

Our Ref: 12S1321000

12 June 2012

Shore School
c/ - WSP Environmental Pty Ltd
Level 1
41 McLaren Street
NORTH SYDNEY NSW 2060
Attention: Mr Dennis Zines

Dear Dennis,

**RE: GRAYTHWAITE CONCEPT PLAN AND STAGE 1 PROJECT APPLICATION
PREFERRED PROJECT REPORT – TRANSPORT
RESPONSE TO SUBMISSIONS**

This document has been prepared by GTA Consultants on behalf of the Shore School to provide a response to issues raised within submissions relating to the traffic and transport aspects of the Preferred Project Report (PPR) for the Graythwaite Concept Plan and Stage 1 Project Application.

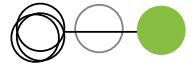
It is understood that 5 submissions were received in response to the PPR exhibition. The submissions include North Sydney Council, the SAD@Graythwaite Community Group (including a review prepared by McLaren Traffic Engineering), two local residents and the Edward Precinct Committee.

The issues raised in the submissions can be summarised to be:

- Consultation with North Sydney Council regarding a preferred option for the proposed pick up facility
- Potential operational impacts of preferred additional pick up facility option
- School bus operations
- On-site parking provisions

Each of these issues is discussed and addressed in this document.

Specific technical issues regarding the Halcrow traffic assessment have been raised in the review prepared by McLaren Traffic Engineering. A specific response to each of the issues raised by McLaren is also provided.



GTA's Involvement with the Graythwaite Site Project

GTA Consultants have been engaged by Shore School as of May 2012 following the relocation of key transport planning staff from Halcrow Pacific Pty Ltd to GTA Consultants. The key staff includes the principal author (Jason Rudd) of the various traffic and transport assessments prepared as part of the Concept Plan and Stage 1 Project Applications for the Graythwaite site.

Furthermore it is acknowledged that GTA Consultants were approached by Julie Bindon (a local resident representing the SAD@Graythwaite Community Group) in February 2012 to prepare a review of the traffic and transport reports prepared by Halcrow Pty Ltd. This approach to GTA Consultants and the subsequent advice to Julie Bindon were provided to the SAD@Graythwaite Community Group prior to the relocation of Halcrow staff to GTA.

The GTA advice in February 2012 concluded that:

"Overall, GTA Consultants considers the Halcrow report to be comprehensive and provides the required level of detail for this size development. The existing conditions assessment, along with the development proposal, are argued effectively and addresses the major issues adequately."

On the basis of this advice GTA were not invited to prepare a traffic review submission on behalf of SAD@Graythwaite Community Group, but rather they subsequently obtained the services of McLaren Traffic Engineering to undertake a review.

Consultation with North Sydney Council - Selection of a Preferred Option for the Proposed Pick Up Facility

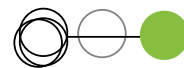
In December 2011 the Department of Planning and Infrastructure (DoPI) wrote to Shore School advising that the Director General requires the School to respond to issues raised in submissions to the revised Environmental Assessment.

Specifically the DoPI stated that:

The department notes that a new pick-up and drop-off facility forms part of the concept plan, and a range of conceptual options have been provided within the Transport and Accessibility Impact Assessment. Notwithstanding that the proposed facility will be the subject of a future development application, the department considers that a "preferred option" needs to be established in the concept plan, in consultation with North Sydney Council. The department requests that any response to submissions report or preferred project report be accompanied by a preferred pick-up and drop-off facility option, in sufficient detail that it can be assessed as part of the concept plan determination.

It should be noted that the concept plan included a range of conceptual options for a new "pick up facility". No new facilities for drop off activities were proposed as part of the concept plan based on an assessment of need and use.

In accordance with the DoPI's request, the School (and including Halcrow representatives) met with the Council Traffic Manager and the Acting Planning Manager on 7 February 2012 to discuss the options with the view to determining a preferred conceptual option.



At officer level it was agreed that the Union Street option entering through the car park was the preferred option from a traffic point of view. However, the Council officers made it clear that a formal response from the Council would need consideration by its Traffic Committee and possibly by the Councillors as well. Accordingly, the School agreed to submit a short report on its preferred option to the Council's Traffic Committee in parallel with its PPR submission to the DoPI.

The report on the preferred option was prepared and submitted to Council on 8 March 2012 with the request for the matter to be addressed at the next available Local Traffic Committee meeting. It does not appear that the Council Traffic Committee considered the preferred option report but the Council's Planning Report on the PPR was considered by the full Council at its Council meeting on 23 April 2012.

A copy of the preferred option report and the letter request for consideration is attached at Appendix A.

Accordingly, comments raised in submissions inferring that Shore School has developed a preferred solution without consulting Council and without attempting to follow the process set out by the DoPI (i.e. having the matter addressed by the local traffic committee) are incorrect and misleading.

Proposed Prep School Student Pick Up Facility

As noted above in the statement from the DoPI, the provision of any additional student pick up facilities at the School would be the subject of future project (development) applications at which time the mix of additional students will be known. Accordingly the detail design and site specific traffic implications will need to be assessed again at that time. The purpose of including a preferred option as part of the Concept Plan stage of the development is to establish the basic conceptual design parameters of such a facility.

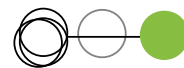
For example, the preferred option shows a pick up zone with a minimum of 4 pick-up parking spaces. However there is potential to increase the length of the pick-up zone to provide up to 6 parking spaces. This can be dealt with through the detail design of the facility as part of future development applications. Further details regarding the operation of pick up zone design aspects are provided in the response to the McLaren Traffic Engineering review below.

Proposed Prep School Student "Pick Up" Only Facility

It is proposed that the new pick up facility would not operate as a drop off facility for students in the morning period. The traffic assessment of the existing drop off facility in Edward Street identified that there was sufficient capacity to accommodate increased drop offs associated with the potential growth of the Prep School. Drop off movements are typically spread out over about a 1 hour period (7:30am-8:30am).

Installation of a permanent new drop-off facility which is accessible by both Prep School and Senior School students will actually encourage car use contrary to all stated policy of those that oppose the School's proposals.

The purpose of the proposed additional on-site "pick up" facility is to provide additional capacity to accommodate the peak demands associated with the afternoon Prep pick up activities, thereby relieving existing pressure on the Edward Street Preparatory School facility and accommodating potential additional Preparatory School student numbers.



Assessment of Proposed Preferred Concept Option – Union Street to Hunter Crescent

Comments in the submissions relating to the proposed preferred option generally relate to traffic generation, available queuing area and potential congestion. It is noted that two of the more detailed submissions indicated that additional capacity was required and did not suggest that an alternate option should be the preferred option (although the Edward Street Precinct Committee submission preferred entry from William Street). On this basis it is considered that, subject to addressing the technical aspects of the pick-up facility operation, the preferred option as presented in the PPR is indeed the preferred option.

The assessment of the preferred “pick up” facility presented in the PPR is based on a number of existing travel behaviours (i.e. surveys) and assumptions about future activities.

The analysis presented in the PPR indicates the capacity of the proposed pick up facility based on the concept design and assumptions regarding pick up times etc. The capacity is then compared with the likely utilisation rates which will and can be varied depending upon factors to be determined such as:

- Number of preparatory versus senior school students attending the school
- Distribution of student collections between the existing Edward Street and proposed Union Street pick up facilities (this can be controlled by the School).

School Bus Facilities

Several submissions to the PPR (including the submission of North Sydney Council) included comments relating the provision of an “on site bus facility” to service all School bus activities including existing and future demands.

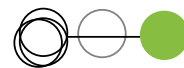
The School currently utilises the existing bus stop in Mount Street in the afternoon to transfer student between North Sydney and the sporting fields at Northbridge. It is acknowledged that the Mount Street bus zone is utilised by other buses, including the adjacent Mary MacKillop Church as was noted in the *Transport & Accessibility Impact Assessment* (page 62) prepared by Halcrow, October 2011, although the School and Mary MacKillop uses rarely overlap.

Students travelling to School in the morning and travelling directly home in the afternoon via bus do so via the public bus facilities at North Sydney Station.

The PPR reiterated that the School’s proposed concept application would not include the provision of an onsite bus facility to replace the existing on street operations in Mount Street.

As part of future development application, the School would seek approval to retain the Mount Street operation and if approved by Council seek to utilise a section of kerb side area along William Street for a period between say 3-4pm on weekdays.

During a meeting with Council officers (7 February 2012) the School was notified that Council would be reducing the length of the Mount Street bus stop to accommodate one bus for the use of the Mary MacKillop Church. This is restated at Page 36 of the Council officer’s report attached to Council’s submission to the DoPI on the PPR. Notwithstanding the proposed Concept application, removal of Mount Street bus spaces without the provision of replacement spaces would exacerbate the situation.



It is also noted that in its submission to the DoPI on the PPR, Council states it is opposed to the use of the lower terraces of Union Street (i.e. the Graythwaite site) to be used as an on-site bus facility. As such any on site bus facility would need to be provided via the School's existing site frontages. For the reasons described in the PPR the provision of an on-site bus facility with access via the existing School frontages is impractical. It is also a very inefficient use of School space for such limited time periods as also noted by the Colston Budd Hunt and Kafes review of the Halcrow transport assessment. The review was commissioned by North Sydney Council.

Proposed On Site Parking Provisions

Council in its submission states that the assessment and determination of the application should be postponed until such time as the 41 space car park under the new East Building is deleted. It is noted that Council's position on this issue is contrary to the independent traffic advice Council received from Colston Budd Hunt & Kafes traffic consultants who were engaged by Council to review the concept and project applications.

As detailed in the PPR, Shore seeks to provide the additional 41 on-site parking spaces as a fair balance between restrictive on-site parking policies and addressing the perceived impacts to local residents regarding the lack of available on street parking. It should be noted that the point raised by the School regarding "existing use rights for parking" on the Graythwaite site prior to the School's purchase of the site are not addressed in the Council response to the PPR.

Note that the proposed additional pick-up facility (Stage 2) as described earlier will require the loss of up to 4 car spaces in the existing car park at the Union Street entrance which is an additional reason for supporting the proposed East Building car park.

Response to Review Prepared By McLaren Traffic Engineering

The review prepared by McLaren Traffic Engineering for the SAD@Graythwaite Community Group raised a number of criticisms of the Halcrow analysis of the proposed pick up facility.

These are addressed below.

1. *Current and Future School traffic to be "absorbed on to and by the school grounds"*

The Shore School, like residents and business of the area, is part of the community. The School has been operating on the site since 1889. While the School has experienced growth between 1889 and today this rate of growth is far exceeded by the growth of North Sydney generally with increased commercial activity and conversion of residential dwellings into family homes and increasing car ownership. Congestion within the surrounding road network is not solely the result of Shore School travel demands, as inferred by McLaren.

The School is an approved land use and activity. Thus comments by McLaren that current traffic should be accommodated on site are inappropriate. It is noted that the Stage 1 Project Application does not seek to increase student numbers on the site. Thus increases to student numbers (and associated potential increased travel demands) will be reassessed in detail as part of the Stages 2 and 3 development applications.

Notwithstanding the above, the School should and does apply management measures to minimise the implications of the School's travel demands. The management of travel demand should be viewed as an ongoing process which is reviewed from time to time and improvement measures implemented where appropriate and in consultation with Council and the community.

It is noted that McLaren suggests that on-site parking is required to meet the "*localised parking demand of the School which is currently putting heavy strain on the nearby on street parking*". The Concept Plan for the Graythwaite Site seeks to increase on-site parking to address the residential comments. However the provision of 41 additional on-site parking spaces is opposed by North Sydney Council.

2. Drop Off and Bus Related Traffic

a. Union Street Traffic Flows

The reference to capacity of Union Street in the *Transport & Accessibility Assessment* (Halcrow, 2011) refers to the desirable environmental capacity of the road rather than the physical carrying capacity or operational capacity of the road. As noted in the Figure 5 of the *Transport & Accessibility Assessment* (Halcrow, 2011) show hourly flows across the day including the period of 8-9am when flows were recorded to be approximately 580 vehicles per hour. However the intersection operation (which is the determinant of road network capacity) of Union Street intersections was determined to be satisfactory with spare capacity.

Notwithstanding the above, the proposed Concept plan for the School would not generate significant traffic flows along Union Street during the AM peak period. The operation of the proposed Union Street "pick up" facility will generate traffic flows during the 3-4pm period when traffic flows along Union Street are in the order of 390 vehicles and thus there is significant spare capacity to accommodate School traffic within the environmental capacity of Union Street.

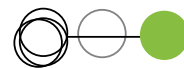
b. Student Drop Off Activity

As described in the Halcrow traffic assessment the existing Preparatory School drop off facility in Edward Street has sufficient capacity to accommodate additional drop off activity.

In estimating the number of additional drop off movements at the Prep School facility in Edward Street, McLaren has incorrectly applied the travel survey data presented in the *Transport & Accessibility Assessment* (Halcrow, 2011). McLaren has incorrectly assumed that 56% of the proposed 132 additional drop offs will occur in Edward Street, namely 74 trips.

What the travel survey and the associated traffic assessment (see Table 4.2 of the *Transport & Accessibility Assessment* -Halcrow, 2011) demonstrated that the rate of drop off movements is significantly less for senior school students than it is for Prep School students. Thus the number of drop offs (and pick-ups) and the associated locations will vary depending upon the mix of preparatory and senior school students for the potential additional 450 students. For the purpose of preparing the *Transport & Accessibility Assessment* the worst case scenario was assumed, namely that 100 of the potential additional 450 students would attend the Prep School.

As shown in Table 4.2 of the *Transport & Accessibility Assessment* (Halcrow, 2011) it is estimated that the Preparatory School drop off movements would be approximately 48 movements spread across the



drop off period from approximately 7:30am to 8:30am. The vast majority of these movements would use the Edward Street facility.

Thus the assertion by McLaren that there will be some 74 additional movements at the Edward Street facility is incorrect and misrepresents the actual survey data presented in the *Transport & Accessibility Assessment* (Halcrow, 2011).

Senior School drop offs currently occur in a variety of locations, including:

- Blue Street
- William Street
- Mount Street

These locations will continue to occur with the additional senior school students. As shown in Table 4.2 of the *Transport & Accessibility Assessment* (Halcrow, 2011) it is estimated that these would be approximately 84 movements across the drop off period for the Senior School which runs from about 7:00am to 8:30am.

c. Bus Operations

McLaren indicates that buses associated with the School should be accommodated on site. This issue is addressed above.

d. Management of Proposed Pick Up Facility

The proposed pick up facility will be located entirely on the School site and there will be staff available to manage the operation of the facility and student movements to and from pick up area. As such the transfer of students from the Prep School to the pick-up, driver behaviour and staff car park use can be effectively managed. It is envisaged that management procedures will be developed for the proposed facility.

3. Reliability of Data Sources and Assessment Tools

a. School Travel Survey

The McLaren review is critical of the Halcrow analysis of the pick-up facility because of its use of the School Travel Survey presented in the Transport and Accessibility Report (Oct 2011), namely that it presented only a single layer of responses and thus can only give minimal accuracy.

The comments of McLaren fail to take into account the intended purpose of the School Travel Survey which was to give an overall picture of travel demands by the School.

Furthermore, the results of the School Travel Survey were not specifically included in the analysis of the proposed additional "pick up" facility but rather surveys of actual pick up operation at the Edward Street facility. Thus the comments by McLaren on this issue are irrelevant.

c. Sidra Analysis

As commented by McLaren the Sidra analysis presented in the PPR assumes that there are no queues extending from the car park access onto Union Street. This comment is correct but also irrelevant when considering the purpose for which the Sidra analysis was undertaken. McLaren's comment about queuing from the proposed pick up facility relates to the queuing theory analysis which is discussed below. The analysis indicates that proposed pick facility can be designed such that queuing can be accommodated on site and not onto Union Street.

The purpose of the Sidra analysis was to determine the potential for queues to occur along Union Street resulting from vehicles waiting to turn right into the site because of a lack of gaps in opposing traffic flow along Union Street.

The Sidra analysis indicated that such queuing in Union Street would not be significant (Level of Service A). That is that there would be sufficient gaps in Union Street flows such that queuing would not be significant. The analysis included the associated turn speeds of vehicles entering the site.

Thus McLaren's comments regarding the inappropriate use of Sidra to assess the capacity of the pick-up facility are not relevant and misleading.

d. Use of Queuing Theory

The McLaren review highlights a number of variables which it is said by McLaren have not been taken into account. This is incorrect as the variables stated are each accounted for by the survey of existing pick up operations.

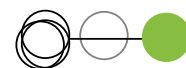
Notwithstanding the above, the variables stated by McLaren and numerous others will need to be reanalysed as part of the detail design of the facility which will occur at the development application stage.

Contingency Factor

The Halcrow report for the PPR stated a contingency of 20% was applied to the analysis. As mentioned in the McLaren report, this is incorrect as the contingency used in the analysis was 10%. The Halcrow report also stated the reported queue lengths were for the 95th percentile queue but this was also an error as the reported queue lengths were for the 99th percentile.

Notwithstanding the above, the Halcrow analysis uses a 10% contingency **in addition** to the use of the 99th percentile queue lengths (i.e. probability that 1 event in 100 events will result in 99th percentile queue length).

The use of the 99th percentile is considered to be in excess of the typical standard used in traffic assessments, which is the 85th percentile. By applying a further 10% contingency factor the results of the analysis are not only appropriate for a traffic assessment but are sound considering the sensitivity associated with this particular case.



Service Rate of Pick Up

The theoretical “service rate” or capacity of 220 vehicles per hour for the proposed facility is based on the average pick up time of 65 seconds and the provision of 4 pick-up spaces.

The average pick up time of 65 seconds is based on actual operational surveys of the existing Edward Street facility. The proposed average time used in the analysis therefore includes variations in pick up times namely vehicle delay and faster than average collections within the pick-up area.

The observed service rate was reduced by 10% as a contingency and used in the queuing analysis.

Number of Pick Up Spaces in the Collection Zone

The analysis presented in the Halcrow report assumed a total of 4 pick-up spaces within the pick-up zone. As noted above, there is potential to increase the number of pick up spaces from 4 to 6 spaces.

The following table indicates the reduced 99th percentile queue length associated with a 6 space pick up zone.

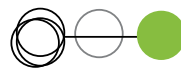
Union Street Pick Up Vehicle Queue Lengths (99th Percentile)

	With 4 Pick Up Spaces	With 6 Pick Up Spaces
29 Vehicles in 15 Minute Period	7 vehicles	5 vehicles
40 Vehicles in 15 Minute Period	14 vehicles	7 vehicles

The analysis shows that the ability of increased pick up spaces to accommodate more traffic movements and further reduce the already small probability that queuing would extend to Union Street.

Notwithstanding the above, the operation of the pick-up area will need to be managed to ensure that the system operates smoothly. It is noted that the observed average pick up time associated with the existing Edward Street facility could be implemented for the new facility including:

- Teachers assisting students into vehicles
- Advanced notification of vehicle on approach
- Facility to open prior to collection to provide an off street queuing area for those parents who arrive early
- Wardens to move on traffic should queues extend beyond the car park (pick up facility access).



McLaren's Estimated Queues

It is noted that McLaren has quoted a queuing figure of 29 vehicles. No justification as to how this number is calculated is provided and is irresponsible.

Notwithstanding the above, the comments of McLaren ignore the estimated demand for the facility and the School's ability to control which students are collected from Union Street pick up facility.

In summary, the analysis provided in the PPR is of sufficient detail to allow the approval of the concept facility. Further assessment will be required during detail design to be undertaken as part of a development application for Stage 2. However, it is clear that the provision of 6 parking spaces would significantly reduce the potential for queuing to extend onto Union Street addressing the primary concerns raised by McLaren and other submissions.

4. Work Place Manage Plan – Issues to be Addressed by Future Stages

The comments by McLaren have already been addressed by the School within the Statement of Commitments submitted with the Environmental Assessment and PPR. The commitments relate to the full range of travel activity undertaken by the School including:

- Public transport
- Opportunities to promote car sharing, walking and cycling
- Car Park Management
- Drop Off and Pick Up Zones operational management

It is more appropriate to prepare a management plan once a firm proposal with explicit components have been developed (i.e. the number of Preparatory versus Senior School students is known).

Naturally, should you have any questions or require any further information please do not hesitate to contact the undersigned.

Yours sincerely

GTA CONSULTANTS

Jason Rudd
Associate Director

Appendix A

Letter for Consideration and Preferred "Pick Up Facility" Option
Report Submitted to North Sydney Council

Our ref: 2015-7.4-12

9 March 2012

North Sydney Council
200 Miller Street
North Sydney NSW 2060
Attention: Mr Aurelio Lindaya - Manager Traffic Planning

WSP Environment & Energy

Level 1, 41 McLaren Street
North Sydney NSW 2060

Tel: + 61 (0)2 8925 6701

Fax: + 61 (0)2 8925 6799

ABN: 82 119 251 179

www.wspenvironmental.com

Dear Aurelio,

**Ref: Preferred Pick-Up Option Report
Graythwaite Concept Plan (MP 10_0149) and Project Application
(MP_0150), North Sydney**

You will recall the meeting between Jason Rudd, Kathy Dickson and me with Jon Higlett and you of 7 February 2012 where we discussed the Department of Planning and Infrastructure's request that the Shore School select a preferred pick-up option for their Graythwaite application in consultation with North Sydney Council. At our meeting it was indicated that Council's input would have to be made by their Traffic Committee and also possibly by the Council.

The School has identified its preferred option which is the one where cars enter the existing School drive in Union Street and exit into William Street via a new road connection between the School property and Hunter Crescent. This option was discussed at the 7 February meeting.

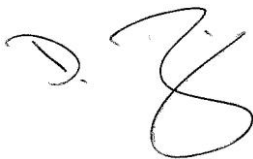
A separate report identifying the preferred pick-up option is attached with this letter for Council to consider.

The preferred pick-up option has been identified within the School's Preferred Project Report which has now been submitted to the Department of Planning and Infrastructure (DoP&I). We understand that DoP&I will be consulting with the Council shortly in regard to the Preferred Project Report.

If it is beneficial to your consideration, I can arrange to meet and discuss aspects of the preferred option at short notice.

Please do not hesitate to contact me should you require any further information.

Yours sincerely



**Dennis Zines
Project Director
WSP Fitzwalter**

Halcrow

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Memorandum

To	Kathy Dickson (Shore School)	Project	Graythwaite – Concept Application
From	Jason Rudd		
Date	7 March 2012	Ref	CTLRJQm08

Re **Graythwaite Part 3A Concept Application MP10_0149**
Preferred Option for Additional On Site Student Pick-Up Facility
Submission to the North Sydney Council Local Traffic Committee

Dear Kathy

The following sets out the findings of our traffic assessment of the preferred concept for the additional student pick-up facility to be provided on the Shore School site.

Background

In October 2011, Shore School submitted an amended proposal and Revised Environmental Assessment (EA) for the Part 3A Concept Application and Stage 1 Project Application for the Graythwaite site.

The revised Concept Application included a number of options for provision of an additional formal vehicle pick-up facility on the Shore School site. These options were developed following feedback from community open days held during the EA process. The full set of options was documented in the *Transport and Accessibility Impact Assessment*¹.

In response to submissions on the Concept Application, the Department of Planning and Infrastructure has requested that Shore School, in consultation with North Sydney Council, select a preferred option for the additional pick-up facility to be included in the Preferred Project.

¹ *Graythwaite Part 3A Concept Application and Stage 1 Project Application, Transport & Accessibility Assessment (Halcrow, 4 October 2011).*

Purpose of an Additional Pick-Up Facility

The only existing formal vehicle pick-up of students at the School is provided at the Preparatory School which is accessed via Edward and Mount Streets.

The purpose of the new pick-up facility is to provide additional capacity to accommodate for a possible increase in the Preparatory School population (nominally a maximum of 100 extra students to add to the current population of 240) that would be part of the Stage 2 approval and to relieve the pressure on the existing Edward Street facility.

Consultation with Council Officers

A meeting was held with Council officers (7 February 2012) to provide a briefing on the project and to obtain feedback from Council on the selection of a preferred option.

The following key principles were identified by Council for consideration in the selection of a preferred pick-up facility option.

1. The extent of vehicle queuing area is to be maximised so as to minimise the implications of vehicles queuing from the site on to the external road network.
2. Significant changes to the operation of the road network are unlikely to be acceptable to the Local Traffic Committee.
3. Minimise the number of vehicle access points (ie. driveways) to and from the School site.
4. Minimise the impact to existing trees along the School's road frontages as these provide amenity and visual screening to adjacent residents.

Description of the Preferred Pick-Up Facility Concept

The preferred option for the additional pick-up facility is Option 2 as shown in Attachment A.

The key features of this option include:

- Construction of an internal road providing a link between the Union Street and Hunter Crescent.
- The link road will utilise the existing driveways at:
 - Union Street – car park access
 - Hunter Crescent
- The link road to include the existing circulation aisle within the car park beneath the tennis courts.
- Construction of a pick-up zone with capacity to accommodate a minimum of 4 vehicles adjacent to a designated student waiting area.
- Vehicles to enter via Union Street, access the pick-up area and depart to Hunter Crescent (ie. one way flow through the School).
- On site queuing area = approximately 100 metres or 16 vehicles.

Through discussions with residents and the School and our on site observations it is noted that the afternoon pick up period at the existing Edward Street pick-up facility is the critical period with regard to congestion on the surrounding road network.

As documented in the *Transport and Accessibility Assessment Report*² the drop off activities in the morning are spread out over a period of generally 90 minutes whereas the afternoon pick up generally occurs within a 15-30 minutes window between 3:00pm – 3:30pm.

Hence the proposed pick-up facility will only operate in the afternoon to provide additional capacity during the peak pick up period.

² *Graythwaite Part 3A Concept Application and Stage 1 Project Application, Transport & Accessibility Assessment (Halcrow, 4 October 2011)*

Assessment of Preferred Concept

Demand for New Pick-Up Facility

The peak demand for an on site pick-up facility is associated with Preparatory school students. Senior School students have a significant higher proportion of travel via public transport and after school sporting activities where students are bussed to sporting facilities at Northbridge.

The Preparatory School currently has 240 students. Surveys of the existing pick-up facility in Edward Street indicated that there is a peak pick up demand in the order of 40 vehicles during a 15 minute period between 3:00pm and 3:15pm.

This equates to a rate of 1 vehicle for every 6 students arriving within a 15 minute period.

Should Stage 2 of the Concept Plan be approved there is potential to increase the preparatory school population from 240 to 340 students.

For Stage 2 the demand for the pick-up facilities is estimated to increase from 40 vehicles to 57 vehicles in the peak 15 minute period between 3:00pm - 3:15pm

It is proposed that the number of students to be collected from a pick-up facility will be evenly distributed between the existing Edward Street facility and the new Union Street – Hunter Crescent facility, namely 29 vehicles at each location.

Capacity of Proposed Pick-Up Facility

Observations of the existing Edward Street facility indicate that the average loading time of vehicle is 1:05 minutes. This was surveyed from the point where it pulls into the loading area, students are loaded into the vehicle and the vehicle pulls away from the loading area.

Based on these surveys the proposed pick-up facility which can accommodate 4 vehicles at once has a capacity to accommodate approximately 55 vehicles with a 15 minute period.

Therefore the proposed Union Street – Hunter Crescent pick-up facility could accommodate the likely peak 15 minute demand of 29 vehicles. In fact there is likely to be spare capacity such that additional students could be picked up from the proposed additional facility further reducing pressure on the existing Edward Street facility.

Vehicle Queues

Queuing theory³ has been applied to the proposed additional pick-up facility to determine the probability of vehicle queues extending back from the loading area, through the car park and onto Union Street.

The analysis is based on a theoretical capacity of 220 vehicles per hour with a 20% reduction contingencies and a vehicle queuing length of 16 vehicles.

The queuing analysis presented in Attachment B indicates that the 95th percentile queues lengths to be :

- Demand of 40 vehicles per 15 minute period = 14 vehicles
- Demand of 29 vehicles per 15 minute period = 7 vehicles

The queuing analysis indicates that the proposed available queuing area is sufficient to accommodate vehicle queues associated with the pick-up facility on site.

Intersection Operation

An aaSIDRA analysis was undertaken for the proposed site entry to the pick-up facility driveway in Union Street.

The analysis was based on the surveyed two way flows along Union Street during the operation of the proposed pick-up facility (namely 3:00pm – 3:30pm) and a peak demand of 40 vehicles in a 15 minute period.

The analysis provided the following results:

- Intersection Level of Service: LoS A
- Average Intersection Delay (worst movement): 10 seconds / vehicle
- 95th percentile queue in Union Street: 9 metres (1-2 vehicles)

³ Transportation and Traffic Engineering Handbook (ITE) p303

The analysis indicates that there would be minimum vehicle delays and queuing in Union Street during the period of the proposed pick-up facility operation.

Sight Distances at Union Street

Under the preferred option, vehicles access in the proposed pick-up facility will be entering from Union Street. No exit movement for these vehicles would occur at Union Street. It is proposed that during the operation of the pick-up facility all vehicles will exit to Hunter Crescent.

The available sight distances both from vehicles waiting to turn into the Union Street driveway to approaching cars and from cars approaching the along Union Street to a potential car queuing in Union Street waiting to turn into the driveway comply with the minimum AS2890.1 requirements for driveway access.

Summary

The provision of an additional on site pick-up facility has been included as part of the preferred concept application. The provision of an additional facility has been in part a response to community feedback and the School's desire to address existing and potential future issues associated with congestion in Edward Street arising from the capacity of the existing pick-up facility.

The preferred option has been selected to be Option 2 which provides a one way link road through the School running between Union Street and Hunter Crescent.

The analysis presented in this assessment indicates that the preferred pick-up option can operate satisfactorily with regards to containing vehicle queues on site and minimising the implications and modifications to the surrounding road network.

As such it is concluded that the preferred option (Option 2) is consistent with the key principles identified by Council for the selection of a preferred option.

Attachment A - Preferred Pick-Up Facility Option

Attachment B - Vehicle Queuing Analysis

Queue Analysis – 29 vehicles per 15 minute peak period

arrival rate	116	vph
service rate	198	vph

Probability of "n" units in the system

n = no. of queued vehicles	Prob.	Prob n or more
0	41.4%	1.000
1	24.3%	0.586
2	14.2%	0.343
3	8.3%	0.201
4	4.9%	0.118
5	2.9%	0.069
6	1.7%	0.040
7	1.0%	0.024
8	0.6%	0.014
9	0.3%	0.008
10	0.2%	0.005
11	0%	0.003
12	0%	0.002
13	0%	0.001
14	0%	0.001
15	0%	0.000
16	0%	0.000
17	0%	0.000
18	0%	0.000
19	0%	0.000
20	0%	0.000

Queue Analysis – 40 vehicles per 15 minute peak period

arrival rate	160	vph
service rate	198	vph

Probability of "n" units in the system

n = no. of queued vehicles	Prob.	Prob n or more
0	19.2%	0.998
1	15.5%	0.806
2	12.5%	0.651
3	10.1%	0.526
4	8.2%	0.425
5	6.6%	0.343
6	5.3%	0.277
7	4.3%	0.223
8	3.5%	0.180
9	2.8%	0.145
10	2.3%	0.117
11	2%	0.094
12	1%	0.076
13	1%	0.061
14	1%	0.049
15	1%	0.039
16	1%	0.031
17	1%	0.025
18	0%	0.020
19	0%	0.016
20	0%	0.012