BEFORE THE DUNEDIN CITY COUNCIL

IN THE MATTER OF of the Resource Management Act 1991

AND

IN THE MATTER OF A Notice of Requirement by the Otago Regional Council for a designation pursuant to section 168 of the Act in relation to a Central City Bus Hub (DCC Notice of Requirement: DIS-2017-1)

STATEMENT OF EVIDENCE BY ANDY LIGHTOWLER ON BEHALF OF THE OTAGO REGIONAL COUNCIL

9 OCTOBER 2017

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1. INTRODUCTION

QUALIFICATIONS AND EXPERIENCE

1.1 My name is Andy Lightowler. I hold a Bachelor of Science degree in Transport Operations and Planning from Aston University, obtained in 1987 and I am an Associate member of the Institute of Logistics and Transport. I am a Technical Director with the firm Beca Limited, which practices as an engineering professional services consultancy.

1.2 I have been engaged in the field of transport operations, transport planning and transport engineering for 30 years. My experience includes leading the transport planning input to the design of Manukau Bus Rail Interchange for Auckland Transport between 2014 and 2016, undertaking feasibility studies for a wide variety of bus interchange and bus priority projects in New Zealand, Ireland, the UK and Hong Kong.

1.3 I confirm my obligations in terms of the Environment Court's Code of Conduct for Expert Witnesses contained in the Practice Note 2014. I re-confirm that the issues addressed in this brief of evidence are within my area of expertise. I re-confirm that I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

1.4 I have been engaged by the Otago Regional Council to prepare traffic and transport planning evidence in relation to the Notice of Requirement for a central city bus hub.

2. SCOPE OF EVIDENCE

2.1 Within this evidence I address the following matters:

1. My involvement in the Project to date
2. The existing and future transport environment

3. Assessment of transport effects and mitigation

4. Issues raised by submitters.

3. EXECUTIVE SUMMARY

3.1 I was engaged by Otago Regional Council (ORC) to develop a preferred layout for the Dunedin Bus Hub project.

3.2 The proposed Bus Hub will comprise ten bus bays on Great King Street, between Moray Place and St Andrew Street in Dunedin city centre, and one further bay on Moray Place. In order to improve the safety and efficiency of the predicted increase in bus and pedestrian movements to and from the Bus Hub, the intersections with Moray Place and St Andrew Street are proposed to be upgraded. Moray Place will be signal controlled and both intersections will incorporate fully protected pedestrian crossings. A mid-block courtesy crossing will also be provided mid-way along Great King Street.

3.3 My transport advice concerns the development of the preferred design layout of the Bus Hub and the proposed operation of the intersection of Great King Street with Moray Place and with St Andrew Street. This process included intersection traffic modelling, swept path analysis, full scale site trials and an independent road safety audit.

3.4 A number of transport related submissions have been received in relation to this Project. These primarily related to concerns over congestion and operational efficiency of Great King Street and the surrounding intersections; and concerns over pedestrian safety.

3.5 It is my opinion that the predicted transport effects of the proposed changes to the road network can be accommodated with less than minor effects on the safe operation of this future transport network.

4. MY INVOLVEMENT WITH THE PROJECT TO DATE

4.1 I was engaged by ORC to lead the preparation of concept design options for the proposed Bus Hub and the identification of a preferred concept design option. In order to confirm the suitability of the preferred Bus Hub concept design layout, a site trial was undertaken. Following this, I have led the preparation of a preliminary design for the preferred concept design for the Bus Hub.

4.2 With reference to the Site under consideration, my work has involved overseeing the identification and refinement of the concept design layout, the modelling of intersections affected by the Bus Hub design, the consideration of access arrangements to affected properties on Great King Street, checking the layout is able to accommodate the movement of buses and other road traffic. I am familiar with the transport environment around the site and most recently visited the areas on 29 September 2017.

5. THE EXISTING AND FUTURE TRANSPORT ENVIRONMENT

5.1 The Bus Hub is proposed to be located on Great King Street between Moray Place and St Andrew Street. This section of Great King Street is approximately 200 metres in length and located approximately 150m north east of the Octagon (Dunedin city centre).

5.2 The intersection of Great King Street with St Andrew Street is currently traffic signal controlled. The intersection of Great King Street with Moray Place is currently a priority controlled intersection, with priority given to traffic on Moray Place.

5.3 St Andrew Street is classified as a Regional Road in the Dunedin City Council (DCC) District Plan Operative City Plan[1]. Regional Roads provide connections between the regional roads and connect major rural, suburban, commercial and industrial areas.

[1] Dunedin City Council Operative City Plan – Volume 2

5.4 Moray Place is classified as a Collector Road. Collector roads distribute and collect local traffic within and between neighbourhoods and link rural communities. They provide for traffic movement and property access.

5.5 Great King Street is classified as a Local Road. The primary function of Local roads is to provide access to properties, rather than to act as through-routes.

5.6 The current speed limit on Great King Street, Moray Place and St Andrew Street is 50km/h.

5.7 On street parking is available on both sides of the sections of Great King Street and Moray Place, and on one side of St Andrew Street, within the proposed scheme extents. This comprises a combination of short-stay car parking and five minute (P5) loading bays. The proposed changes to the on street parking are discussed in the Statement of Evidence by Andy Carr[2].

5.8 The land use along Great King Street currently comprises a combination of commercial, retail and car parking, with (from north to south) The Stadium Sports Bar, Farmers department store, commercial car parking managed by Wilsons, Dunedin Community House/ car park on the west side; and mixed retail outlets, the Dunedin Central Police station, Countdown supermarket / car park and The Break bar on the east side.

5.9 A number of side accesses from these establishments generate vehicle movements onto Great King Street, with major accesses to the Farmers / Wilsons and Countdown car parks and minor accesses to the Community House private car park, the Victoria Hotel (by the $2 Shop) and the Police Station. A second access to the Countdown car park is located on Moray Place within the proposed scheme extents. A number of these facilities also have alternative accesses, with Victoria Hotel accessible off St Andrew Street and Cumberland Street, and Police Station and Countdown accessible from Cumberland Street.

[2] 'Statement of Evidence by Andy Carr on Behalf of the Otago Regional Council' (dated October 2016)

5.10 Traffic and pedestrian counts are available for the morning (AM) and evening (PM) peak hours (i.e. approximately 08.00-09.00 hours and 16.30-17.30 hours) at the intersection of St Andrew Street and Great King Street and the intersection of Moray Place and Great King Street, recorded in August 2016[3]. Recorded peak hour traffic volumes in both directions were approximately 670 to 790 vehicles per hour (veh/h) on St Andrew Street, 250 to 530veh/h on Great King Street and 250 to 540veh/h on Moray Place. Bus movements were recorded to be minimal, with three bus movements on St Andrew Street in the AM peak and three on Moray Place in the PM peak. A total of 155 (AM) and 390 (PM) pedestrian movements were recorded at the signalised crossings at the Great King Street / Moray Place intersection.

5.11 Pedestrian footpaths are provided on both sides of all roads within the proposed Bus Hub scheme extents.

5.12 The existing signalised intersection of St Andrew Street and Great King Street incorporates a combination of protected and unprotected pedestrian crossing facilities. The existing priority intersection of Great King Street and Moray Place incorporates a priority pedestrian crossing with a refuge island across Great King Street only. The side accesses within the proposed scheme extents comprise drop kerbs on the pedestrian footpath, with some incorporating a change in surface type to indicate vehicle priority.

5.13 There are currently no dedicated cycle facilities within the proposed scheme extents.

5.14 There are currently no bus stops provided on Great King Street.

5.15 A total of ten stops are proposed to be provided for local bus services at the Bus Hub (five stops on each side of the road). The majority of the bus bays will be set at an angle from the existing street edge, creating a 'saw-tooth' kerbline. This design will optimise the balance between length of street

[3] 'Dunedin Bus Hub Network Effects – Model Development Report' by TDG (dated September 2016)

edge required by each bay, ease of bus movements (dynamic capacity), footway and road width and bus accessibility for pedestrians.

5.16 An additional stop for longer distance bus services will be provided on the north-east side of Moray Place.

5.17 Great King Street will remain open as a public road.

5.18 The intersection of Great King Street with Moray Place is proposed to be signalised. This is in order to provide improved pedestrian crossing facilities to cater for additional pedestrian movements expected to occur between the Bus Hub and surrounding areas, and to improve the efficiency, reliability and safety of bus movements into and out of the Bus Hub (particularly due to the existing priority for through movements on Moray Place) .

5.19 The right turn movement from Great King Street into Moray Place is proposed to be banned. This will allow improved signal phasing to provide increased priority to bus movements in to and out of the Bus Hub as well as protected pedestrian crossings. It will also simplify the geometric layout of the intersection, with no requirement for a right turning lane on the Great King Street approach. A dedicated all-pedestrian crossing phase (i.e. allowing straight movements only) will provide protection from turning buses and other vehicles, as well as prioritising pedestrian movements.

5.20 The intersection of Great King Street and St Andrew Street is proposed to be upgraded, with new lane designations, kerb build-outs and a protected pedestrian crossing phase. This is in order to improve the efficiency and safety of bus movements into and out of the Bus Hub, and to provide improved pedestrian crossing facilities. Two alternative methods of operation of the intersection were modelled for the St Andrew Street intersection – one incorporating a dedicated all-pedestrian crossing phase (i.e. the same as what will be provided at the intersection of Great King Street and Moray Place), and one incorporating a dedicated Barnes Dance pedestrian crossing phase (i.e. allowing diagonal crossing movements to take place).

5.21 A mid-block courtesy pedestrian crossing (i.e. unsignalised), with kerb build-outs, will also be provided on Great King Street to satisfy current and anticipated future pedestrian desire lines between the west and east side of Great King Street. The crossing type and layout has been selected based on pedestrian safety and operational efficiency of the Bus Hub. Its location will provide sufficient room for the desired number of bus stops on Great King Street, which would be compromised if the crossing was situated further south in line with the Police station's pedestrian entrance.

5.22 It is proposed that the road level is not raised at the crossing point. The Bus Hub layout is anticipated to promote sufficiently low speeds without the requirement of further traffic calming; and a raised table would increase bus passenger discomfort.

5.23 All accesses within the proposed scheme extents are proposed to be retained as existing, with the following exceptions:

- The Community House access on Great King Street will be closed, with an alternative access provided on Moray Place.
- The Victoria Hotel access adjacent to the $2 Shop will be modified to allow exiting vehicles only. Kerb build-outs will be constructed adjacent to the Farmers, Countdown and Police Station accesses to improve visibility for vehicles emerging from the accesses.

5.24 The surface treatment of the larger accesses (Countdown and Farmers) is proposed to give priority to vehicles, while at the smaller accesses (Victoria Hotel and Police Station) the footpath treatment will extend over the access, giving priority to pedestrians. Kerb build-outs are proposed to be provided at the majority of accesses, including at the police station access, in order to improve inter-visibility between vehicles and provide appropriate sight distance for traffic leaving the police station onto Great King Street.

5.25 The informal pedestrian route through the private Community House car park is proposed to be closed along with the closure of the Community House access on Great King Street. As there is no pedestrian footpath

through the car park, this existing route is neither safe nor legal. A formal access through the site would need to follow the internal edge of Community House and could encourage pedestrians to cross the street mid-way between the proposed pedestrian crossings.

5.26 An alternative route around Community House to the intersection of Great King Street and Moray Place will be provided and directs pedestrians to the proposed fully protected pedestrian crossing facilities at this location.

5.27 Two 6m length loading zones will be provided on Great King Street for businesses to use. A number of the proposed bus bays will also be available for use as loading bays by larger service vehicles on a pre-agreed time restricted basis.

6. ASSESSMENT OF TRANSPORT EFFECTS AND MITIGATION

6.1 My evidence of the impact of the Project on the surrounding transport network is based on modelling of the operation of the intersections of Great King Street with Moray Place and with St Andrew Street undertaken by Beca.

6.2 My evidence is also based on the results of a trial of the preferred concept design and on tracking analysis undertaken at the Moray Place and St Andrew Street intersections and at the main access and egress points in the Bus Hub area.

6.3 Existing traffic models of the intersections of Great King Street with St Andrew Street and Great King Street with Moray Place (base year 2016) were provided to Beca by ORC. These models were developed by TDG for ORC and are based on traffic counts conducted in August 2016[4].

6.4 The model of the intersection of Great King Street with Moray Place was modified to incorporate traffic signal control and pedestrian crossing facilities, as is proposed for the Bus Hub. The model also incorporates the

[4] 'Dunedin Bus Hub Network Effects – Model Development Report' by TDG (dated September 2016)

banned right turn movement from Great King Street into Moray Place, which is also proposed.

6.5 The model of the intersection of Great King Street with St Andrew Street was modified to incorporate the geometric and lane changes necessary to cater for the proposed bus movements between Great King Street and St Andrew Street.

6.6 The modelling was undertaken on the basis that, with the exception of the banned right turn from Great King Street onto Moray Place, existing traffic flows are unaffected by the Bus Hub (i.e. traffic does not reroute away from the Bus Hub), but that bus movements contribute to additional traffic movements.

6.7 The network effects of banning the right turn from Great King Street onto Moray Place are discussed further in the evidence provided by TDG.

6.8 The number of additional bus movements assumed to be generated by the Bus Hub is approximately 35 movements in each direction (for both the AM and PM peaks). The increased bus volumes were incorporated into the traffic models.

6.9 Although the increase in bus movements is significant, the overall number of buses is relatively minor (on average approximately one bus every two minutes in each direction).

6.10 Detailed traffic modelling conducted for the proposed signal controlled Great King Street / Moray Place intersection indicates the Bus Hub Project will only have a minor effect on the operational performance of the intersection.

6.11 The modelling results indicated that the intersection level of service[5] will remain at A in the morning (AM) peak and drop from A to B in the evening

[5] Level of service is a qualitative measure of the quality of traffic service, based on performance measures such as traffic density and delay. These are graded in 'Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis' as follows:

(PM) peak. The average vehicle delay was predicted to increase from 2s to 10s (AM) and from 2s to 12s (PM) and the largest (95th percentile) queue was predicted to increase from 5m to 20m (AM) and from 10m to 40m (PM). Hence the largest queue predicted by the model will not extend to adjacent intersections.

6.12 Traffic modelling conducted for the upgraded Great King Street / St Andrew Street intersection, incorporating a dedicated all-pedestrian crossing phase and increased bus volumes, indicates the Bus Hub Project will not have a significant adverse effect on the operational performance of the intersection.

6.13 The modelling results indicated that the intersection level of service will drop from B to C in the AM and PM peaks. The average vehicle delay was predicted to increase from 13s to 25s (AM) and from 14s to 29s (PM) and the largest (95th percentile) queue was predicted to increase from 30m to 90m (AM) and from 40m to 80m (PM). Hence the largest queue predicted by the model will not extend to adjacent intersections.

6.14 Detailed traffic modelling conducted for the upgraded Great King Street / St Andrew Street intersection, incorporating a Barnes Dance pedestrian crossing phase and increased bus volumes, indicates the Bus Hub Project will not have a significantly adverse effect on the operational performance of the intersection.

6.15 The modelling results indicated that the intersection level of service will drop from B to C in the AM and PM peaks. The average vehicle delay was predicted to increase from 13s to 34s (AM) and from 14s to 35s (PM) and the largest (95th percentile) queue was predicted to increase from 30m to 130m

- A: Free flow, where drivers are virtually unaffected by other vehicles
- B: Stable flow, where drivers have reasonable freedom of speed and manoeuvring
- C: Stable flow, where drivers have restricted freedom of speed and manoeuvring
- D: Close to the limit of stable flow, where drivers are severely restricted in freedom of speed and manoeuvring
- E: Traffic volumes at or close to capacity, with virtually no freedom of speed and manoeuvring
- F: Breakdown of flow, with queueing and delays.

(AM) and from 40m to 90m (PM). Hence the largest queue predicted by the model will extend to the intersection of St Andrew Street and Cumberland Street for a short time during the AM peak.

6.16 The layout trial confirmed that the Bus Hub layout will allow buses to operate satisfactorily in the Hub area (accessing and egressing individual stops without conflicting with other traffic) and manoeuver safely at the Moray Place and St Andrew Street intersections.

6.17 Tracking (swept path) analysis has been undertaken to confirm that buses are able to operate satisfactorily in the Hub area and manoeuver safely at the Moray Place and St Andrew Street intersections; and that other traffic is able to manoeuver to and from the various individual access and egress locations on St Andrew Street.

7. ISSUES RAISED BY SUBMITTERS

7.1 I note that 22 submissions were received in relation to the Project. Of these submissions, eight were in support, 12 in opposition and two neither in opposition or support. Of the submissions in opposition or neither in support or opposition, the following transport related matters were raised by the submitters:

1. Concerns over the traffic congestion effects of the Bus Hub project on the already congested Great King Street and on the wider road network in Dunedin.

2. Concern over the narrow width of Great King Street and its suitability for use as a Bus Hub; and concerns that Great King Street is not easy for buses to access.

3. Concern that proposed bus timetabling has not been considered when undertaking traffic modelling.

4. Concern that restricting traffic movements along Great King Street and Moray Place (particularly the banning of the right turn from Great King Street onto Moray Place) has not been appropriately assessed.

5. An objection regarding the banning of left turning traffic from the Countdown access on Great King Street appears to have been made in error.

6. A suggestion that the proposed mid-block crossing is signalised.

7. Concern about the pedestrian desire line through Community House being closed, and the loss of amenity and safety of the proposed desire line around Community House.

8. Concerns around pedestrian safety, particularly with the increased bus and increased pedestrian volumes predicted as a result of the Bus Hub.

9. Concerns around pedestrian safety at the side accesses on Great King Street

10. The need to maintain appropriate sight distances at the police station access onto Great King Street.

7.2 I have addressed all of these matters in section 6 of my evidence.

7.3 In my opinion, the Project will not have a significant adverse effect on traffic flows on Great King Street or at its intersections with Moray Place and St Andrew Street, given the small increase in total traffic volumes anticipated.

7.4 Following swept path analysis and site trials, I am satisfied that all proposed bus movements can be made safely and efficiently throughout Great King Street and at the intersections with St Andrew Street and Moray Place.

7.5 It is my opinion that it is not necessary to consider individual bus timetabling when undertaking the intersection modelling for this Project, and that the modelling undertaken is suitable for its purpose.

7.6 I consider that the banning of the right turn movement from Great King Street into Moray Place is appropriate, given the improvements to be gained in the intersection operation and geometric layout, as well as the low volume of traffic currently making the movement.

7.7 I consider that the proposed courtesy mid-block crossing is the safest and most appropriate crossing type for this location.

7.8 I consider that closing the pedestrian route through the Community House car park and providing an alternative route around Community House will improve safety for pedestrians.

7.9 I am satisfied that appropriate measures have been taken in the proposed design to protect and provide priority to pedestrians, both at the intersections with Moray Place and St Andrew Street, and at the side accesses on Great King Street.

7.10 I am satisfied that appropriate sight distances are provided at the police station access onto Great King Street.

8. CONCLUSION

8.1 On the basis of the evidence outlined above, I consider that the proposed design for the Dunedin Bus Hub is suitable for the required purpose, and that the predicted transport effects of the proposed changes to the road network can be accommodated with less than minor effects on the safe operation of this future transport network.

8.2 I consider that the effects of the proposed Project have been appropriately assessed through a combination of traffic modelling, site trials, and swept path analysis. I acknowledge the concerns raised in the submissions and it is my opinion that these concerns are appropriately addressed in the body of this evidence.