street level strategies

19 January 2021

Our ref: 202007_003

Trinity Grammar School

C/- Bloompark Consulting

Attn: Peter Brogan

Via email

Dear Peter

RE: SSD-10371 Trinity Grammar School redevelopment – Response to Submissions II – Traffic items

1. Background

This letter has been written to address the second Request for Information (RFI) issued on 11 December 2020 by the Department of Planning, Industry and Environment (DPIE) regarding SSD-10371 for Trinity Grammar School's redevelopment.

An earlier RFI was issued following the lodgement of the formal Response to Submissions in October 2020 and our response was issued on 6 November 2020.

2. Traffic – Pick-up/Drop-off capacity

The request from DPIE:

> *The Department requests additional information be provided to understand the capacity and demand of the pick-up and drop off area. In this regard the Department notes that the analysis provided with the RtS indicates that under both the existing and the proposed arrangements the pickup/drop off would operate below capacity. However, the Department requires more information to substantiate the assessment as from the details provided in the public submissions and having regard to the previous findings of the NSW Land and Environment Court case (Council of Trinity Grammar School v Ashfield Council [2015] NSWLEC 1086), it appears likely that the current arrangements cannot accommodate the current demand, contrary to the information provided in the RtS. Therefore, the Department requires:*
>
> a) *detailed information based on surveys and data collection to demonstrate how the existing and proposed demand has been calculated. The Department notes the number of vehicle trips is very different from data provided in the original traffic assessment, and the increase in demand (82 AM trips and 45 PM trips) is inconsistent with the traffic assessment*

which provides that the proposal would generate an additional 196 student vehicle trips in both of the peaks, the vast majority of which would be pick-ups / drop offs.

b) *detailed information to demonstrate demand in the 20 minutes immediately before the AM bell and 20 minutes immediately after the PM bell, noting that peak demand is not spread over an hour but is usually concentrated over a very short timeframe. Where demand results in queuing on Victoria Street, an analysis should be provided of any change in queue lengths and time frame for the on-street queue to clear as a result of the revised design and increased student numbers.*

c) *consideration of impacts on queue lengths as a result of other vehicles accessing the site to park.*

The Department notes that the school has increased student numbers from 1500 (as per the last consent consent) to 1655. The traffic analysis should compare the situation between current lawful operation of 1500 students and the proposal for 2100 students.

Our response:

The DPIE has requested that the applicant clarify how the demand for pick-up/drop-off in the car park was calculated, and notes that the demand calculations (82x AM trips and 45x PM trips) are inconsistent with the additional 196 trips generated by the development. See Table 1 below.

	Existing Car Park	Future Car Park
Length of Pick-up/Drop-off area (m)	105	170
Number of bays (6m per vehicle)	18	28
Average turnover time (sec)	120	120
Capacity per hour (no. vehicles)	**525**	**850**
Demand AM peak (no. vehicles)	327	409 +82
Demand PM peak (no. vehicles)	179	224 +45
Queuing demand (no. vehicles)	11	14
Queue length required (m)	65	82

Table 1 - AM and PM demand for pick-up and drop-off

a. Clarification pick-up/drop-of demand vs traffic generation

There is a distinction to be made between the calculations *for pick-up/drop-off* (+82 AM trips and +45 PM trips) and *for traffic generation* (+196 AM and PM trips) as they are not the same metric.

Traffic generation refers to all trips that are generated by the development which has been assessed as 196 additional student trips.

Pick-up/drop-off metrics relate to the demand for pick-up and drop-off as a proportion of the car park traffic which is itself a proportion of the traffic generated. It is like an inverted triangle as shown below.

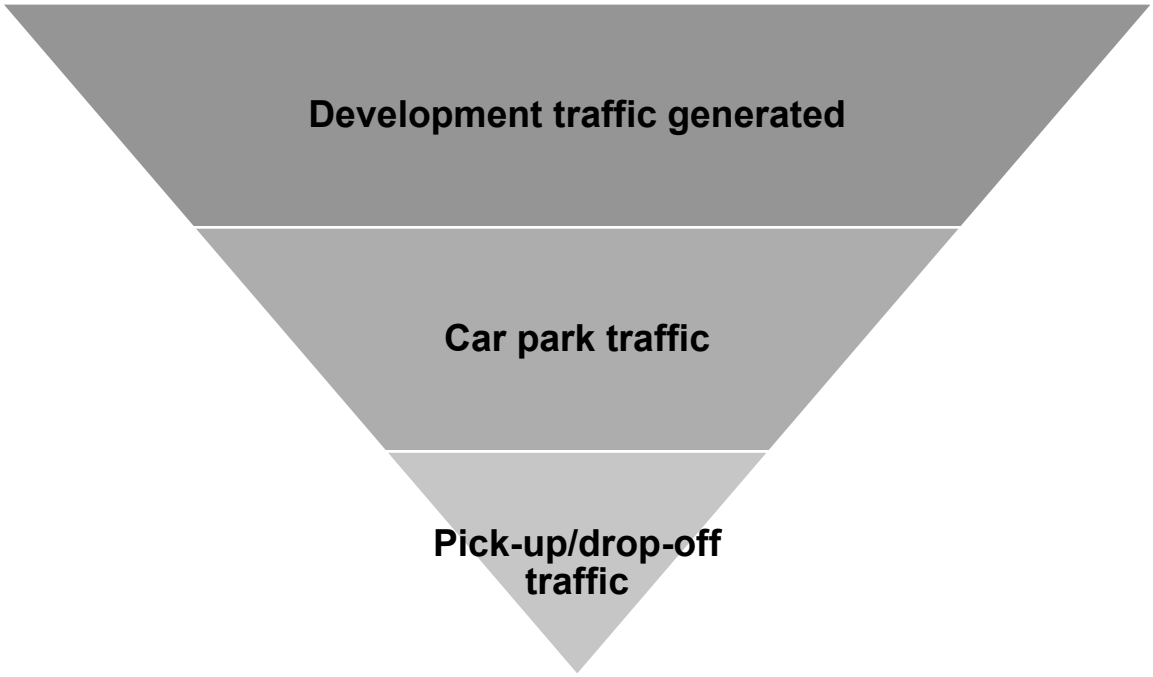

Figure 1 - Pick-up/drop off traffic as a proportion of larger volumes

Therefore the 196 additional student trips should not be confused with the additional demand for +82 AM trips and +45 PM trips for the pick-up and drop-off function as the 196 trips are the additional traffic generated rather than additional demand for the pick-up/drop-off function.

b. Demand for pick-up/drop-off in the 20-minutes before and after school

The demand for the pick-up/drop-off function was calculated using data from parking surveys undertaken by TTM Consulting in July 2019 of the school's underground car park.

To read Figures 2 and 3 below, the data reads as follows from left to right:

- Blue column = time of day (24 hour time)
- Green column 1 = number of vehicles *entering* the car park
- Green column 2 = number of vehicles *exiting* the car park
- Red column = number of total vehicles *parked* in the car park

5:00	3	0	10
5:15	19	4	25
5:30	5	13	17
5:45	3	0	20
6:00	8	2	26
6:15	18	6	38
6:30	27	14	51
6:45	90	45	96
7:00	76	79	93
7:15	33	12	114
7:30	47	27	134
7:45	100	57	177
8:00	147	117	207
8:15	117	97	227
8:30	50	56	221
8:45	13	14	220
9:00	7	11	216
9:15	15	7	224
9:30	9	8	225
9:45	5	9	221
10:00	5	4	222
10:15	2	7	217
10:30	3	4	216

Figure 2 - Data from the AM peak parking survey

13:00	6	11	213
13:15	3	5	211
13:30	8	3	216
13:45	4	6	214
14:00	5	4	215
14:15	6	4	217
14:30	11	4	224
14:45	24	21	227
15:00	35	21	241
15:15	32	38	235
15:30	57	56	236
15:45	55	101	190
16:00	25	64	151
16:15	33	35	149
16:30	39	54	134
16:45	42	22	154
17:00	58	110	102
17:15	20	54	68
17:30	13	25	56
17:45	25	14	67
18:00	6	18	55
18:15	7	19	43

Figure 3 - Data from the PM peak parking survey

The parking surveys found that the AM peak for the car park is 7.45am-8.45am, and the PM peak is 3pm-4pm, although the afternoon peak is more spread out from a traffic perspective.

The figure below shows the school bell times for Trinity Grammar School.

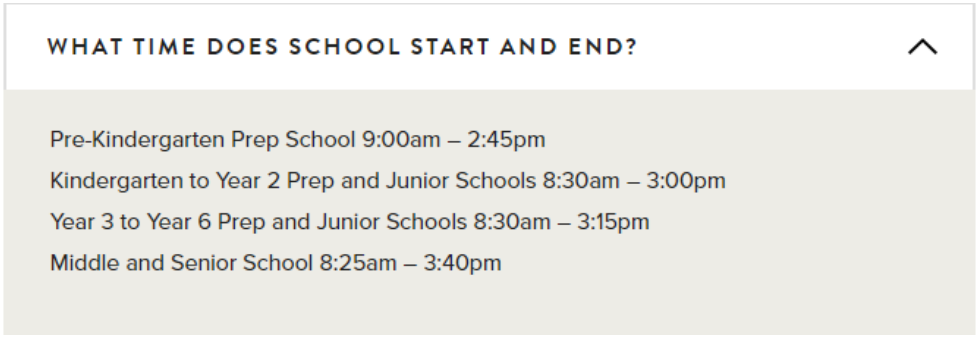

Figure 4 - Trinity Grammar School bell times

To allow for 20 minutes before the morning bells and 20 minutes following the afternoon bells, the spread of time is as follows:

- 8.05am-9am to cover before all bells in the morning
- 2.45pm-4pm to cover later than the afternoon bells

As is evident in the data provided, the afternoon peak is very spread out and no on-street queuing was observed during site visits. The morning peak is more significant, with the peak load being spread over a 45 minute duration, between 7.45am and 8.30am.

It is acknowledged that queuing does currently occur on Victoria Street in the AM peak as vehicles attempt to access the Jubilee car park. In the data collection for this project, the current parking/access arrangements indicate a maximum queue length of 160 metres on Victoria St was observed between the Jubilee car park entry and Seaview Street, and a maximum queue length of 115m between Jubilee car park and Harland Ave. However, the data show that these on-street queues reduce within 10-15 seconds and the total time that any queuing occurs on Victoria Street is 12 minutes between 8.15-8.30am.

Counterintuitively, the cause for these on-street delays is not actually that too many vehicles are trying to access the car park at once. The delay is caused by vehicles that are using the car park to pick-up or drop-off that are held up by other vehicles attempting to park within the car park. These vehicles parking block the circulation pathway and reduce the total queue distance within the car park which then leads to vehicles queuing back onto the street.

This issue can be mitigated through the proposed design of the future car park which is intended to design out the problem. The school has been very focussed on resolving this issue.

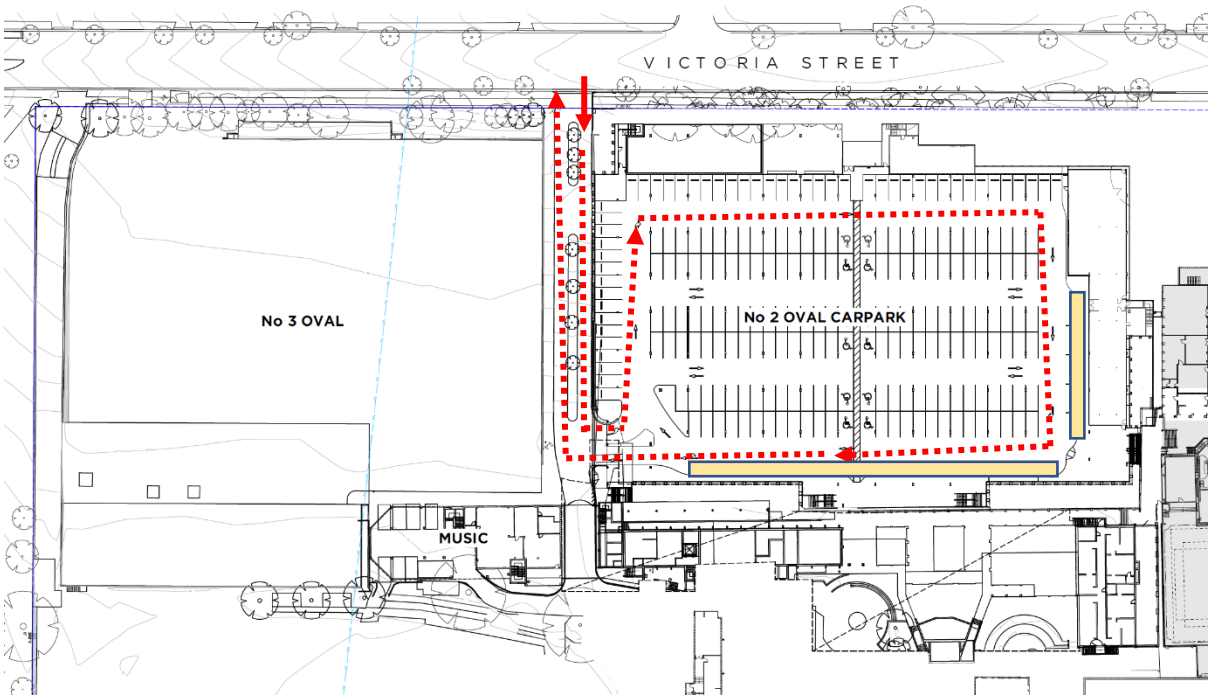

Figure 5 - Existing Jubilee car park layout

As can be seen in the diagram of the existing car park above (Figure 5), there are many car parking spaces along the wall parallel with Victoria St, along the entry/exit driveway, and the car parking aisles have a north-south orientation. The red dashed line indicates the path of travel for vehicles to circulate through the car park. This path of travel is to access both the pick-up/drop-off area which is marked in yellow, and any other car parking. Vehicles enter and exit out of the one driveway at Victoria St.

With the rotation of the car parking spaces running north-south, the major delays are caused by vehicles parking their vehicles that then block the circulation pathway. As delays

generally occur in the first half of the car park as vehicles first enter, this leaves less room inside the car park for other vehicles attempting to enter which reduces the internal queuing space and results in queues on-street. The fact that queues dissipate within 10-15 seconds on-street confirms that the internal delays are very brief in nature, allowing the on-street queue to clear quickly.

With a desire to remove this impact, the school has taken the approach to design out the cause of the problem by extending and redesigning the car park to lengthen the internal circulation/queue area and to reorient car parking aisles to an east-west orientation. See below for the new layout (Figure 6). This design essentially separates the two functions of *parking* and *pick-up/drop-off* to significantly reduce potential for delays to occur.

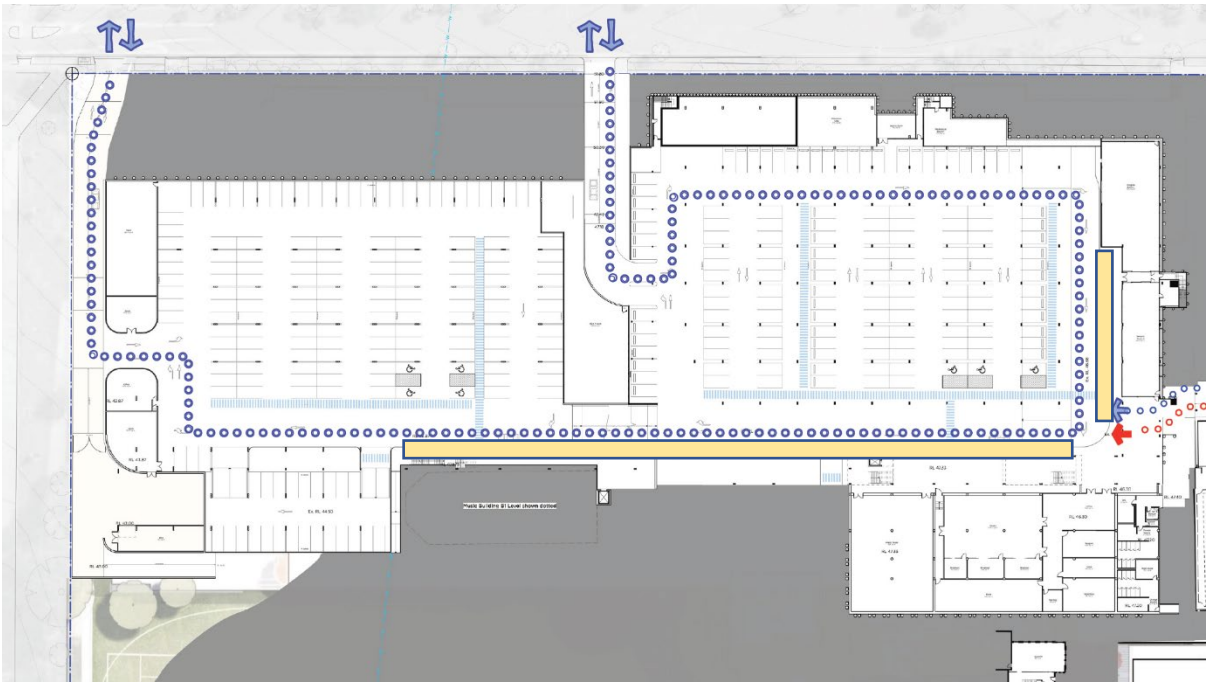

Figure 6 - Jubilee car park future layout

The major factors of this design change are:

- Creates additional pick-up and drop-off spaces (marked in yellow);
- Significantly lengthens the internal circulation space;
- Increases the internal space which increases the on-site queuing capacity;
- Reorients the car park aisles to run east-west to remove opportunities for vehicles to park while circulating (and delay others in the process);
- Removes the majority of car parking spaces next to the circulation pathway (see blue dotted path) to reduce parking delays;
- Expands the footprint of the existing staff car park and connects it to the Jubilee car park;
- Redistributes parking spaces that were taken from the circulation pathway in Jubilee to the expanded staff car park; and
- Creates a separate entry and exit point during peak times to better manage demand.

This design is intended to resolve the existing on-street queuing issues by significantly reducing opportunities to park while circulating and increases the internal space by 40%. Our earlier RTS (dated 6 November 2020) included the table below that shows the differences between the existing car park and the future car park.

Item	Existing Car Park	Future Car Park
No. spaces on circulation aisle	107	41 (-66)
No. parking spaces next to pick up/drop off zone	25	0 (-25)
Total number of spaces	**312**	**324 (+12)**
Length of pick up/drop off area (m)	**105**	**170 (+65)**
Length of main circulation aisle (m)	290	408 (+118)
Total length of circulation aisle (m)	180	501 (+321)
Driveway length – entry (m)	75	108 (+33)
Driveway length – exit (m)	75	45 (-30)
Total roadway length (m)	**620**	**1,062 (+442)**

Table 2 - Comparison of Existing and Future car park

Given the school is proposing a 25% increase from existing volumes, this is more than adequate capacity to meet the growth in demand and the new design will offset the existing on-street queuing.

c. Calculations for pick-up/drop-off demand

The demand for the pick-up/drop-off for the existing student numbers is calculated as follows:

- The existing drop off/pick up bay is **105m long**;
- Assume **6 metres per pick-up/drop-off bay**, so 105m = **18 vehicle bays**;
- A **2-minute turnover time** is assumed which is standard for such bays, so each "bay" can turnover 30 cars per hour (i.e. 60 vehicles every 2 minutes);
- For these 18 bays, the drop off/pick up can accommodate a total of **540 vehicles per hour** (18 bays x 30 vehicles per bay);
- The parking survey shows that at the peak, the maximum number of vehicles accessing the car park totalled **741 vehicles in the AM peak** and **395 in the PM peak**;
- But breaking this down further, the total entering and exiting (i.e. using the pick-up/drop-off) can be derived as being:
    - **327 in the AM** (57+117+97+56) – this all those that exit as the entry includes those that will park all day
    - **179 in the PM** (35+32+57+55) – this is all those that enter as the exit includes those that were parked all day;

- Based on this, the 18 bay pick-up/drop-off area is able to manage the flow with some spare capacity; and
- In the future state, the pick-up/drop-off bay increases to 170m with the number of bays increasing to 28.

In addition, the potential for queuing to occur was assessed.

- The AM is the worst-case scenario with the total 327 vehicles entering the car park which is equivalent to 6 vehicles/minute or 12 vehicles every 2 minutes;
- On the basis of the bays turning over every two minutes, there is potential for up to 12 vehicles to queue as the bays turnover; and
- With 12 vehicles that require 6 metres each, the queue length required is 72 metres which does not exceed the available length in the car park.

To put this into context with the existing 1,655 students, as a worst-case scenario, we can assume that as the students increase by 25%, so does the parking demand.

- This 25% increase returns a demand of 409 vehicles in the AM and 224 in the PM. Both of which can be accommodated by the drop off bay.
- Regarding the queuing, the arrival rate increases by three vehicles so the potential queue demand is 14 vehicles or 84 metres.

In consideration of the previous consent condition for 1,500 students, this is a 10% *decrease* on the existing student numbers. The car park operates with the existing available space for pick-up/drop-off:

- Demand reduces to 297 vehicles in the AM peak and 163 vehicles in the PM peak
- The required queue length is 60 metres which does not exceed the available distance in the car park

The table below shows the different metrics across the three scenarios.

	At 1,500 students (Existing -10%)	Existing 1.655 students	Full Development (Existing +25%)
Pick-up/Drop-off length (m)	105	105	170
Number of bays	18	18	28
Average turnover time (sec)	120	120	120
Capacity per hour (no. vehicles)	**540**	**540**	**850**
Demand AM peak (no. vehicles)	297	327	409
Demand PM peak (no. vehicles)	163	179	224
Queuing demand (no. vehicles)	10	12	14
Queue length required (m)	60	72	84
Length of main circulation aisle (m)	290	290	408
Total length of circulation aisle (m)	180	180	501

Driveway length - entry (m)	75	75	108
Driveway length - exit (m)	75	75	45
Total roadway length (m)	**620**	**620**	**1062**

Table 3 - Demand for pick-up and drop-off across three scenarios

The improved design of the new car park increases the internal space available for queuing and pick-up/drop-off at 2,100 students, and most importantly, reduces opportunities for vehicles to park and delay other vehicles picking-up and dropping-off.

3. Traffic – Operation of Intersections

The request from DPIE:

> *The traffic assessment indicates that the majority of vehicle trips associated with the school use would travel either via Queen Street / Harland Street or Victoria Street / Liverpool Road, however no assessment has been provided of the impacts of the proposal on these intersections. Therefore, the Department requests that:*
>
> *a) further traffic assessment of the impacts to the operation of these intersections be provided,*
>
> *b) further assessment of the impacts to the operation of the intersection ofHarland Street / Service Avenue.*
>
> *Additionally, the analysis should compare the situation between a current lawful operation of the school (1500 students) vs the proposal for 2100 students. Where appropriate, consideration should be given to any mitigation measures to offset the traffic impacts of the proposal.*

Our response:

Our approach to the traffic modelling for this project was to ensure the intersections that had the potential to be *most impacted* by the school's development were assessed and in the context of the traffic counts and the traffic distribution.

As a result, the following intersections were assessed and modelled in the Traffic Assessment in compliance with the SEARs, and in line with this approach to account for potential impacts to local conditions:

1. Old Canterbury Road/Prospect Road (SEARs);
2. Old Canterbury Road/Hurlstone Avenue (SEARs);
3. Old Canterbury Road/Henson Street (SEARs);
4. Old Canterbury Road/James Street (SEARs);
5. Prospect Road/Seaview Street – East (local);
6. Prospect Road/Seaview Street - West (local);
7. Victoria Street/Seaview Street (local); and
8. Victoria Street/Harland Street (local).

These intersections are shown on the diagram below in yellow.

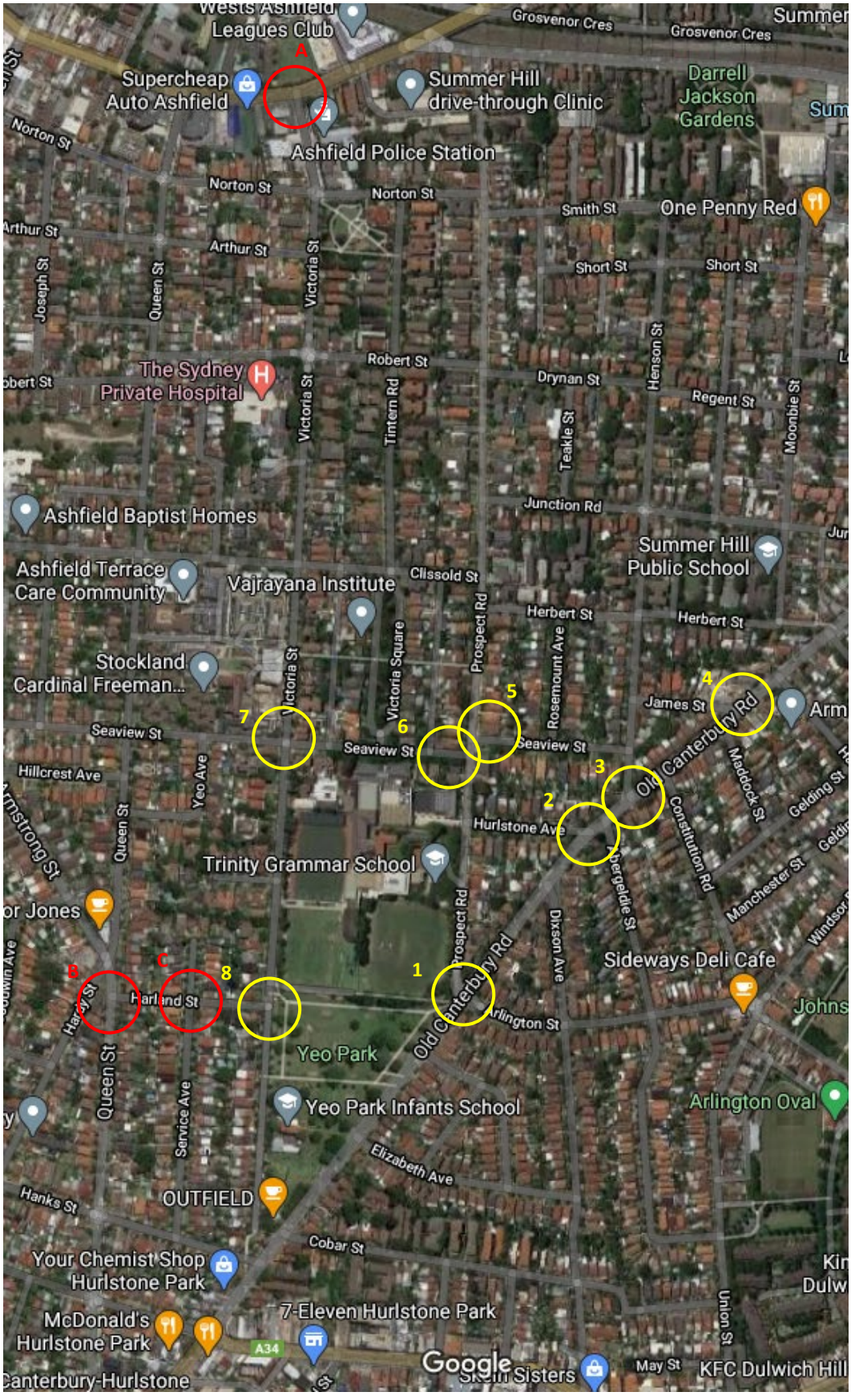

Figure 7 – Intersections reviewed

The intersections that have been modelled (including those required in the SEARs) are intersections that any traffic to and from the school must travel through. Outside of these intersections, there are many paths of travel that vehicles may take to reach their destination and the proportion of traffic from the school dilutes.

The Department has requested further assessment of the following three intersections:

- A - Victoria Street/Liverpool Road (Hume Highway);
- B - Queen Street/Harland Street; and
- C - Harland Street/Service Avenue.

These intersections are marked in red on Figure 7.

The Department states that “the traffic assessment indicates that the majority of vehicle trips associated with the school would use either Queen Street/ Harland Street or Victoria Street/ Liverpool Road” which is partly accurate.

The traffic assessment is based on the existing trip distribution captured in the data collected in October 2019. This distribution shows that 40% of the trips are to/from the north along Victoria Street, and 35% of the trips are to/from the west along Harland Street. The distribution is shown below, and the relevant locations shown in orange.

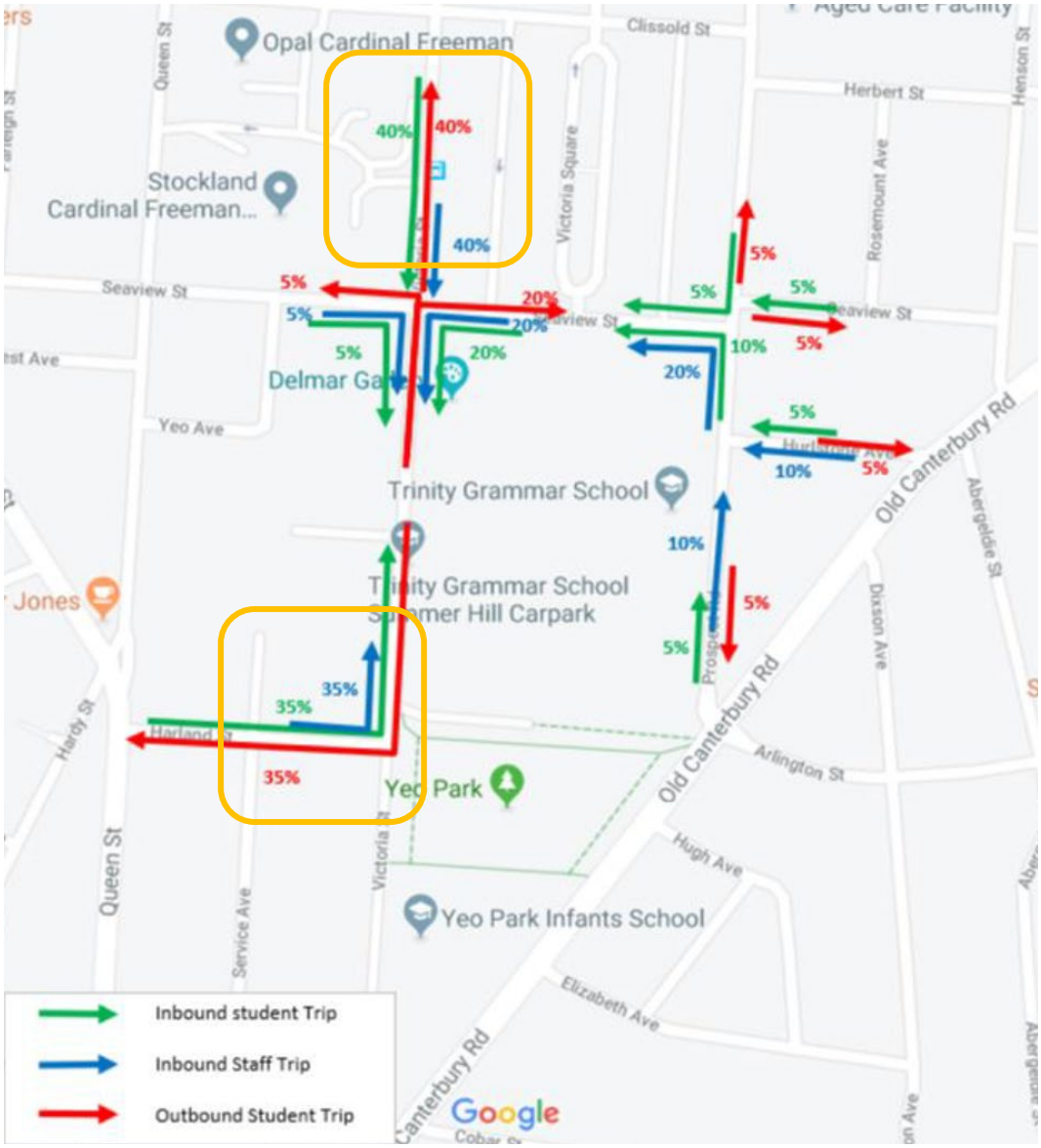

Figure 8 - Trip distribution

As can be seen in the Figure 7 and 8 above, two of the intersections queried by the Department intersect with Harland Street.

As part of the traffic assessment, the intersection with Harland St and Victoria St was modelled and found to operate at a Level of Service A in both peaks across existing and future scenarios. Given this is the intersection that all traffic from or between Service Avenue or Queen Street will pass through and is closest to the school, it will bear the greatest impact. If Victoria St/Harland St were operating at a poor level of service, then there would have been a need to model nearby intersections to understand the broader impact of the traffic distribution. As the level of service is good, it was determined that additional assessment or modelling was not required.

It should also be noted that Harland Street is less than 200 metres in length between Victoria Street and Queen Street so there is limited capacity for additional vehicles to queue, and if there was significant congestion at either the Queen Street intersection or Service Avenue,

this would impact the Harland Street/Victoria Street performance (which it does not). The excellent level of service implies there are no negative impacts borne at Service Avenue or Queen Street. As a preventative measure, there is an opportunity to remove car parking during school peaks on both sides of Harland St between Service Ave and Victoria St to maximise capacity.

As for the Victoria Street/ Liverpool Road intersection (a State road), this intersection is some 840 metres to the north of Seaview Street and requires vehicles to travel through another three intersections prior to reaching it. Our modelling of the intersection at Victoria Ave/Seaview St (which vehicles travelling to/from the school to Liverpool Road would pass through) shows that it operates at a Level of Service A in both the existing and future states. While 40% of the school's traffic is to or from the north, with the additional opportunities for traffic to disperse through other intersections, and the total additional vehicles per hour is less than 100, it is unlikely that the school traffic has any impact on the operation of this intersection.

4. Conclusion

These responses have been developed to respond to an RFI from the Department of Planning, Industry and Environment.

The main concerns from the Department were around the ability for the car park to meet the demand for pick-up/drop-off and address on-street queuing, as well as the potential impact of the school development on three additional intersections.

This letter has discussed these issues and are comfortable with the design change of the car park and the results of traffic modelling already undertaken that the school has taken appropriate measures to address the issues, and that there is no reason that the proposed development should not proceed.

Best regards

Mel Fyfe

Managing Director

street level strategies