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29 October 2017
Our Ref: 15168

Craig Thomas
Logos Property
E: craigthomas@logosproperty.com

Dear Craig

34 Yarrunga Street, Prestons

I have considered the "traffic" issues raised by the Department of Planning (letter of 30.8.17), RMS (letters of 30.8.17 and 13.10.17) and Council (letter of 24.8.17 and attached memos) and respond in the following:

Firstly, as indicated in the Department of Planning email of 25.10.17, Warehouse 1 (i.e. 6) and the Sports and Recreation Facility (4) are not part of the Mod 2 Application. The traffic assessment which accompanied the S96 Applications, for simplicity, assessed the combined Mod 2 and Mod 3 proposals.

The assessed total traffic generation of the approved SSD 7155 development scheme was 258 vtph for the AM & PM network peaks (page 13 of the TTPA assessment March 2016). The total proposed warehouse (plus office) floorspace for the Mod 2 application is 119,165m^2 whereas the total floorspace of the SSD approval was 116,205m^2. The Traffic Assessment for the SSD application "offered" a very significant sensitivity factor to the RMS sourced "network peak" traffic generation rates. Whereas the RMS published network peak trip generations for Erskine Park and Wonderland Business Park (see attached) were as follows:

	AM	**PM**
Erskine Park	0.13	0.17
Wonderland Bus. Park	0.14	0.17

If the highest RMS "comparable" traffic generation rate (0.17 vtph per 100m^2) is applied to the now proposed 119,165m^2, the resultant total projected traffic generation is 203 vtph. Thus, the projected traffic generation of the Mod 2 development scheme assessed

with the actual rates provided in the RMS study is significantly lower than that assessed and approved for the SSD application.

DOP RFI

Traffic 5 Expected Peak Periods

Based on RMS data:

	AM	PM
Site Peaks	6.30 – 7.30am	3 – 4pm
Network Peaks	8 – 9am	5 – 6pm

Traffic 6 Impact of Construction Traffic

The construction vehicle movements associated with the staged construction elements of the development will be significantly less than that of the traffic generation of the completed and operational elements and as such there are no measures needed to manage the construction traffic movements.

Traffic 7 Traffic Assessment

The assessed warehouse floorspace in the Traffic Reports of 112,854m^2 did not include Buildings 4 and 6 which were separately assessed and added (see page 9) to give the total assessed generation due to the fact that they do not reflect a warehouse use as such and are subject to a separate S96 application. It is noted however that the assessed total warehouse/office floorspace 119,070m^2 (see top P10) should have been 119,165m^2. However, the +95m^2 would have no perceptible difference.

Traffic 8

For others

Traffic 9 Expected Daily Traffic

The RMS published average daily generation factor is 2.1 vtph / 100m^2 so 119,165m^2 is 2,500 vpd plus Buildings 4 and 6 of say 500 vpd gives a total of 3,000 vpd.

Cars	70%
Rigid	17%
Articulated	13%

**classification based on RMS data, no more detailed info available*

Traffic 10 & 11

For others

Traffic 12 Parking for Warehouse 1

The proposed provision is 1 space per 241m^2 which significantly exceeds the RMS criteria of 1 space per 300m^2 and Council's criteria is 1 space per 250m^2. The proposed 152 spaces exceed the provision of 132 spaces at the existing Volvo facility which is to be transferred to the site.

EMAIL OF 25.10.17

Access Arrangement

The proposed access on Bernera Road for WH3B is to enable the user to "side load" some trucks and the access gate will only be opened to enable the side loaded trucks to egress. These will be very minor truck movements restricted to left turn egress only enforced by a central median island in Bernera Road incorporated into the Chevron at the commencement of the proposed right turn bay (see attached plan). This arrangement reflects the same treatment which is approved for the Building 4 access on Bernera Road and the minor egress movements will be facilitated by gaps in the northbound traffic flow introduced by the operation of the traffic signals at the intersection to the south. Consequently, there will not be any adverse traffic implications as a result of this aspect of the proposal particularly as the roadway is straight and level, there will be excellent sight distances available and the egress activity will be somewhat less than that for WH4 where access has been approved for both ingress and egress.

Traffic Impact

The RMS traffic generation criteria for warehouse use does not differentiate between the warehouse and ancillary office elements and it is noted that the size of the proposed ancillary office elements is not inordinate. The issue relating to WH1 (6) and the Sports/Recreational facility are addressed in the forgoing.

Widening of Bernera Road

The generalised widening of Bernera Road is to be undertaken with Section 94 funds therefore it is not the responsibility of individual developers to widen the road other than on site frontage to Bernera Road. The northbound carriageway of Bernera Road along the entire road frontage from Kurrajong Road to Yarrunga Road and for the length of the right turn bay north of Yarrunga Road will be widened as a responsibility of the

development. The DOP advise that the generalised widening of Bernera Road is not required as part of Mod 2.

The SIDRA model file for the intersection as incorporated in the Traffic Report and has been provided to Council and RMS.

COUNCIL ISSUES

Traffic Generation

The RMS traffic generation rate for Warehouse use of 0.5 vtph/100m^2 was established in a study/analysis by the former Traffic Authority in 1979 nearly 40 years ago (see attached). This study assessed sites of 1,920m^2, 4,730m^2, 6,140m^2 and 7,220m^2 etc which bear no relevance to contemporary large warehouses with 12 hour shifts etc.

The RMS circular TDT 2013/04 specifies that the new data for the relevant landuses (e.g. Business Parks and Industrial Estates) "*should be used to replace those sections of the existing Guide to Traffic Generating Developments*".

The survey for RMS for TDT 2013/04 for Erskine Park included 5 factories, 2 factory/warehouses and 1 office building and 1 workshop (Linfox Trucks).

The submission from Liverpool Council references a survey for RMS of a "Warehouse" use of 136,737m^2 and its traffic generation rate of 0.919 vtph/100m^2. This survey was for a site at Tuggerah (see attached details) which incorporates besides warehouse use 93 offices and 16 retail outlets. It is apparent therefore that the nature of the site bears no resemblance to the proposed warehouse development or the other referenced comparable warehouse precincts contained in the same RMS document (i.e. Erskine Park and Wonderland).

RMS ISSUES (13.10.17)

Intersection Arrangement

Further turning path assessment has been undertaken as Council has advised that it is not possible to acquire the necessary land on the NW and SE corners in the short term to achieve the final intersection arrangement for the left turn movements although there is a current DA submitted for the site on the NW corner of the intersection and Council will impose a Consent Condition on that DA requiring dedication of the required land necessary to achieve the required intersection geometry. The attached SP 1, 2 and signage/roadmarking diagrams indicate:

SP 1 – B Double trucks turning right and semi-trailers turning left with some minor trim to the proposed kerbs on the NW and SE corners. It would be proposed that regulatory signage be installed “NO LEFT TURN ON GREEN ARROW VEHICLES OVER 19M LONG” for the left turn movements (this is equivalent to the relatively common “NO RIGHT/LEFT TURN VEHICLES LESS THAN X M EXCEPTED”.

SP 2 – B Double trucks turning right and left requiring some greater trim of the proposed kerbs with implications for the location of kerb ramps and cyclist/pedestrian movements.

The turning paths for right turning B Double vehicles are not a “single radius” turn however guidelines (T1) would be provided to guide the drivers and this is considered to be an acceptable interim arrangement until the land is acquired and the left turn radii modified.

Floorspace / Traffic Generation

Clarified in the forgoing

SIDRA Model Results

The SIDRA models are for the proposed intersection with the projected traffic generation of the two relevant developments with a very significant sensitivity factor added. The overall Levels of Service are C in the AM peak and D in the PM peak. It is also noted a 50% heavy vehicle percentage was applied to the Yato Road movements.

In the circumstances it is considered that the SIDRA results are quite satisfactory.

Intersection Design

It is not feasible to achieve a fully complying B Double design for the intersection at the present time. However, it is noted that:

- the very predominant turning movements at this intersection are and will continue to be the movements to and from the M7 (the north)
- there is a very large H.V. transmission pole on the SW corner (right on the kerb return) and no apparent opportunity at present to acquire the land to improve the geometry of that corner
- reducing the footway widths to 2 metres on each corner would enable B Double passing however this would position signal posts in the middle of the footways (obstructing pedestrians and cyclists) and would not permit the appropriate provision for kerb ramps.

It is suggested that the way forward to achieve a satisfactory interim arrangement of this intersection is to:

- modify the proposed NW and SE corners to accommodate a semi-trailer turning left with a right turn B Double and install signage prohibiting B Doubles turning on green arrow. It is assessed that the percentage of B Double vehicles making the left turn movements will only be some 5% of the total movements and that this will not impact on the operational performance of the intersection particularly as the green arrow provision is only supplementary to the respective main signal phase movements.
- designate the centre approach lanes on Yarrunga Street and Yato Road as right turn only and provide road marking to guide the movement of turning trucks (see attached plan).

Yours faithfully

Ross Nettle
Director
Transport and Traffic Planning Associates

3 SURVEY ANALYSIS

3.1 Survey Output Requirements

The data was analysed with the key parameters needing to be established being

- Weekday survey site peak hourly generation AM & PM
- Weekday hourly generation in adjacent network AM & PM peak
- Weekday daily trip generation

3.2 Average Trip Rates for Business Parks and Industrial Estates

The trip generation calculation that was to be performed would depend upon the variable that was interrogated, in this case the total floor area by type of land use.

The summary of the survey data for each of the surveyed areas is shown in Table 3.1. Average trip generation rates for sites in the Sydney area are summarised in Table 3.2 together with those for non-Sydney area. The detailed results are contained in a separate "Data Report".

Table 3.1 Traffic survey results summary. Refer to next page

	Sydney areas				Non-Sydney areas						
Site ID	Site 1 Erskine Park Industrial Estate, Erskine Park	Site 2 Helensburgh Business Park, Helensburgh	Site 3 Wonderland Business Park, Eastern Creek	Site 4 Riverwood Business Park, Riverwood	Site 5 Tuggerah Business Park, Tuggerah	Site 6 Central Business Park, Albion Park Rail	Site 7 Anambah Business Park, Rutherford	Site 8 Freeway Business Park, Beresfield	Site 9 Shearwater Business Park, Taylors Beach	Site 10 Port Stephens Industrial Estate, Taylors Beach	Site 11 Johnson Street Business Park, Dubbo
Gross Floor Area in estate m²	693,605	1,605	406,600	29,983	136,737	42,899	29,766	89,291	16,022	19,881	14,419
Person-based trips											
Site AM peak hour	1148	28	885	173	1416	294	168	575	244	94	120
Trips per 100 m² of GFA	0.17	1.74	0.22	0.58	1.04	0.69	0.56	0.64	1.52	0.47	0.83
Site PM peak hour	1294	29	927	157	1458	519	204	555	285	97	149
Trips per 100 m² of GFA	0.19	1.81	0.23	0.52	1.07	1.21	0.69	0.62	1.78	0.49	1.03
Vehicle network AM peak hour	976	24	743	173	1408	270	123	575	176	93	120
Trips per 100 m² of GFA	0.14	1.50	0.18	0.58	1.03	0.63	0.41	0.64	1.10	0.47	0.83
Vehicle network PM peak hour	1073	7	822	94	1060	477	160	396	258	54	136
Trips per 100 m² of GFA	0.15	0.44	0.20	0.31	0.78	1.11	0.54	0.44	1.61	0.27	0.94
Daily total person trips:											
During Survey Times	0600 to 1900	0700 to 1900	0700 to 1900	0700 to 1900	0700 to 1900	700 to 1900	0600 to 1900	0700 to 1900	0600 to 1900	0600 to 1900	0600 to 1900
	11750	144	7654	1344	10796	3590	1898	5210	2253	931	1227
24 hours	14056	168	9929	1410	12066	4205	2064	6399	2389	975	1316
Trips per 100 m² of GFA (24hrs)	2.03	10.49	2.44	4.70	8.82	9.80	6.93	7.17	14.91	4.90	9.13
Vehicle-based trips											
Site AM peak hour	1046	21	820	129	1256	268	145	504	193	64	108
Trips per 100 m² of GFA	0.15	1.31	0.20	0.43	0.92	0.62	0.49	0.56	1.20	0.32	0.75
Site PM peak hour	1128	24	763	123	1,222	418	173	481	209	78	116
Trips per 100 m² of GFA	0.16	1.50	0.19	0.41	0.89	0.97	0.58	0.54	1.30	0.39	0.80
Network AM peak hour	929	19	679	129	1256	246	111	495	147	64	108
Trips per 100 m² of GFA	0.13	1.18	0.17	0.43	0.92	0.57	0.37	0.55	0.92	0.32	0.75
Network PM peak hour	965	5	703	69	794	382	127	354	187	42	116
Trips per 100 m² of GFA	0.14	0.31	0.17	0.23	0.58	0.89	0.43	0.40	1.17	0.21	0.80
Daily total vehicle trips:											
During Survey Times	0600 to 1900	0700 to 1900	0700 to 1900	0700 to 1900	0700 to 1900	700 to 1900	0600 to 1900	0700 to 1900	0600 to 1900	0600 to 1900	0600 to 1900
	11036	146	7327	1059	9271	2822	1640	4831	1,813	714	1,164
24 hours	13125	168	9584	1116	10383	3351	1793	5876	1921	751	1,246
Trips per 100 m² of GFA (24hrs)	1.89	10.47	2.31	3.72	7.59	7.81	6.02	6.58	11.99	3.78	8.64

Table 3.2 Trips rate summary.

Site ID	Sydney areas Site 1 to Site 4				Non-Sydney areas Site 5 to Site 11				All survey sites Site 1 to Site 11				Avg Non-Sydney / Sydney %
Trips per 100 m² of GFA	Min	Max	Avg	St Dev	Min	Max	Avg	St Dev	Min	Max	Avg	St Dev	
Person-based trips													
Site AM peak hour	0.17	1.74	0.68	0.74	0.47	1.52	0.82	0.36	0.17	1.74	0.77	0.50	122%
Site PM peak hour	0.19	1.81	0.69	0.76	0.49	1.78	0.98	0.44	0.19	1.81	0.88	0.56	143%
Vehicle network AM peak hour	0.14	1.50	0.60	0.63	0.41	1.10	0.73	0.27	0.14	1.50	0.68	0.41	122%
Vehicle network PM peak hour	0.15	0.52	0.32	0.19	0.27	1.61	0.83	0.45	0.15	1.61	0.65	0.44	259%
Daily total person trips	2.03	10.49	4.92	3.90	4.90	14.91	8.81	3.16	2.03	14.91	7.39	3.79	179%
Vehicle-based trips													
Site AM peak hour	0.15	1.31	0.52	0.54	0.32	1.20	0.70	0.29	0.15	1.31	0.63	0.38	133%
Site PM peak hour	0.16	1.50	0.56	0.63	0.39	1.30	0.78	0.31	0.16	1.50	0.70	0.43	139%
Network AM peak hour	0.13	1.18	0.48	0.49	0.32	0.92	0.63	0.24	0.13	1.18	0.57	0.34	132%
Network PM peak hour	0.14	0.41	0.25	0.13	0.21	1.17	0.66	0.32	0.14	1.17	0.51	0.33	263%
Daily total vehicle trips	1.89	10.47	4.60	3.99	3.78	11.99	7.49	2.53	1.89	11.99	6.44	3.28	163%

Table 3.1 Traffic survey results summary.

Site ID	Sydney areas			
	Site 1 Erskine Park Industrial Estate, Erskine Park	Site 2 Helensburgh Business Park, Helensburgh	Site 3 Wonderland Business Park, Eastern Creek	Site 4 Riverwood Business Park, Riverwood
Gross Floor Area in estate m^2	693,605	1,605	406,600	29,983
Person-based trips				
Site AM peak hour	1148	28	885	173
Trips per 100 m^2 of GFA	0.17	1.74	0.22	0.58
Site PM peak hour	1294	29	927	157
Trips per 100 m^2 of GFA	0.19	1.81	0.23	0.52
Vehicle network AM peak hour	976	24	743	173
Trips per 100 m^2 of GFA	0.14	1.50	0.18	0.58
Vehicle network PM peak hour	1073	7	822	94
Trips per 100 m^2 of GFA	0.15	0.44	0.20	0.31
Daily total person trips:				
During Survey Times	0600 to 1900	0700 to 1900	0700 to 1900	0700 to 1900
	11750	144	7654	1344
24 hours	14056	168	9929	1410
Trips per 100 m^2 of GFA (24hrs)	2.03	10.49	2.44	4.70
Vehicle-based trips				
Site AM peak hour	1046	21	820	129
Trips per 100 m^2 of GFA	0.15	1.31	0.20	0.43
Site PM peak hour	1128	24	763	123
Trips per 100 m^2 of GFA	0.16	1.50	0.19	0.41
Network AM peak hour	929	19	679	129
Trips per 100 m^2 of GFA	0.13	1.18	0.17	0.43
Network PM peak hour	965	5	703	69
Trips per 100 m^2 of GFA	0.14	0.31	0.17	0.23
Daily total vehicle trips				
During Survey Times	0600 to 1900	0700 to 1900	0700 to 1900	0700 to 1900
	11036	146	7327	1059
24 hours	13125	168	9384	1116
Trips per 100 m^2 of GFA (24hrs)	1.89	10.47	2.31	3.72

Table 2.1 Details of the selected survey sites.

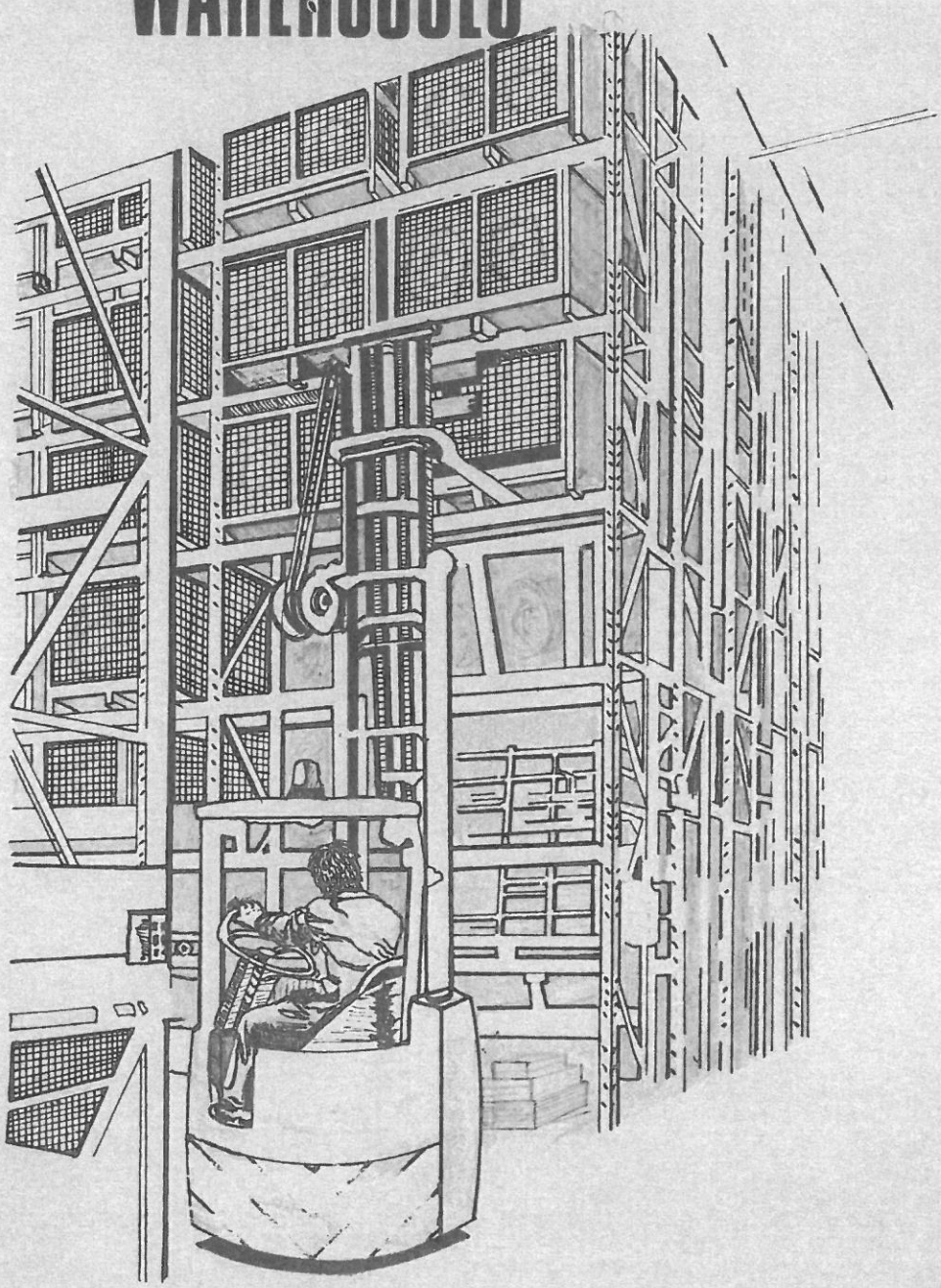
Traffic results summary

Survey area ID	Sydney areas						
	Site 1 Erskine Park Industrial Estate, Erskine	Site 2 Helensburgh Business Park, Helensburgh	Site 3 Wonderland Business Park, Eastern Creek	Site 4 Riverwood Business Park, Riverwood	Site 5 Tuggerah Business Park, Tuggerah	Site 6 Central Business Park, Albion Park Rail	Site 7 Anambah Business Park, Rutherford
Date of survey	29/03/2012	28/03/2012	27/03/2012	28/03/2012	1/05/2012	8/05/2012	2/05/2012
Day of survey	Thursday	Wednesday	Tuesday	Wednesday	Tuesday	Tuesday	Wednesday
Duration of survey	06:00-19:00	07:00-19:00	07:00-19:00	07:00-19:00	07:00-19:00	07:00-19:00	06:00-19:00
Surrounding area characteristics:							
Surrounding landuse (eg residential, commercial, open space, etc)	Commercial	Residential	Residential	Residential	Commercial	Residential	Open space
Indicative Public Transport Accessibility Score	2	2	4	8	48	10	0
Principal adjacent road- AM peak period (weekday	8.00 to 9.00 am	8.30 to 9.30 am	7.30 to 8.30 am	8.15 to 9.15 am	8.00 to 9.00 am	8.00 to 9.00 am	8.00 to 9.00 am
Principal adjacent road - PM peak period (weekday	3.30 to 4.30pm	4.30 to 5.30pm	4.15 to 5.15pm	5.00 to 6.00pm	3.00 to 4.00pm	4.00 to 5.00pm	4.00 to 5.00pm
Principal adjacent road – daily peak period (weeke	1.00 to 2.00 pm	11.00 am to 12.00	12.15 to 1.15 pm	1.15 to 2.15 pm	11.00 am to 12.00	11.00 am to 12.00	2.00 to 3.00 pm
Estate characteristics:							
Year opened	2003	2011	2007	2004	2006	2000-2005	2008-201
Total site area (hectares)	326.9	0.6	114.6	4.7	52.2	14.6	17.
No. of units/lots (including vacant units/lots)	38	21	26	16	229	79	1
No. of occupied units/lots	36	13	22	16	184	66	1
Predominant business types within estate:							
no. of factories	5	0	0	0	6	0	
no. of factories/warehouses	2	0	0	0	2	0	
no. of warehouses	27	0	20	15	41	13	
no. of offices	1	9	0	1	93	4	
no of retailers	0	0	0	0	16	25	
no. of workshops	1	0	0	0	0	9	
no. of manufacturers	0	3	2	0	2	0	
no. of others commercial businesses	0	1	0	0	23	15	
Gross Floor Area in estate m^2 (occupied)	693,605	1,605	406,600	29,983	136,737	42,899	29,766
No. of employees	incomplete data from businesses			231	incomplete data from businesses		182
Person Trips:							
Peak 1-hour person-trips	1294	29	927	173	1458	519	204
Time of peak 1-hour person-trips	14:45-15:45	14:45-15:45	14:00-15:00	08:15-09:15	16:30-17:30	16:15-17:15	15:00-16:00
Peak person-trips per business	35.9	2.2	42.1	10.8	8	7.9	11.3
Peak person-trips per hectare	4	49.4	8.1	37.0	28	35.6	11.6
Peak person-trips per 100 m^2 of GFA	0.187	1.807	0.228	0.577	1.066	1.210	0.685
Peak person-trips per employee	incomplete data from businesses			0.749	incomplete data from businesses		1.121
Total daily person-trips	14056	168	9929	1410	12066	4205	2064
Total daily person-trips per business	390.4	13.0	451.3	88	65.6	63.7	114.6
Total daily person-trips per hectare	43.0	287.0	86.6	301.5	231.4	288.7	117.6
Total daily person-trips per 100 m^2 of GFA	2.026	10.492	2.442	4.703	8.824	9.802	6.933
Total daily person-trips per employee	incomplete data from businesses			6.105	incomplete data from businesses		11.339
Person-trips during adjacent road AM peak	976	24	789	173	1408	270	123
Person-trips during adjacent road PM peak	1073	7	858	94	1060	478	160
Vehicle Trips:							
Peak 1-hour vehicle-trips	1128	24	820	129	1256	418	173
Time of peak 1-hour vehicle-trips	14:45-15:45	14:45-15:45	08:00-09:00	08:15-09:15	08:00-09:00	16:15-17:15	15:00-16:00
Peak vehicle-trips per business	31	1.8	37.3	8.1	6.8	6.3	9.6
Peak vehicle-trips per hectare	3.5	40.9	7.2	27.6	24.1	28.7	9.9
Peak vehicle-trips per 100 m^2 of GFA	0.163	1.495	0.202	0.430	0.919	0.974	0.581
Peak vehicle-trips per employee	incomplete data from businesses			0.558	incomplete data from businesses		0.951
Total daily vehicle-trips	13125	168	9384	1116	10383	4619	1793
Total daily vehicle-trips per business	364.6	12.9	426.5	69.75	56.4	70.0	99.6
Total daily vehicle-trips per hectare	40.1	286.3	81.9	238.6	199.1	317.2	102.2
Total daily vehicle-trips per 100 m^2 of GFA	1.892	10.467	2.308	3.722	7.593	10.767	6.024
Total daily vehicle-trips per employee	incomplete data from businesses			4.83	incomplete data from businesses		9.85
Vehicle-trips in adjacent road AM peak (Average)	1165	126	2749	1608	2594	1131	112
Vehicle-trips in adjacent road PM peak (Average)	972	149	2593	1613	2844	1281	150
Vehicle-trips during adjacent road AM peak	929	19	724	129	1256	246	111
Vehicle-trips during adjacent road PM peak	965	5	714	69	794	382	127
Average vehicle occupancy	1.10	1.10	1.12	1.16	1.17	1.16	1.17
% of total trips by principal mode:							
% Car (as driver)	62.5%	81.9%	63.2%	68.8%	79.1%	78.5%	70.0%
% Car (as passenger)	8.0%	8.3%	8.3%	12.3%	11.2%	13.4%	13.4%
% Commercial Vehicles	28.3%	4.2%	25.9%	12.6%	4.9%	6.2%	15.5%
% Bus	0.8%	0.0%	2.1%	0.5%	3.2%	0.0%	0.0%
% Cycle	0.1%	0.0%	0.3%	0.1%	0.3%	0.6%	0.2%
% Motorbike	0.1%	0.0%	0.0%	0.0%	0.3%	0.4%	0.0%
% On foot	0.1%	5.6%	0.2%	5.7%	1.1%	0.8%	0.6%
% Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%

TRAFFIC
AUTHORITY OF
NEW SOUTH WALES

LAND USE TRAFFIC GENERATION

DATA AND ANALYSIS 11
— WAREHOUSES



LAND USE TRAFFIC GENERATION

DATA AND ANALYSIS 11
— WAREHOUSES

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Table 3.5
Vehicle generation rates

Industry Type	Employee Density (Non C-V generation rate)	Commercial Vehicle generation rate
Chemical, petroleum & coal products	Low	Low
Basic metal products	Low	Low
Food, beverages	Medium	Medium
Wood,wood products	Medium	Medium
Transport equipment	Medium	Medium
Glass, clay & non-metallic mineral products	Medium	High
Other industrial machinery & household appliances	Medium	Medium
Textiles	High	Low
Clothing & footwear	High	Medium
Paper,paper products,printing	High	Medium
Precision, electrical, radio & electronic engineering	High	Medium
Fabricated metal products	High	High
Leather, rubber & plastic products	High	High
Vehicle manufacture	High	High

If the development includes such uses as bulky goods retailing, then traffic generation would be higher. This component should be assessed separately.

3.10.2 Warehouses

Rates

Daily vehicle trips = 4 per 100m^2 gross floor area
Morning peak hour vehicle trips = 0.5 per 100m^2 gross floor area

Factors

Vehicle generation rates vary substantially depending upon the type of goods being warehoused and the nature of the particular manufacture / retail system.

Where retailing is permitted from the site, traffic generation rates are higher.

Particular care should be taken in assessing industrial unit developments where a high proportion of warehouse uses are proposed. These developments can also suit small factory operations such as electronics / computer assembly and repairs. Uses such as these can substantially increase trip generation and parking demands.

3.10.3 Plant nurseries

A *plant nursery* is any place where horticultural stock is propagated for the purpose of sale. Horticultural stock means tree, vine, plant, shrub or other vegetation.

acceptable if visibility is adequate, if passing bays are provided for each 30 metres length and if it can be shown that such an arrangement will not cause queuing onto the public road.

Wherever possible, trucks must travel a minimum distance of 30 metres before being required to stop. This must be increased where necessary to ensure that drivers are not forced, induced or encouraged to stand their vehicles on a public road.

There must be adequate provision made for the manoeuvring, loading and unloading of vehicles on the site. *Australian Standard 2890.2* provides further information on the requirements of service vehicle areas.

See Section 6 for Internal Design guidelines.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 2 - Factories* outlines research undertaken on the traffic and parking characteristics of factory developments.

The report *Government Regulation of Industrial Property Development* by Richard Cardew for the Australian Institute of Urban Studies addresses car parking requirements for factories.

5.11.2 Warehouses.

Definition.

A *warehouse* is a building or place used for the storage of goods, merchandise or materials pending their sale and distribution to persons engaged in retail trade.

Parking.

All new warehouses on undeveloped sites must provide on-site parking for all vehicles used by employees. In the case of wholly redeveloped sites each site is treated on its merit. Provision of one car space per 300m^2 gross floor area is recommended.

Variations on the recommended parking rate must be considered in the context of both current and potential users. While surveys might justify a lesser parking rate for a particular development, provision must be made for future users by setting aside (but not necessarily surfacing), space for car parking. The recommended rate of parking provision is in the middle range parking rate observed in the RTA's survey. The rates vary from one space per 80m^2 to one space per 960m^2, the mean and sample standard deviation figures being 338m^2 and 280m^2 respectively based on a sample of 10 sites. A particular situation where a parking rate greater than that recommended above is warranted, would be for a development with a greater than average employment density. The mean floor area per employee at the warehouses surveyed by the RTA was 226m^2 per employee.

On-site parking for staff must be located in places readily accessible from the principal staff entrances to buildings.

When retailing occurs at a warehouse, additional parking must be provided, in proportion to the floor area associated with the retailing activities, at the rate given in Section 5.7.1 *Shopping centres*.

Care must be taken in assessing industrial unit developments where a larger number of warehouse uses are proposed. Such developments can also suit small factory operations with greater parking demands.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

Minimum carriageway widths of 6.5m for two-way operations and 4.5m for one-way operations are recommended for internal roads where parking is not permitted. If parking is permitted, these widths must be increased by 2.4m for each lane of car parking and by 3.0m for each lane of truck parking. For very small developments, a two-way internal road of 4.5 metres width with no parking permitted, might be acceptable if visibility is adequate, if passing bays are provided for each 30 metres length and if it can be shown that such an arrangement will not cause queuing back onto the public road.

When possible, trucks must travel a minimum distance of 30 metres before being required to stop. This must be increased when necessary to ensure that drivers are not forced, induced or encouraged to stand their vehicles on a public road.

There must be adequate provision made for the loading, unloading and manoeuvring of vehicles on the site. *Australian Standard 2890.2* provides further information on the requirements of service vehicle areas.

See Section 6 for Internal Design guidelines.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 11 - Warehouses* outlines original research undertaken on the traffic and parking characteristics of warehouse developments.

5.11.3 Plant nurseries

Definition

The term *Plant Nurseries* refers to places at which horticultural stock is propagated for the purpose of sale.

Parking

Off-street car parking should be provided to accommodate peak parking periods at the facility.

The recommended number of off-street parking spaces for plant nurseries should be the greater of:

- 0.5 spaces per $100m^2$ of site area
- minimum of 15 spaces

Parking provision for auxiliary facilities associated with a plant nursery are not included in these figures. Refer to appropriate guidelines for parking provision rates of auxiliary facilities with appropriate allowance for dual or complementary use.

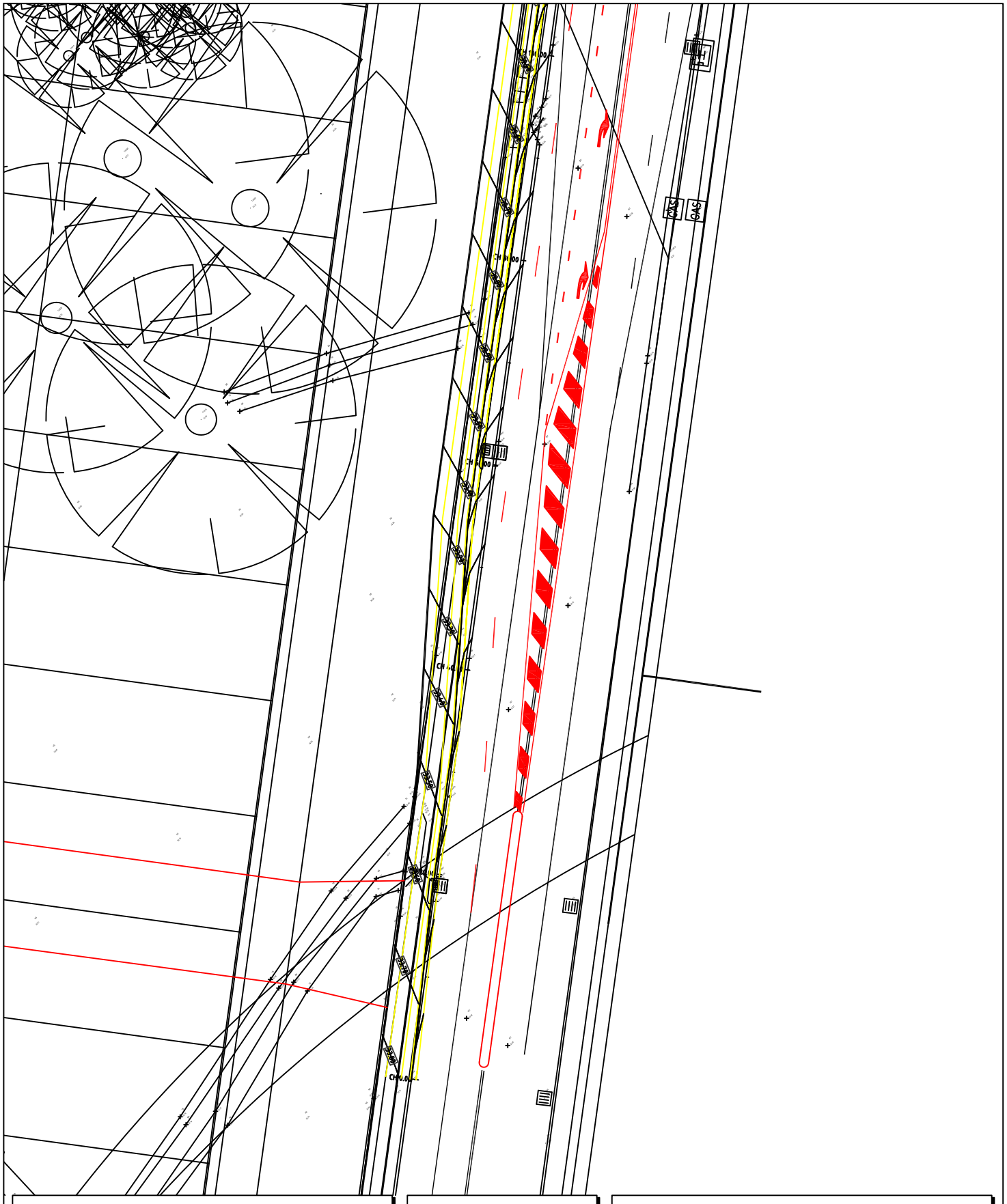
Provision ought to be made for car / trailer combinations at strategic locations.

Driveways

See Tables 6.1 and 6.2 for details relating to driveways.

Parking area and internal road design

Consideration should be given to the type of service vehicles requiring access and their geometric movement requirements. It is recommended that the Australian Standard *AS 2890.2* be consulted for further information on service area design.

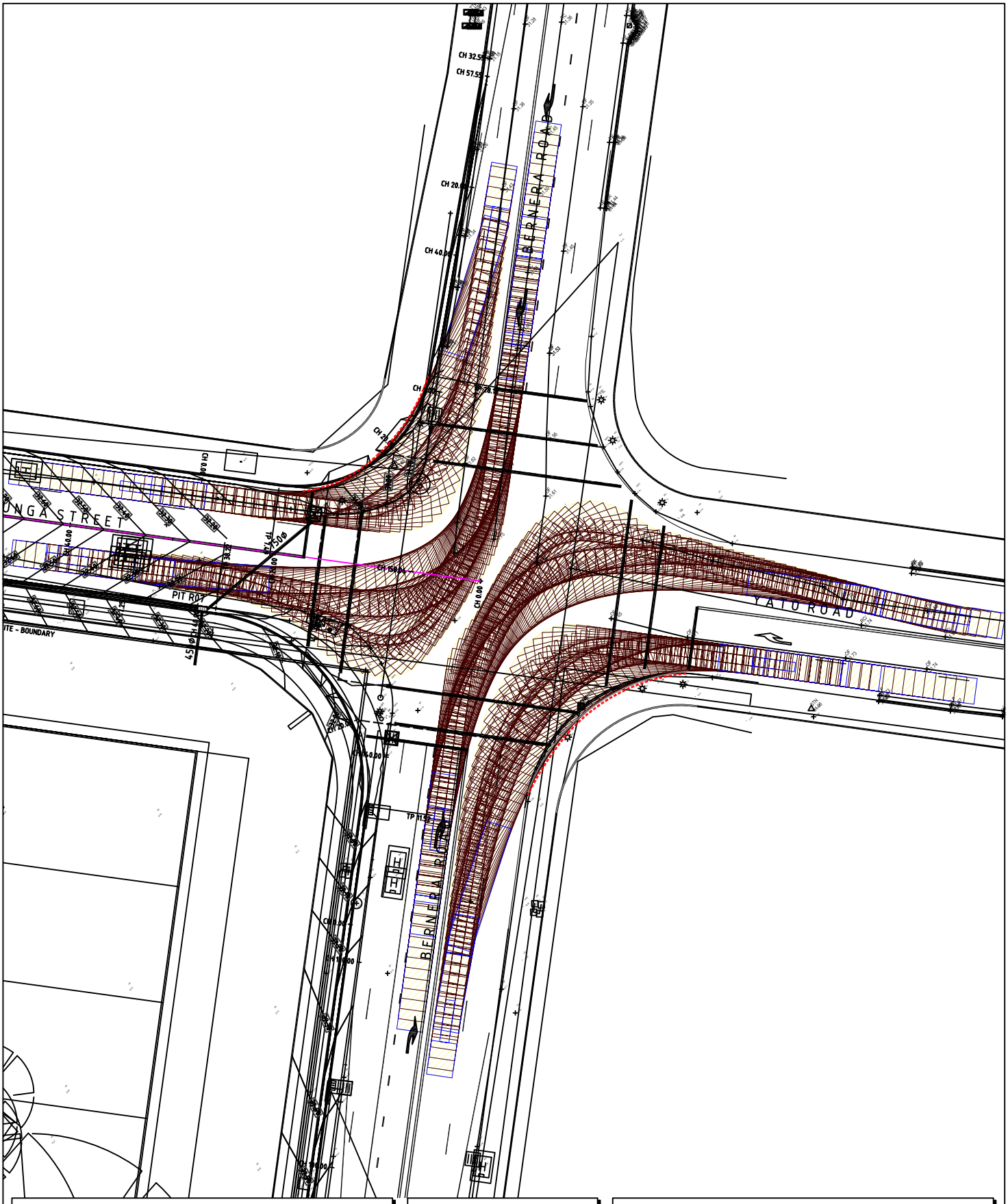


LEGEND

This drawing has been prepared using vehicle modelling computer software AutoTrack V9.21 in conjunction with AutoCAD 2013. The vehicle used is based upon vehicle data provided by Austroads and incorporates a reasonable degree of tolerance. However, it is not possible to account for all vehicle types/characteristics and/or driver ability.

N

PROPOSED MEDIAN/CHEVRON ARRANGEMENT



LEGEND

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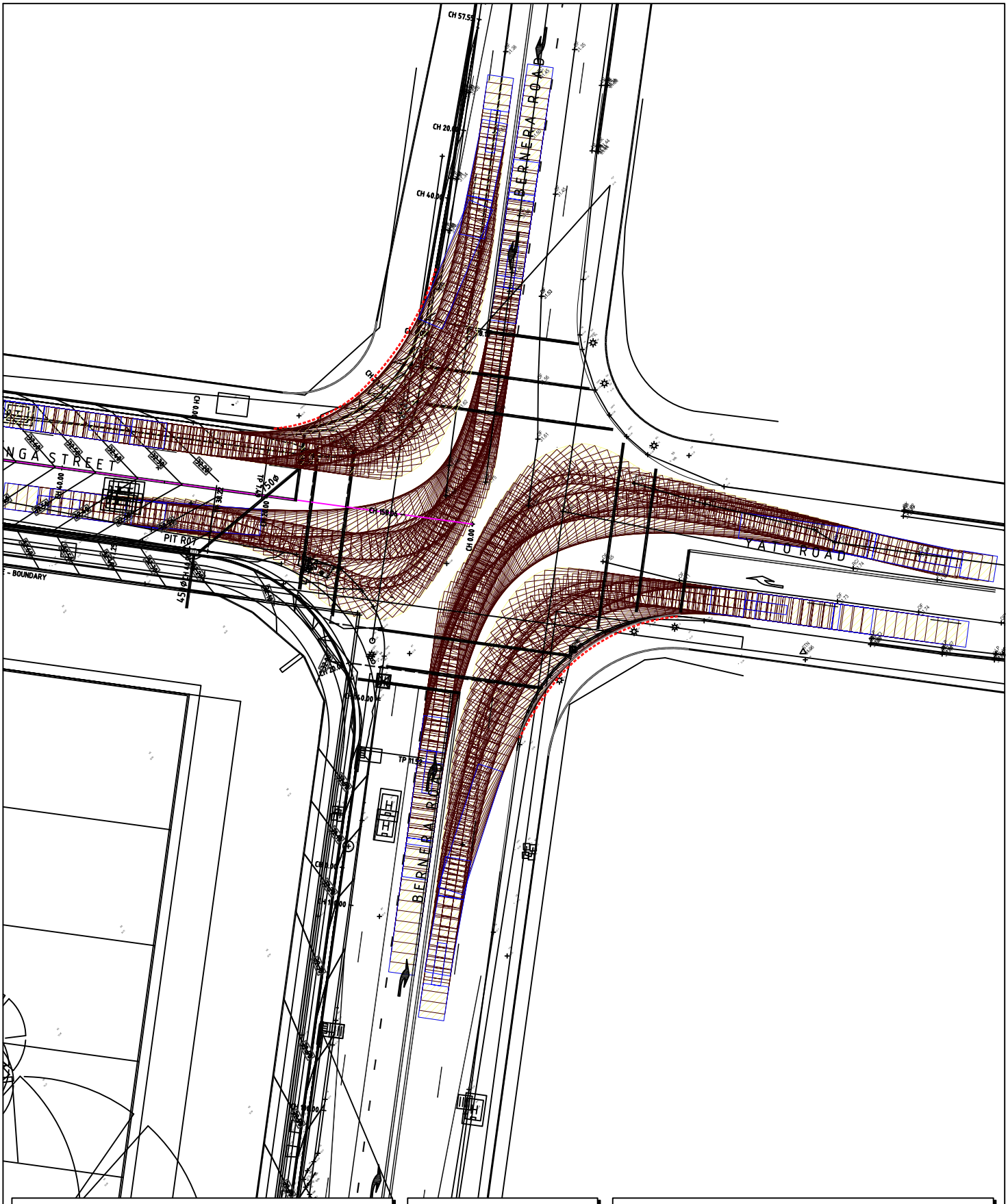
N

SWEPT PATH ANALYSIS OF A 25m ARTICULATED VEHICLEVTURNING RIGHT FROM BERNERA INTO YARRUNGA AND A 19m ARTICULATED TURNING LEFT FROM YARRUNGA INTO BERNERA

SP 1



LEGEND

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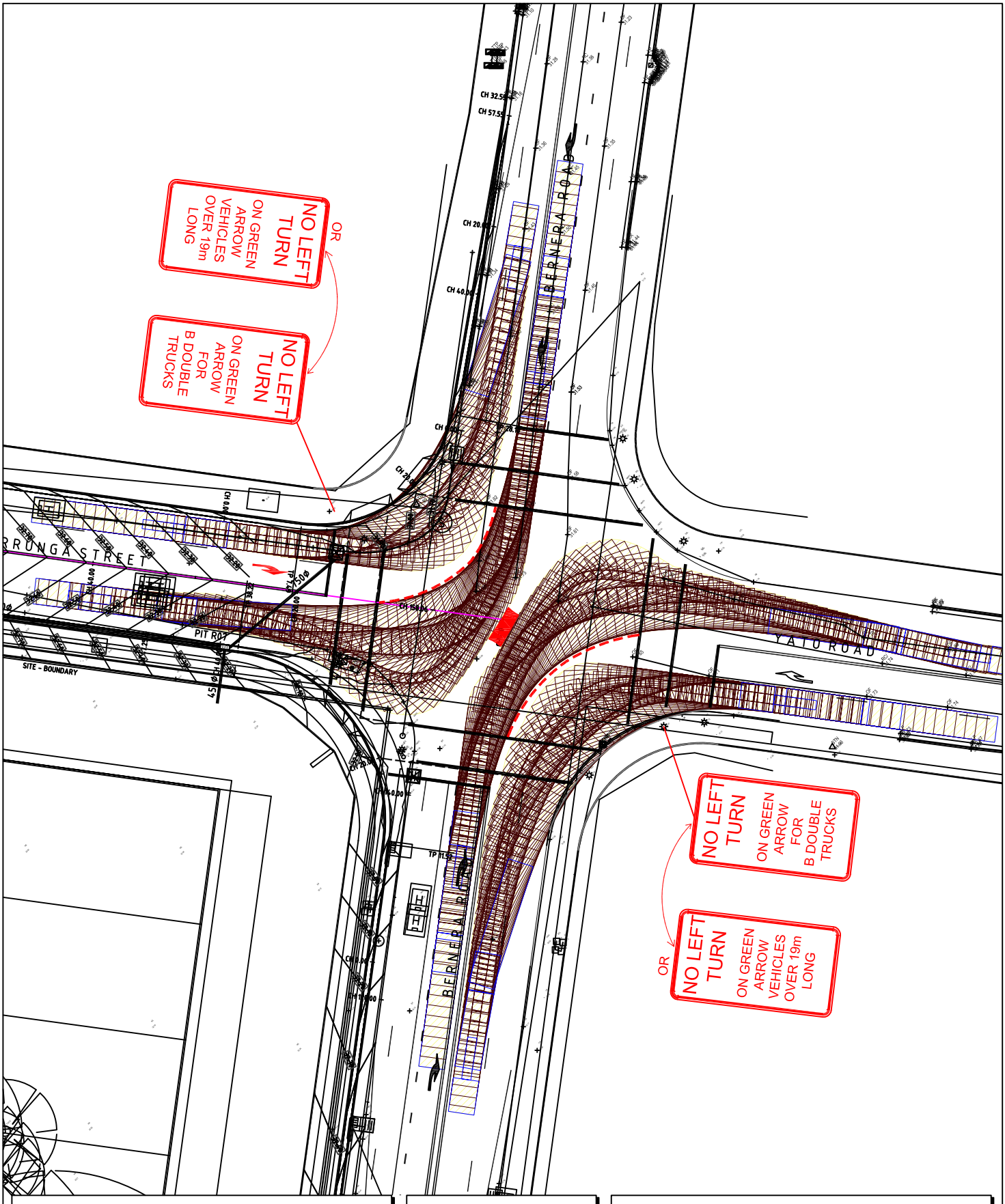
SWEPT PATH ANALYSIS OF A 25m ARTICULATED VEHICLES

SP 2



LEGEND

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PROPOSED LINEMARKING AND SIGNAGE