68	0.58	46.8
12	R	43	2.4	0.696	12.5	LOS A	10.6	75.4	0.68	0.68	45.6
Approach		866	2.3	0.694	8.8	LOS A	10.6	75.4	0.68	0.58	46.7
All Vehicles		1745	2.1	0.696	9.0	LOS A	10.6	75.4	0.54	0.60	47.0

Intersection movement summary in 2026 Base + Other Development + North Penrith Development with upgrades

Castlereagh Rd / Coreen Ave

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Castlereagh Rd (S)											
1	L	85	8.6	0.428	24.1	LOS B	19.8	146.5	0.56	0.95	37.6
2	T	1459	6.0	0.429	15.5	LOS B	20.0	147.5	0.56	0.50	40.4
3	R	403	6.3	0.933	59.2	LOS E	18.3	134.7	0.98	0.93	23.0
Approach		1947	6.2	0.933	24.9	LOS B	20.0	147.5	0.65	0.61	34.8
East: Coreen Ave (E)											
4	L	191	15.5	0.950	91.7	LOS F	16.7	132.3	1.00	0.90	17.1
5	T	104	3.0	0.454	67.4	LOS E	8.9	64.2	0.98	0.77	20.4
6	R	185	10.8	0.896	92.5	LOS F	16.6	126.7	1.00	0.99	17.1
Approach		480	11.0	0.949	86.7	LOS F	16.7	132.3	0.99	0.91	17.7
North: Castlereagh Rd (N)											
7	L	456	4.4	0.443	11.7	LOS A	10.1	73.2	0.33	0.69	45.6
8	T	2615	5.5	0.944	61.1	LOS E	73.2	536.3	1.00	1.06	21.6
9	R	35	15.2	0.375	86.6	LOS F	3.7	29.4	1.00	0.73	17.9
Approach		3105	5.5	0.944	54.1	LOS D	73.2	536.3	0.90	1.00	23.4
West: Mullins Rd (W)											
10	L	41	5.1	0.491	88.4	LOS F	4.4	32.0	1.00	0.74	17.5
11	T	32	6.7	0.879	89.3	LOS F	7.7	58.2	1.00	0.94	16.6
12	R	41	12.8	0.879	97.5	LOS F	7.7	58.2	1.00	0.94	16.7
Approach		114	8.3	0.879	91.9	LOS F	7.7	58.2	1.00	0.86	16.9
All Vehicles		5646	6.2	0.950	47.6	LOS D	73.2	536.3	0.82	0.86	25.4

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Castlereagh Rd (S)											
1	L	98	3.2	0.889	51.5	LOS D	58.7	420.7	0.98	0.97	25.9
2	T	2456	2.8	0.890	43.1	LOS D	59.0	422.5	0.98	0.96	26.3
3	R	398	6.3	0.855	55.8	LOS D	16.5	121.4	0.98	0.92	23.8
Approach		2952	3.3	0.890	45.1	LOS D	59.0	422.5	0.98	0.95	25.9
East: Coreen Ave (E)											
4	L	233	3.2	0.885	76.8	LOS F	18.1	130.4	0.95	0.93	19.3
5	T	127	6.6	0.309	50.8	LOS D	9.2	68.3	0.88	0.71	24.2
6	R	351	3.9	0.879	77.7	LOS F	27.4	198.5	1.00	0.96	19.3
Approach		711	4.1	0.885	72.6	LOS F	27.4	198.5	0.96	0.91	20.0
North: Castlereagh Rd (N)											
7	L	259	2.8	0.251	11.6	LOS A	5.8	41.8	0.31	0.68	45.6
8	T	1569	3.4	0.853	55.9	LOS D	37.2	268.0	1.00	0.96	22.8
9	R	45	4.7	0.587	87.4	LOS F	4.7	34.3	1.00	0.76	17.7
Approach		1874	3.3	0.853	50.6	LOS D	37.2	268.0	0.90	0.91	24.3
West: Mullins Rd (W)											
10	L	102	2.1	0.622	79.6	LOS F	9.0	63.8	1.00	0.80	18.8
11	T	85	2.5	0.858	79.8	LOS F	12.7	91.4	1.00	0.95	18.0
12	R	59	3.6	0.858	87.6	LOS F	12.7	91.4	1.00	0.95	18.0
Approach		246	2.6	0.859	81.6	LOS F	12.7	91.4	1.00	0.89	18.3
All Vehicles		5782	3.4	0.890	51.8	LOS D	59.0	422.5	0.96	0.93	24.1

Intersection movement summary in 2026 Base + Other Development + North Penrith Development with upgrades

Castlereagh Rd / Peachtree Rd

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Castlereagh Rd (S)											
1	L	118	5.4	0.704	21.6	LOS B	22.0	160.8	0.51	0.94	38.9
2	T	1757	5.3	0.703	13.2	LOS A	22.2	162.2	0.51	0.46	42.3
Approach		1875	5.3	0.703	13.7	LOS A	22.2	162.2	0.51	0.49	42.1
East: Peachtree Rd (E)											
4	L	124	4.2	0.795	87.3	LOS F	11.3	81.8	1.00	0.87	17.6
Approach		124	4.2	0.795	87.3	LOS F	11.3	81.8	1.00	0.87	17.6
North: Castlereagh Rd (N)											
7	L	45	2.3	0.077	13.7	LOS A	1.3	9.4	0.28	0.70	43.7
8	T	2867	3.8	0.819	23.7	LOS B	53.2	384.6	0.85	0.79	34.6
9	R	122	3.4	0.674	81.3	LOS F	10.7	76.9	1.00	0.82	18.6
Approach		3035	3.7	0.819	25.9	LOS B	53.2	384.6	0.84	0.79	33.5
West: Peachtree Rd (W)											
10	L	38	8.3	0.254	64.0	LOS E	3.4	25.2	0.87	0.73	21.8
12	R	40	7.9	0.126	63.8	LOS E	3.5	26.4	0.87	0.74	21.9
Approach		78	8.1	0.254	63.9	LOS E	3.5	26.4	0.87	0.74	21.8
All Vehicles		5112	4.4	0.819	23.5	LOS B	53.2	384.6	0.73	0.68	35.1

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Castlereagh Rd (S)											
1	L	77	2.7	0.921	29.9	LOS C	45.4	326.3	0.83	1.00	34.6
2	T	2435	3.0	0.919	21.6	LOS B	45.6	327.6	0.83	0.83	35.8
Approach		2512	3.0	0.919	21.8	LOS B	45.6	327.6	0.83	0.83	35.8
East: Peachtree Rd (E)											
4	L	126	2.5	0.900	86.2	LOS F	10.9	77.8	1.00	0.97	17.8
Approach		126	2.5	0.900	86.2	LOS F	10.9	77.8	1.00	0.97	17.8
North: Castlereagh Rd (N)											
7	L	47	2.2	0.080	14.5	LOS B	1.4	9.8	0.32	0.70	42.9
8	T	1866	2.9	0.563	18.2	LOS B	24.9	178.6	0.68	0.61	38.3
9	R	91	2.3	0.920	90.2	LOS F	8.4	60.2	1.00	0.99	17.3
Approach		2004	2.8	0.920	21.4	LOS B	24.9	178.6	0.68	0.63	36.4
West: Peachtree Rd (W)											
10	L	163	2.6	0.895	68.2	LOS E	11.9	85.1	0.92	0.90	20.8
12	R	146	2.9	0.387	56.2	LOS D	9.8	70.0	0.91	0.80	23.6
Approach		309	2.7	0.895	62.6	LOS E	11.9	85.1	0.91	0.85	22.1
All Vehicles		4952	2.9	0.921	25.8	LOS B	45.6	327.6	0.78	0.76	33.8

Intersection movement summary in 2026 Base + Other Development + North Penrith Development without upgrades

Castlereagh Rd / Jane St

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Jane St (E)											
4	L	123	6.0	0.096	20.1	LOS B	3.7	27.0	0.51	0.66	34.9
6	R	163	5.8	0.210	41.9	LOS C	6.3	46.1	0.79	0.75	26.0
Approach		286	5.9	0.210	32.5	LOS C	6.3	46.1	0.67	0.71	29.2
North: Castlereagh Rd (N)											
7	L	599	6.0	0.969	25.7	LOS B	12.7	93.2	0.27	0.76	34.3
8	T	1962	6.0	1.426	427.4	LOS F	182.9	1346.0	1.00	2.10	4.7
Approach		2561	6.0	1.426	333.4	LOS F	182.9	1346.0	0.83	1.78	5.8
South West: Castlereagh Rd (S)											
31	T	1803	6.0	0.779	9.6	LOS A	11.6	85.7	0.21	0.66	47.7
32	R	472	6.0	0.662	46.4	LOS D	13.5	99.7	0.91	0.81	24.5
Approach		2275	6.0	0.779	17.2	LOS B	13.5	99.7	0.35	0.69	39.9
All Vehicles		5122	6.0	1.426	176.2	LOS F	182.9	1346.0	0.61	1.24	10.2

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Jane St (E)											
4	L	445	3.1	0.339	22.0	LOS B	12.4	89.0	0.59	0.72	33.8
6	R	660	3.0	0.835	56.3	LOS D	26.4	189.4	0.96	0.94	22.2
Approach		1105	3.0	0.835	42.5	LOS C	26.4	189.4	0.81	0.85	25.7
North: Castlereagh Rd (N)											
7	L	383	3.0	0.765	10.6	LOS A	4.3	30.8	0.12	0.64	45.4
8	T	1546	3.0	1.102	141.6	LOS F	82.8	594.3	1.00	1.35	12.2
Approach		1929	3.0	1.102	115.6	LOS F	82.8	594.3	0.83	1.21	14.3
South West: Castlereagh Rd (S)											
31	T	2086	3.0	0.884	12.8	LOS A	22.4	160.6	0.34	0.72	44.4
32	R	285	3.0	0.392	43.7	LOS D	8.2	58.6	0.81	0.76	25.3
Approach		2372	3.0	0.884	16.5	LOS B	22.4	160.6	0.40	0.73	40.7
All Vehicles		5406	3.0	1.102	57.2	LOS E	82.8	594.3	0.63	0.92	22.9

Intersection movement summary in 2026 Base + Other Development + North Penrith Development without upgrades

Castlereagh Rd / Great Western Hwy / Mulgoa Rd

AM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	500	4.0	0.448	24.2	LOS B	16.6	119.9	0.57	0.85	39.2
2	T	1250	4.0	0.770	37.6	LOS C	37.5	271.3	0.92	0.83	31.1
3	R	190	4.0	1.088	184.5	LOS F	23.3	168.4	1.00	1.24	10.2
Approach		1940	4.0	1.089	48.5	LOS D	37.5	271.3	0.84	0.88	27.2
East: Great Western Hwy (E)											
4	L	194	3.8	0.107	7.7	NA[9]	NA[9]	NA[9]	0.00	0.60	49.8
5	T	1121	4.0	1.149	190.4	LOS F	64.6	467.2	0.99	1.43	9.4
6	R	187	3.9	1.074	172.6	LOS F	22.2	160.8	1.00	1.26	11.0
Approach		1502	3.9	1.149	164.6	LOS F	64.6	467.2	0.86	1.30	10.8
North: Parker St (N)											
7	L	1408	4.0	0.780	9.8	NA[9]	NA[9]	NA[9]	0.00	0.65	54.2
8	T	1885	4.0	1.164	186.5	LOS F	130.3	943.5	1.00	1.69	10.4
9	R	199	4.1	1.144	216.2	LOS F	26.4	191.5	1.00	1.25	8.9
Approach		3493	4.0	1.164	116.9	LOS F	130.3	943.5	0.60	1.24	15.2
West: Great Western Hwy (W)											
10	L	225	4.2	0.125	7.7	NA[9]	NA[9]	NA[9]	0.00	0.60	49.8
11	T	699	4.1	0.860	67.4	LOS E	26.7	193.1	1.00	0.98	20.3
12	R	157	4.0	0.900	92.9	LOS F	14.1	101.9	1.00	0.99	17.8
Approach		1081	4.1	0.900	58.7	LOS E	26.7	193.1	0.79	0.90	22.6
All Vehicles		8016	4.0	1.164	101.5	LOS F	130.3	943.5	0.73	1.12	16.4

PM

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parker St (S)											
1	L	369	3.1	0.427	37.0	LOS C	17.0	122.4	0.70	0.90	31.9
2	T	1712	3.0	1.398	437.6	LOS F	172.4	1238.1	1.00	2.39	4.9
3	R	137	3.1	1.255	330.1	LOS F	23.4	168.0	1.00	1.40	6.1
Approach		2218	3.0	1.398	364.2	LOS F	172.4	1238.1	0.95	2.08	5.7
East: Great Western Hwy (E)											
4	L	343	3.1	0.189	7.7	NA[9]	NA[9]	NA[9]	0.00	0.60	49.8
5	T	2107	3.0	1.430	270.7	LOS F	210.4	1510.7	0.97	0.59	16.3
6	R	154	3.0	1.157	244.2	LOS F	22.4	160.6	1.00	1.39	8.2
Approach		2604	3.0	1.430	234.5	LOS F	210.4	1510.7	0.84	0.64	17.1
North: Parker St (N)											
7	L	552	3.1	0.303	9.6	NA[9]	NA[9]	NA[9]	0.00	0.65	54.6
8	T	1590	3.0	1.305	324.6	LOS F	139.9	1004.4	1.00	2.05	6.4
9	R	145	2.9	1.327	385.9	LOS F	26.7	191.4	1.00	1.44	5.3
Approach		2286	3.0	1.327	252.5	LOS F	139.9	1004.4	0.76	1.67	8.0
West: Great Western Hwy (W)											
10	L	498	3.0	0.274	7.7	NA[9]	NA[9]	NA[9]	0.00	0.60	49.7
11	T	1014	3.0	0.693	41.0	LOS C	31.4	225.0	0.90	0.80	26.9
12	R	147	3.1	1.101	196.8	LOS F	19.2	137.9	1.00	1.29	9.9
Approach		1659	3.0	1.101	44.8	LOS D	31.4	225.0	0.64	0.78	26.3
All Vehicles		8767	3.0	1.430	236.1	LOS F	210.4	1510.7	0.81	1.30	9.3

Appendix 7: Principles of TOD

Planning and implementation of a successful TOD involves many small decisions to assure development is consistent with TOD principles. The following summarises the fundamental TOD principles and provides a quick checklist for ensuring the small decisions assure consistency.

TOD draws on many of the same planning and development principles embraced by New Urbanism, Smart Growth and the Liveable Communities movement. Some of the key principles needed to create a successful TOD are:

- defined centre
- active, 18-hour place
- mix of uses, horizontally and/or vertically
- compact pedestrian-oriented design
- moderate to higher density development, especially near transit
- limited parking.

Defined centre

The concept of a TOD is more than providing easy access from home and work to transit. Although transit can be an important anchor for a centre, the centre should create a destination: a sense of place and community.

Every centre is distinctive, and in some cases unique, yet they all contain some common, essential elements, including:

- A sense of vitality, with a compact urban form that is oriented toward walking and a mix of uses.
- A commitment to innovative development, a flexible approach, and the removal of barriers to development.
- Evidence of leadership and Community vision.
- Excellent accessibility to transit and major roads.
- An environment that fosters safe, enjoyable walking among the various uses.
- Responsiveness to the fundamentals of market supply and demand.
- A mix of land uses (residential, retail, employment, civic, cultural, and recreational) and a connectedness between those uses and the overall centre.

Photo 1 Fruitvale Transit Village, Oakland, CA.

Connected directly to the BART Transit Station, this mixed-use TOD provides a sense of arrival and served as a catalyst in the economic and social transformation of the community.

The Fruitvale Transit Village, in Oakland, California, is an example of a centre designed by and for the neighbourhood surrounding the station. Located in a low income neighbourhood, the residents, along with the Unity Council (a non-profit community development organisation), began developing the Transit Village Plan to link the local economy to transit, thereby increasing pedestrian and bicycle traffic and revitalizing the neighbourhood. The Village includes a childcare facility, health care facility, senior centre, library and community resource centre, affordable family and senior housing, retail and office space, and a pedestrian plaza. The Village encompasses 6 to 10 hectares, and have over 400 employees and 200 housing units. The station was designed to serve 15,500 passenger trips daily.

Whether large or small, TOD projects should provide attractive public gathering spaces. 'These urban open spaces differ significantly from the more fluid and spacious parks and open spaces commonly found in today's suburban areas. Throughout urban history, public plazas, village greens, and town squares have been the focal points of towns and town centres, providing a public realm for everyday social life; housing bustling marketplaces and places to meet, mingle, and "people watch"; and providing a backdrop for more exceptional events such as fairs, festivals, coronations, protests and even revolutions.'

~ Charles Bohl,
Place Making: Developing Town Centres, Main Streets and Urban Villages

Mix of uses

Creating a mix of land uses provides diversity and variety, helps to define the centre and creates an active 18-hour place.

The diversity in land uses enables people to take care of the majority of their needs within a short walking distance. The mix of uses can be either vertical, in the same building, or horizontal, located next to each other.

The key is to locate the various uses close together, make them easily accessible and supportive of each other.

For example, although larger in scale, in Dallas (Texas), the Mockingbird Station is a 4 hectare, AUD$192million mixed-use TOD that features an art house movie theatre, 211 loft apartments, upscale retail, a planned new hotel, offices and restaurants. The mix of uses provides both excellent development opportunities, a destination for locals and visitors, and walkable and transit supportive development.

Active, 18-hour place

A mix of land uses promotes activity around the clock, either within the TOD or easily accessible from the TOD. This in turn promotes the most efficient use of the transit system: travel in both directions, throughout the day. A mix of employment, residential and recreational uses, that provide services during the day, evenings and weekends, expands transit ridership beyond the morning and evening commute to encourage transit use for shopping and entertainment purposes during the mid-day, evening and weekends. The 18-hour activity along with well designed areas also enables safer environments for walking and cycling, with increasing “watching” from the presence of people during many hours of the day.

Photo 2 Pioneer Place, Portland, OR.

Pioneer Place incorporates the transit station directly into the design of this 100,000 square metre mixed-use TOD project in the heart of downtown Portland.

Pedestrian-Oriented Design

Within a TOD, non-auto trips increase when a mix of uses is easily accessible and arranged in a way that emphasises travel on foot rather than car. In Portland, Oregon, research found that residents of TODs were twice as likely to choose to walk for non-work trips as residents of the general region.

Creating a pedestrian environment requires considering the dimensions of the human body and the scale of the spaces that people use. Subtle factors, focused on a pleasant environment for the pedestrian, encourage people to walk.

As noted in the Creating Transit Station Communities in the Central Puget Sound Region – A Transit-Oriented Development Workbook, 'most people do not feel comfortable walking in a wide-open area with busy traffic passing closely by. Pedestrians are drawn to streets and paths with a feeling of intimacy and enclosure. This feeling can be created by locating buildings close to the sidewalk, by lining the street with trees, and by buffering the sidewalk with planting strips or parked cars. People on foot enjoy small details, such as displays in shop windows, street level lighting and signs and public art and displays.'

Moderate to Higher Density development

Residential or employment development near transit stations provides a ready market for transit trips. Consequently, higher densities strengthen the demand for transit.

Development should be at higher densities in TODs in relation to the existing surrounding development pattern. Within TODs, densities should be the highest nearest transit.

Each centre will have a unique function, both locally and regionally within the city's/region's development framework and within the transit network. US research shows that typically in more urban TODs with larger scale and intensity of commercial (office) activity, office locations should be in close proximity (within 200-300 m) of the station to match employee expectation of a short walk to/from their work location and the transit station. On the other hand, in centres with a predominantly residential catchment (e.g. like the North Penrith Development), residential areas and densities can be further away from the station and up to an 800 metre (or 10 minute) walk from the residence to the station; US transit ridership surveys show that residents are willing to walk up to 800 metres if within a good quality transit station which provides high quality and frequent transit (with services at least every 10-15 minutes).

Historically, 15 to 17 dwelling units per hectare will support a bus line and 20 to 60 dwelling units per hectare will support a rail line.

Photo 3 Embarcadero LRT, San Francisco, CA

All the basic elements of a good TOD design: moderate to higher density, a mix of uses, development at a pedestrian scale, creation of a defined centre and civic spaces are included in this development along the Embarcadero line.

When the density increases to over 123 dwelling units per hectare, the number of auto and non-auto trips are equal. From US based research, the general rule of thumb is that a 10% increase in density equates to a five percent increase in transit trips.

Limited Parking

Parking is one of the most challenging aspects of any TOD. Typical suburban development, with 50 to 75% of the site devoted to surface parking, results in land use densities that are too low to support transit service. By creating a more limited parking supply, including introducing shared parking schemes and moving parking from surface parking lots to on-street parking and parking structures, residents, shoppers and employees are encouraged to use transit to get to the TOD and to walk within the TOD.

Parking in a TOD should consider three fundamental components: size, location and design. Parking needs to be sized sufficiently to meet auto needs that cannot be satisfied by transit. In areas with established office markets and high quality transit service, office parking ratios for TOD are lower than conventional ratios. In emerging markets (e.g. areas without strong commercial precincts and/or strong transit), office TOD requires conventional parking ratios. In areas with stronger commercial mix and/or reasonably high transit frequency, shared parking between uses or a parking management district can reduce the need for parking by 25% over conventional ratios depending on the mix of uses.

In terms of parking facilities, these should be located so buildings, not the parked cars, are the dominant visual feature. The design of the parking needs to relate to the streetscape, circulation routes, and pedestrians and integrated into the development.

In centres with a mix of uses, including adjacent to main streets, surface parking lots should not be directly adjacent to active main streets and structured parking buildings should be sleaved with active ground floor uses.

A simple checklist for evaluating TOD

In addition to these principles, for development to be transit oriented, parking, density, and building orientation need to be shaped by transit, unlike conventional development practices. It is not enough that it is adjacent to transit.

A successful TOD will reinforce the community and the transit system.

This checklist is intended to guide planners and communities in reviewing proposed projects and in assessing the transit-friendliness of current land use codes and policies.

Within an easy walk of a major transit stop (e.g. 400 to 800 metres), consider the following:

Land use

- Are key sites designated for ‘transit-friendly’ uses and densities? (Are they walkable, mixed-use, and not dominated by activities with significant automobile use)?
- Are ‘transit-friendly’ land uses permitted outright, and thus not requiring special approval?
- Are higher densities allowed near transit?
- Are multiple compatible uses permitted within buildings near transit?
- Are the first floor uses ‘active’ and pedestrian-oriented?

- Is a mix of uses generating pedestrian traffic concentrated within walking distance of transit?
- Are auto-oriented uses discouraged or prohibited near transit?

Site & building design

- Are buildings and primary entrances sited and oriented to be easily accessible by pedestrians from the street?
- Do the designs of buildings and the spaces around them allow direct pedestrian movements between transit, mixed land uses and surrounding areas?
- Does the site's design allow for the intensification of densities over time?
- Do buildings incorporate architectural features that convey a sense of place and relate to the street and the pedestrian environment?
- Are amenities, such as storefront windows, awnings, architectural features, lighting, and landscaping, provided to help create a comfortable pedestrian environment along and between buildings?
- Are there footpaths along the site frontage? Do they connect to footpaths and streets on adjacent and nearby properties?
- Are there trees sheltering streets and footpaths? Is there pedestrian-scale lighting?
- Are buildings and parks used to provide a focal point or anchor the area?

Street patterns & parking

- Are street patterns based on a grid/interconnected system that simplifies access for all modes?
- Are pedestrian routes buffered from fast-moving traffic and expanses of parking?
- Does the transport hierarchy promote movement of people firstly as pedestrians, secondly as cyclists, thirdly through public transport and lastly using private motor vehicle?
- Are parking requirements reduced in close proximity to transit, compared to the norm?
- Is there a parking strategy that would allow for shared parking so guests, customers, and employees can utilise the same parking spaces?
- In high density areas, is structured parking encouraged over surface parking?
- Is most of the parking located to the side or to the rear of the buildings?
- Is secure and convenient bicycle parking available?

Station

- Is the station well connected to other public transport modes and the surrounding community?
- Is the station accessible for all, safe and secure, easy to navigate, and a pleasant place to be?
- Are placemaking and pedestrian movement given a higher profile in planning and delivery of the project than optimizing transit operations? (Thus is the transit element of the project targeted toward passengers?)

Appendix 8: AUTOTRACK Vehicle Swept Path Analysis

Design Vehicle: AUSTROADS 25.0m oversized articulated truck

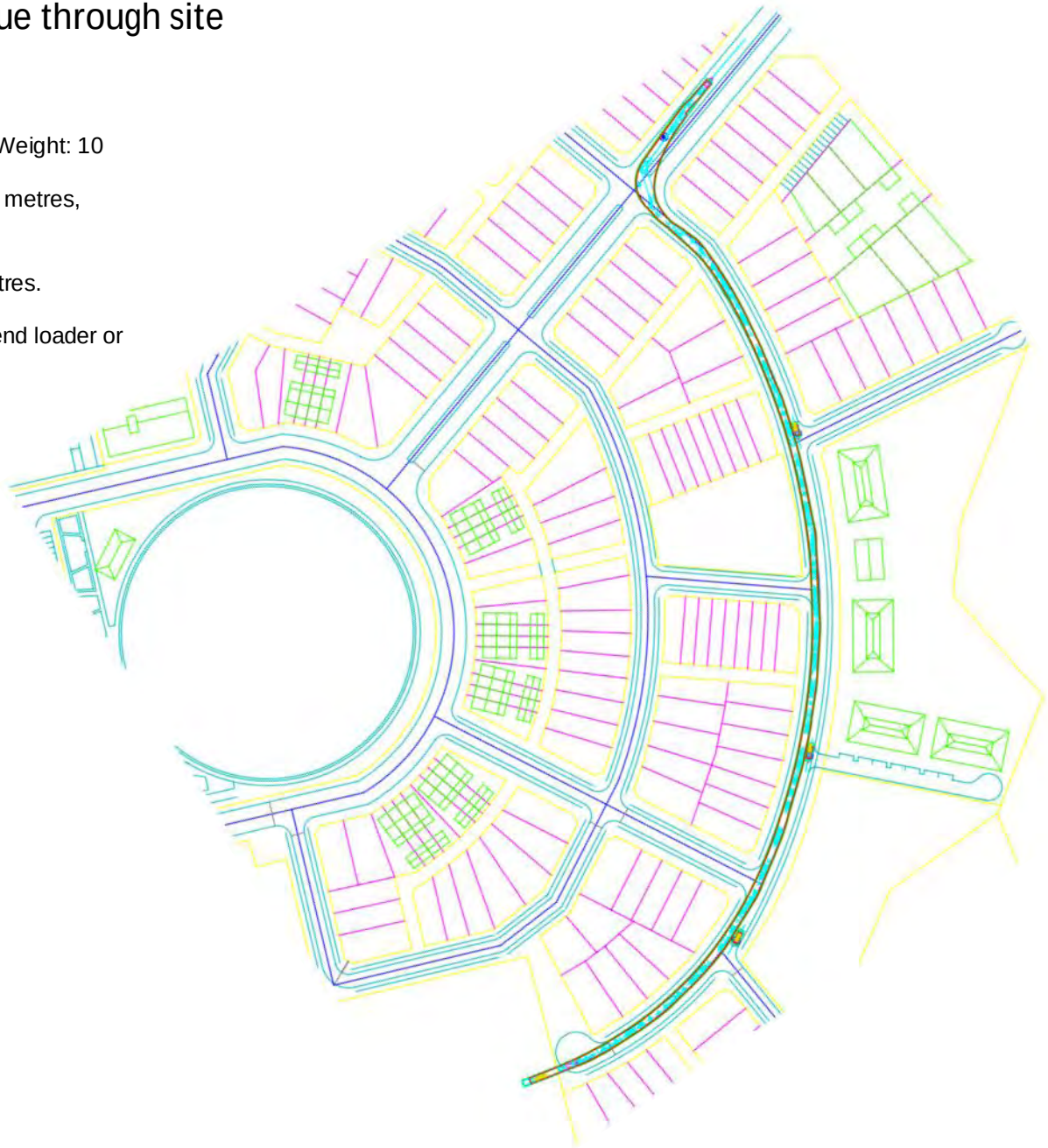
Path from PTD to Coreen Avenue through site

Oversized Military Articulated truck

- Mack 6 x 6 truck: Length: 9.6 metres, Weight: 10 tonne (unloaded)
- Plant Transporter: Length: up to 11.95 metres, Weight: up to 8.5 tonne (unladen)

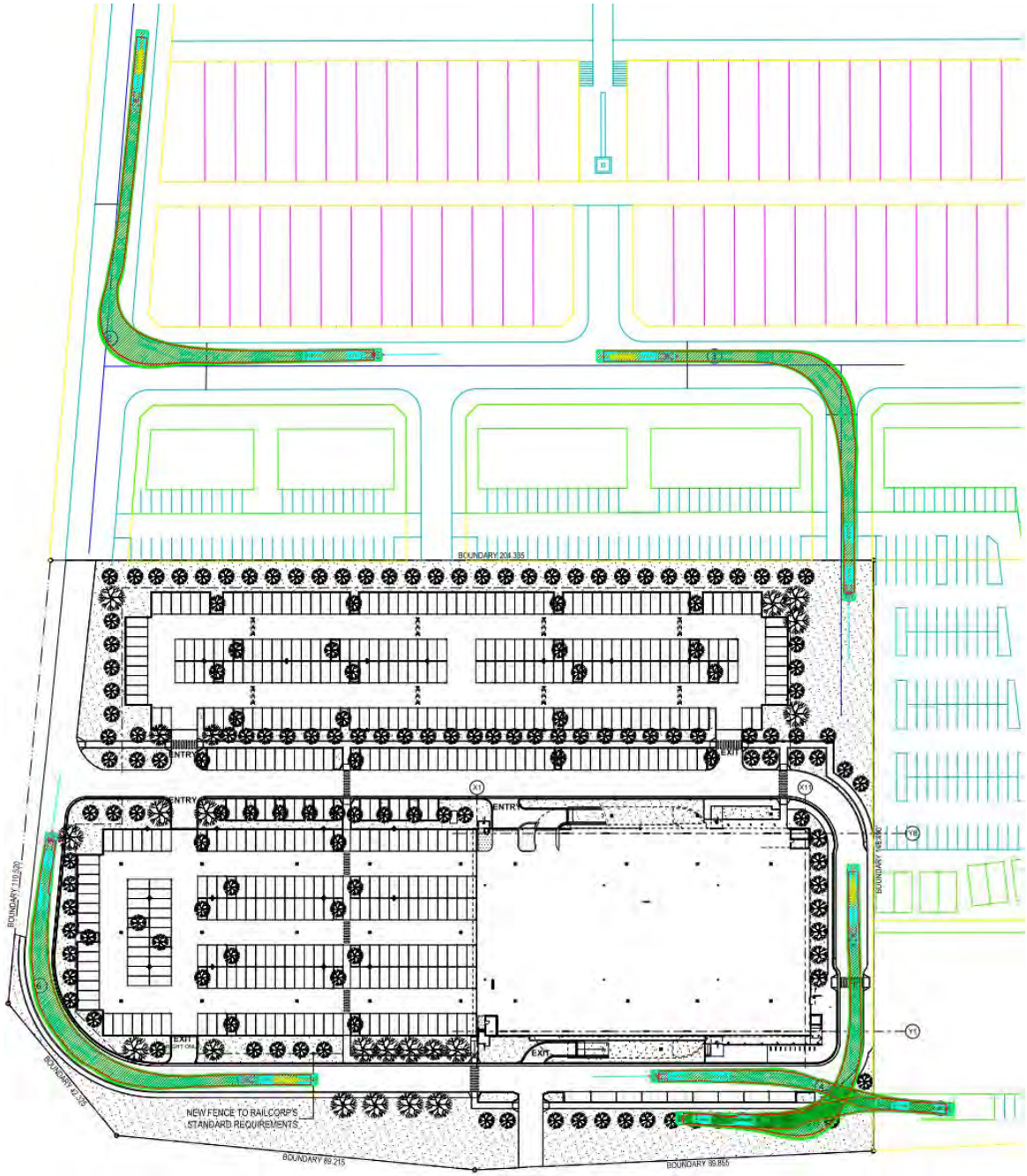
Total length of articulated vehicle: up to 24 metres.

Likely cargo: plant equipment such as a front end loader or bulldozer.



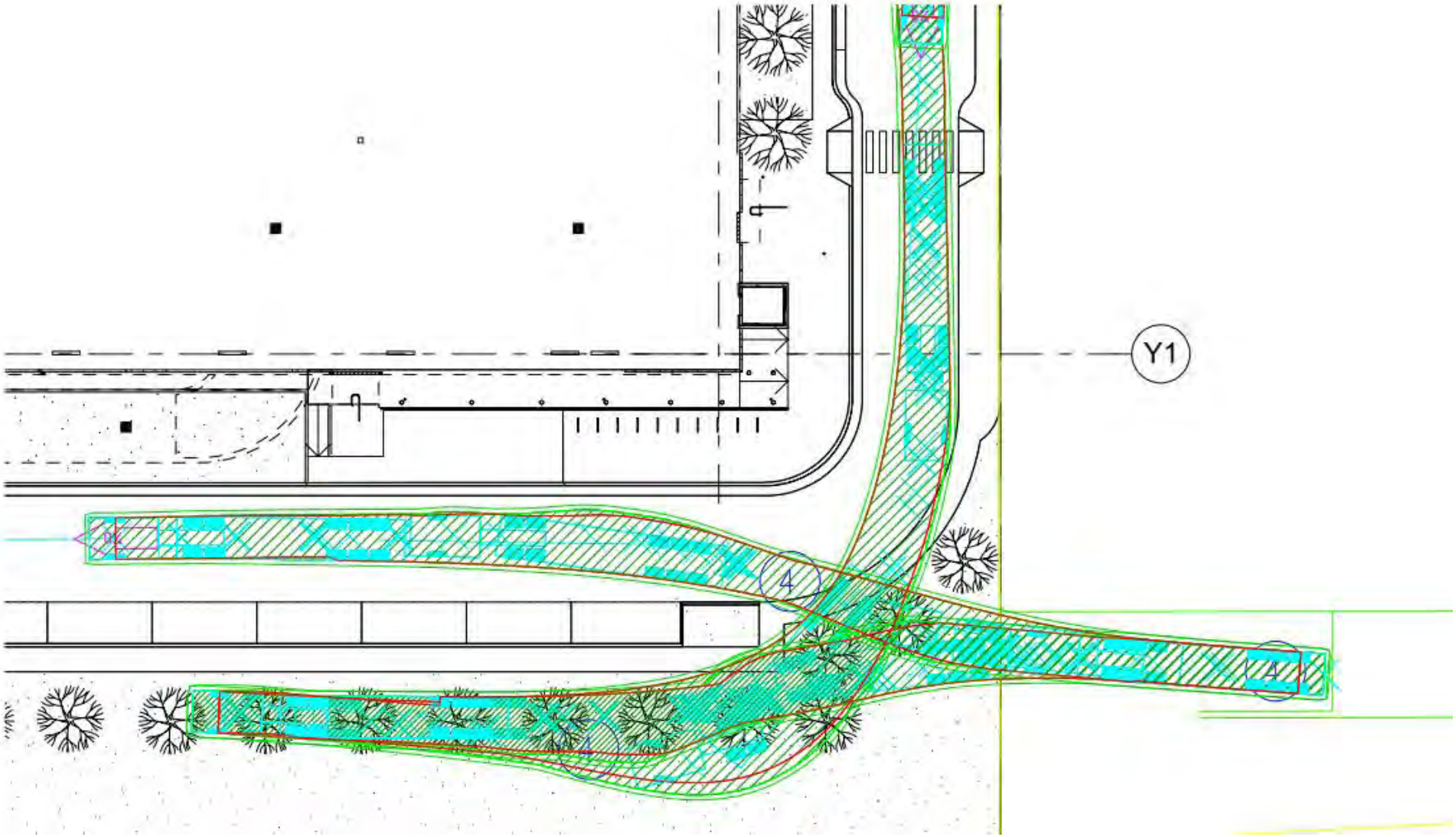
Design Vehicle: AUSTROADS 19.0 Semi-trailer

Path to/from supermarket loading dock



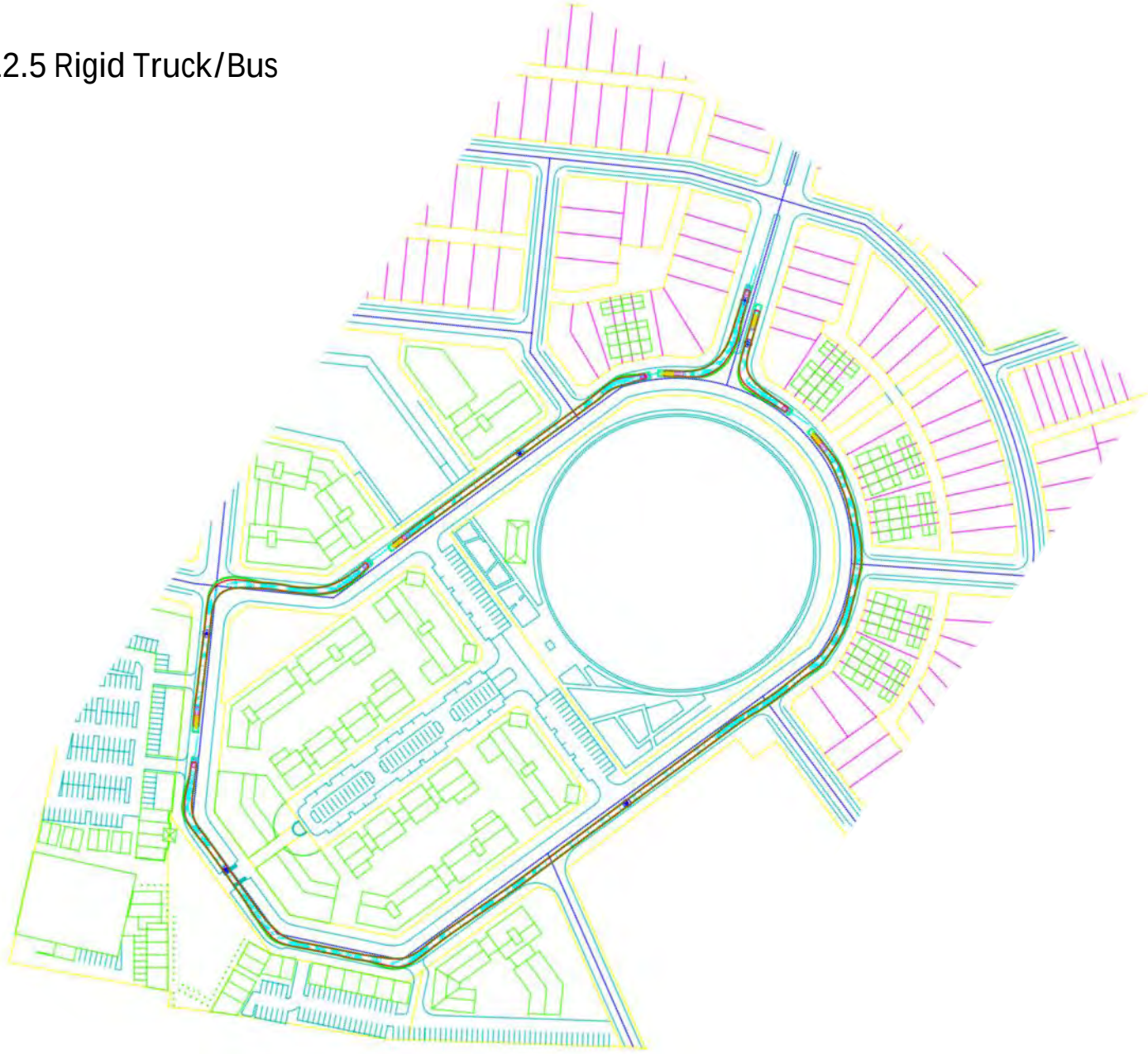
Design Vehicle: AUSTROADS 19.0 Semi-trailer

Manoeuvres into/out of supermarket loading dock



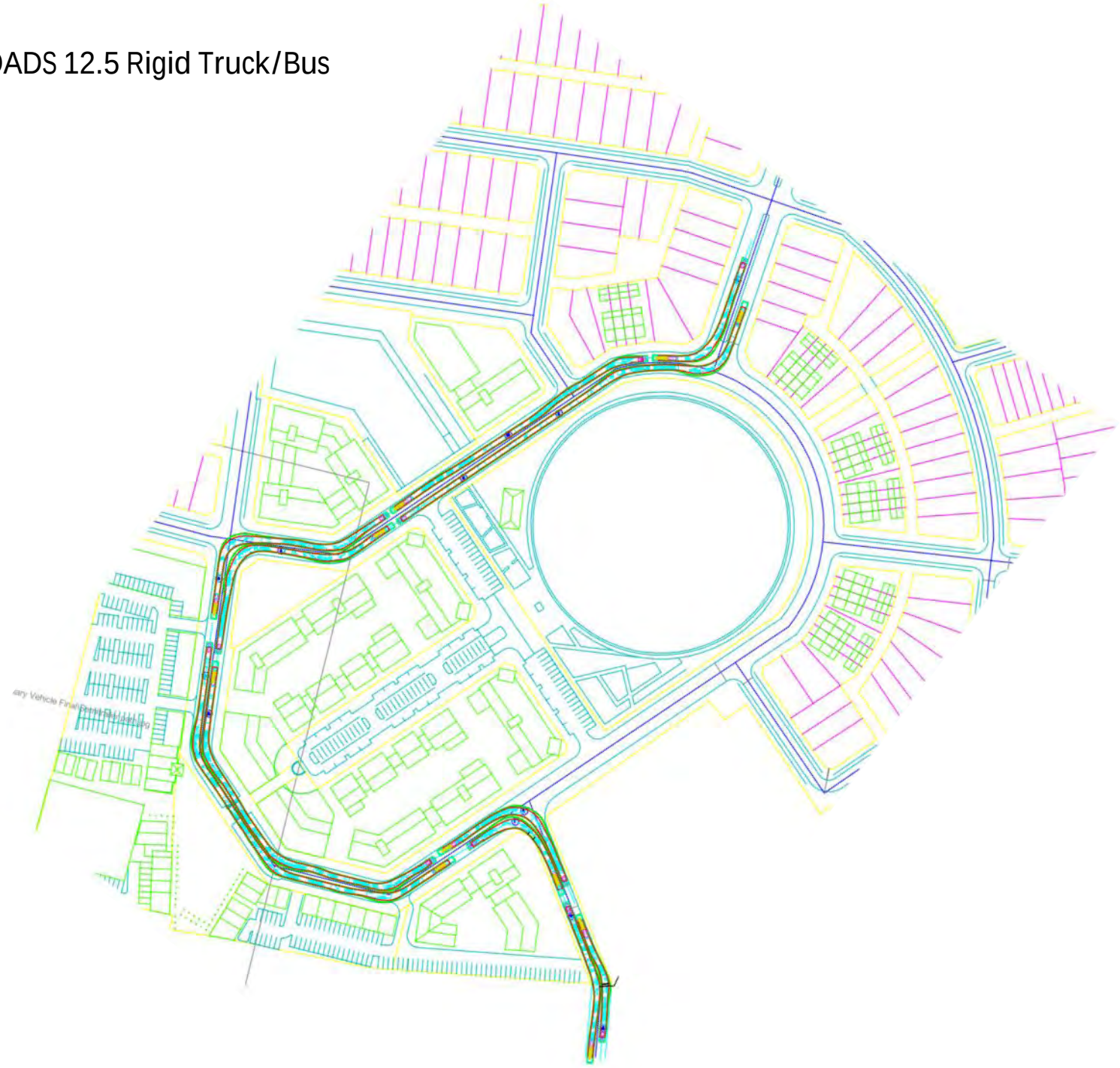
Design Vehicle: AUSTROADS 12.5 Rigid Truck/Bus

Interim Bus Route



Design Vehicle: AUSTROADS 12.5 Rigid Truck/Bus

Long-Term Bus Route

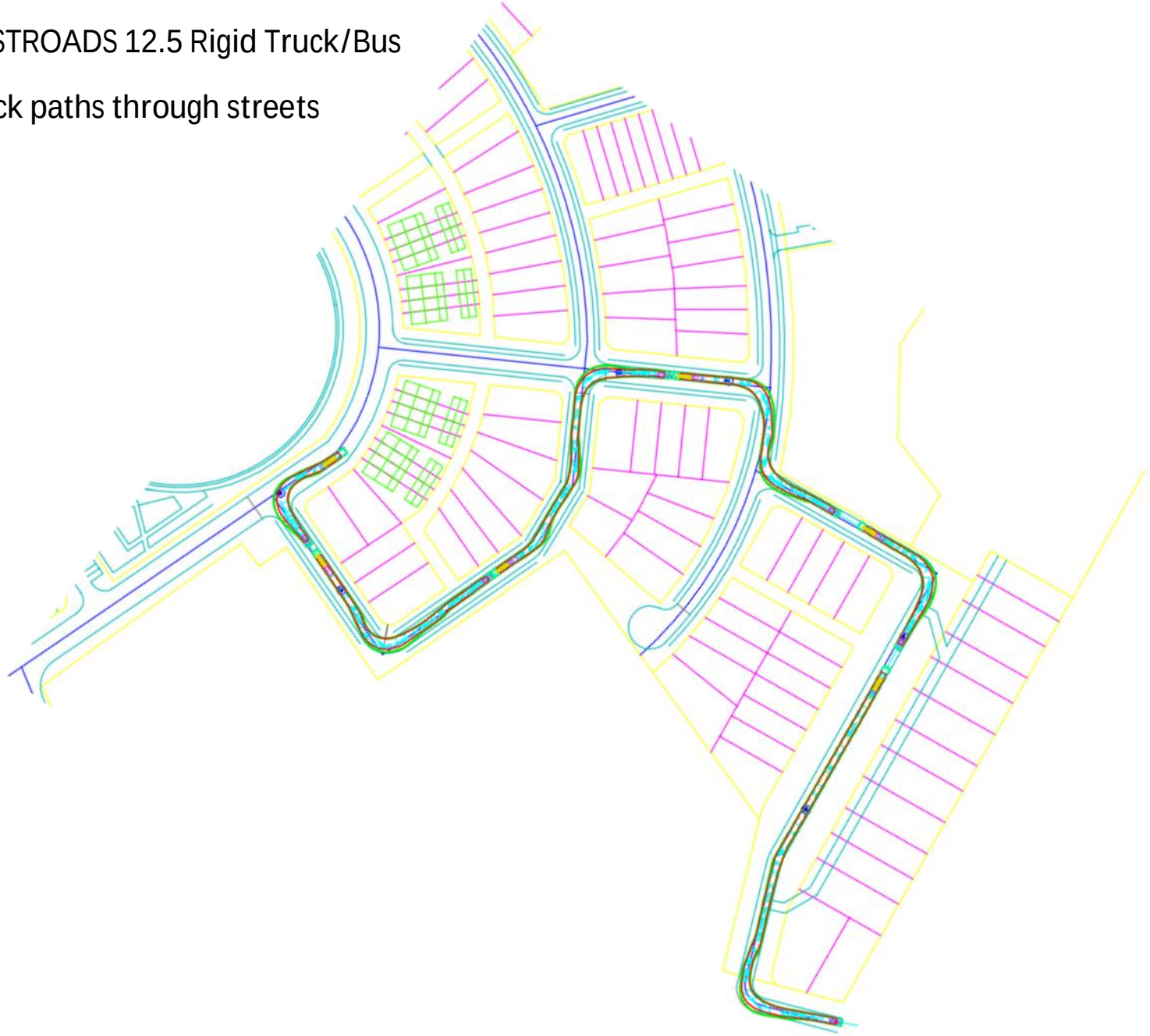


Design Vehicle: AUSTROADS 12.5 Rigid Truck/Bus

Sample garbage truck paths through streets

Design Vehicle: AUSTROADS 12.5 Rigid Truck/Bus

Sample garbage truck paths through streets



Appendix 9: Full upgrade list cost estimate, apportionment and timing

A concept level engineering cost estimate has been prepared for each of the upgrades listed in Tables 24 and 29. Table 36 and Table 37 show a summary of the results of the upgrades for the lists in Tables 24 and 29 respectively.

These are concept level budget costs only, prepared using standard unit rates based on previous projects. Rates for small-scale projects assume that they would be undertaken as part of a wider works program.

In addition we have allowed a 77% mark-up to cover overheads, margin and contingency, as follows:

- Traffic Control 8%
- Public utility plant relocation and/or protection 5%
- Contractor's Overheads 18%
- Contractor's margin 10%
- Design 4%
- Project Management 7%
- Risk and Contingency 25%
- Total % allowance 77%

No allowance has been made for the cost of land acquisition or on-going maintenance costs (due to lack of information). All costs are in $Australian dollars and are 2010 values.

The estimates are based upon information made available to PB at the time of preparing the estimates. The estimates have been prepared for this specific Client and Project, and should not be used or relied on for any other use. PB accepts no liability for actual costs varying from those estimated.

Table 36 Estimate of possible costs – Future Base plus other developments plus North Penrith Project

Intersection	Recommended upgrades (in addition to existing layout)	Estimated cost
Parker Street/Coreen Avenue/ Richmond Road	▪ 120 m long right turn bay on Coreen Avenue ▪ 50 m long left turn bay on Parker Street ▪ Additional through lane on Parker Street, 100 m on approach and departure ▪ Additional through lane on Richmond Road, 100 m on approach and departure ▪ Additional 135 m long right-turn bay on Richmond Road ▪ 25 m long left turn bay on Oxford Street ▪ 40 m long right turn bay on Oxford Street	$1,500,000
Parker Street/ Copeland Street	▪ 120 m long right turn bay on Parker Street northbound ▪ 70 m long right turn bay on Copeland Street westbound ▪ 40 m long left-turn slip lane on Copeland Street eastbound	$720,000
Coreen Avenue/ Coombes Drive	▪ Install 'seagull' treatment on Coreen Avenue	$25,000
Coreen Avenue/ New Site Access	▪ Install one-lane roundabout	$770,000
Coreen Avenue/ Commuter car park road	▪ Widen one corner of roundabout (to accommodate large vehicles turning)	$30,000
Castlereagh Road/ Coreen Avenue	▪ Convert two-lane roundabout to traffic signals ▪ Additional through lanes on Castlereagh Road in each direction, 100m on approach and departure ▪ Two 150 m long right turn bays on Castlereagh Road northbound ▪ One through lane, one 75 m long left-turn bay and one 150 m long right turn bay on Coreen Avenue ▪ One 150 m long left turn slip lane and one 70 m long right turn bay on Castlereagh Road southbound ▪ One shared through-right lane and one 60 m long shared left-through lane on Mullins Road	$3,240,000
Castlereagh Road/ Peachtree Road	▪ Additional through lanes on Castlereagh Road in each direction, 100 m on approach and departure	$1,170,000

Table 37 Estimate of possible costs – Future Base plus North Penrith Project only

Intersection	Recommended upgrades (in addition to existing layout)	Estimated cost
Parker Street/Coreen Avenue/ Richmond Road	▪ 120 m long right turn bay on Richmond Road ▪ 25 m long left turn bay on Oxford Street	$170,000
Coreen Avenue/ Coombes Drive	▪ Install 'seagull' treatment on Coreen Avenue	$25,000
Coreen Avenue/ New Site Access	▪ Install one-lane roundabout	$770,000
Coreen Avenue/ Commuter car park road	▪ Widen one corner of roundabout (to accommodate large vehicles turning)	$30,000
Castlereagh Road/ Coreen Avenue	▪ Retain two-lane roundabout ▪ Add left-turn slip lane and downstream merge on Coreen Avenue (to Castlereagh Road southbound)	$320,000

Apportionment

The traffic assessment in Section 4 has considered two future traffic scenarios:

1. Future growth in base traffic, traffic from other developments, and traffic generated by the Project; and
2. Future growth in base traffic and traffic generated by the Project only.

These two scenarios would involve a different set of infrastructure upgrades and different percentage contributions. The relative costs and contributions are shown in Table 39.

Table 38 Comparison of road network upgrades for traffic assessment scearios

	Traffic scenario 1: Future Base Growth plus other developments plus North Penrith Project			Traffic scenario 2: Future Base Growth plus North Penrith Project only		
Upgrade	Est. Cost	% Growth	Contribution	Est. Cost	% Growth No other Devt.	Contribution
Intersection of Parker Street/Oxford Street/ Coreen Avenue & Richmond Road	$1,880,000	11%	$207,000	$300,000	40%	$120,000
Intersection of Parker Street/Copeland Street	$720,000	6%	$44,000	$0	-	$0
Intersection of Coreen Avenue & Coombes Drive	$25,000	44%	$11,000	$25,000	58%	$15,000
Intersection of Coreen Avenue & Site Boulevard	$770,000	100%	$770,000	$770,000	100%	$770,000
Intersection of Coreen Avenue & Commuter car park road	$30,000	100%	$30,000	$30,000	100%	$30,000
Intersection of Castlereagh Road & Coreen Avenue	$3,240,000	10%	$318,000	$320,000	38%	$122,000
Intersection of Castlereagh Road & Peachtree Road	$1,170,000	14%	$169,000	$0	-	$0
Total			$1,549,000			$1,057,000

The first traffic scenario presumes that the other developments will proceed as assumed, with no changes to scale or timing. The results of the analysis, indicate that a large program of road upgrades is required to provide sufficient capacity for these developments not to reduce performance of the road network, with the Project only representing a small percentage of the increase in traffic. This scenario has the potential to leave the Government with a small contribution from the Project to a large number of works packages, with uncertain funding for the remaining majority of the works. It also assumes that agreed plans exist for the works with a cost estimation open to scrutiny.

By contract the second scenario provides certainty in relation the amount of development and the set of road network upgrades required. The Project would contribute a larger percentage of a smaller package of upgrades. The smaller package of works has the advantage of being more easily delivered, and has a more direct relationship between the infrastructure being provided and the need generated by the Project.

It would also allow the developer to undertake ‘works-in-kind’ relieving the Government from the burden of the infrastructure upgrades, and allowing the infrastructure to be delivered in a timeframe that may not be possible if works had to wait for contributions to be collected from all developers contributing to the need for the upgrade.

Other developments, should they come on line, would then be able to reduce their list of infrastructure upgrades to works for which they have a stronger nexus for.

The proposed apportionment for the Project is proposed as follows.

- Parker Street/Richmond Road/Coreen Avenue/Oxford Street – 40%
- Coreen Avenue/Coombes Drive – 58%
- Coreen Avenue/New Site Boulevard Access – 100%
- Coreen Avenue/commuter car park – 100%
- Castlereagh Road/Coreen Avenue/Mullins Road – 38%
- Travel Plan – 100%.

Timing

With the current level of performance of the road network, and then adding on the traffic from future base growth, the other planned developments and the Project, a large number of the intersections mentioned for upgrade in Table 24 would require upgrading within the next few years. However, there are no current plans for the road network upgrade, nor a commitment from the other developments to contribute to the cost of the upgrades required:

- Parker Street/Richmond Road/Coreen Avenue/Oxford Street – 2011
- Parker Street/Copeland Street – 2011
- Coreen Avenue/Coombes Drive – 2013
- Castlereagh Road/Coreen Avenue/Mullins Road – 2012
- Castlereagh Road/Peachtree Road – 2015.

The North Penrith Project represents only a small percentage of the traffic driving the need for these upgrades, even if the other developments proceed as assumed.

More certainty can be gained from the future traffic scenario that includes the future base growth plus the traffic generated by the North Penrith Project only (i.e. without the traffic generated by other developments). The list of upgrades required for this scenario was described in Table 26. Based on this scenario, the estimated years of upgrading are

- Parker Street/Richmond Road/Coreen Avenue/Oxford Street – 2012
- Coreen Avenue/Coombes Drive – 2018
- Castlereagh Road/Coreen Avenue/Mullins Road – 2020.

It is proposed that these upgrades more reasonably reflect the required works to mitigate the impact of the development on the road network. Converting these years into yields of development, the following stages are proposed:

- Parker Street/Richmond Road/Coreen Avenue/Oxford Street – On release of Stage 1A
- Coreen Avenue/Coombes Drive – On completion of Stage 2A
- Castlereagh Road/Coreen Avenue/Mullins Road – On completion of Stage 2D (full development).