MIRVAC PROJECTS PTY LTD

TRANSPORT REPORT FOR PROPOSED DISTRIBUTION CENTRES AND WAREHOUSE DEVELOPMENT AT HOXTON PARK

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APPENDIX

1. INTRODUCTION

1.1 Colston Budd Hunt and Kafes Pty Ltd has been commissioned by Mirvac Projects Pty Ltd to prepare a report on the transport implications of the proposed distribution centres and warehouse development at Hoxton Park. The site is located within the former Hoxton Park Airport site, as shown on Figure 1, which has been rezoned under the Liverpool LEP 2008.

1.2 The Hoxton Park Airport site has been identified for a mixed use development containing general industrial, residential and commercial/retail uses. The regional and local traffic effects of the proposed development, comprising 45.7ha of industrial area, 14.2ha of residential and 2.5ha of commercial/retail area, have previously been assessed through a number of studies undertaken in association with the rezoning of the former airport site. These studies are appended and include:-

- Hoxton Park Airport Redevelopment - Traffic Impact Assessment (Sinclair Knight Merz, September 2006);

- Hoxton Park Airport Regional Modelling -Traffic Study (Sinclair Knight Merz, April, 2007).

1.3 Mirvac Projects proposes to develop a number of lots within the portion of identified industrial land located on the southern part of the site. A concept and project application have been developed for these lots and associated road works, including a Big W distribution facility of some 89,000m^2, a Dick Smith distribution facility of some 50,000m^2 (ultimately) and two warehouse developments of some 22,400m^2.

1.4 The Director-General's Environmental Assessment Requirements include:-

*"**Transport***

- ***robust predictions of the traffic volumes likely to be generated during construction and operation; and***
- ***an assessment of the predicted impacts of this traffic on the capacity, efficiency, and safety of the surrounding road network, including modelling of key intersections."***

1.5 This report has been prepared with regards to the Director General's Requirements and assesses the transport implications of the proposed development, comprising the two distribution facilities and the two warehouse developments. The report forms part of a project application for the Big W and Dick Smith distributions facilities and two warehouse developments. The application has been prepared under Part 3A of the Environmental Planning and Assessment Act 1979. The findings of the assessment are set down through the following chapters:-

- Chapter 2- describing transport context; and

- Chapter 3- assessing the transport implications of the proposed development.

2. TRANSPORT CONTEXT

Site Location and Road Network

2.1 The site is located within the former Hoxton Park Airport site, which has been rezoned under the Liverpool LEP 2008. The site is bounded by the M7 Motorway to the west, Cowpasture Road to the east and by open space and residential areas to the north. The M7 and Cowpasture Road converge to the south of the site at a grade separated intersection. Access to the site is provided via a signalised intersection on Cowpasture Road located to the north of the M7 interchange.

2.2 The main roads in the vicinity of the site include Cowpasture Road, the M7 Motorway, Hoxton Park Road and Elizabeth Drive. Local collector roads such as Green Valley Road and North Liverpool Road connect Cowpasture Road with the residential areas of Green Valley and Bonnyrigg.

2.3 Cowpasture Road is a classified Main Road (MR648) and operates as an arterial road running north-south between the Horsley Drive and Camden Valley Way. South of the M7 and north of North Liverpool Road, Cowpasture Road provides a four lane divided carriageway with two traffic lanes in each direction, clear of intersections.

2.4 Cowpasture Road, between the M7 interchange and North Liverpool Road, provides one northbound lane and one southbound lane. This section of Cowpasture Road is currently being upgraded by the Roads and Traffic Authority to provide a divided carriageway with two traffic lanes in each direction. Main intersections along Cowpasture Road are generally controlled by traffic signals with additional storage lanes for turning vehicles.

2.5 The M7 Motorway is located to the west and connects to the M5 Motorway at Casula, the M2 Motorway at Baulkham Hills and intersects with the M4 Motorway at Eastern Creek. The M7 provides a divided carriageway with two traffic lanes in each direction. It intersects with Cowpasture Road at a grade separated interchange adjacent to the site.

2.6 Hoxton Park Road is located to the south and provides an east-west connection between Cowpasture Road (south of the M7 interchange) with the Hume Highway at Liverpool. At its western end it provides an undivided road with one traffic lane in each direction. The RTA is currently upgrading Hoxton Park Road to a four lane divided road, similar to the eastern end upgrade, undertaken in association with the Liverpool-Parramatta Bus Transitway.

2.7 North Liverpool Road and Green Valley Road provide east-west connections from Cowpasture Road towards Liverpool, through the residential areas of Green Valley and Bonnyrigg. Both roads provide one traffic lane and one parking lane in each direction, clear of intersections, with residential driveways having direct access to the roadway. Intersections along both these roads are generally controlled by roundabouts or give-way signs, although traffic signals are located where these roads intersect with the Liverpool-Parramatta Bus Transitway and at main intersections including the intersection of Cowpasture Road/North Liverpool Road.

2.8 Elizabeth Drive is located to the north and provides an east-west connection between The Northern Road at Badgery's Creek and the Hume Highway at Liverpool. It intersects with Cowpasture Road to the north of the site at a signalised intersection. Elizabeth Drive generally provides a four lane divided carriageway.

Previous Studies

2.9 The overall site has been identified for a mixed use development containing general industrial, residential and commercial/retail uses, comprising:-

- industrial - 45.7ha;
- commercial/retail - 2.5ha; and
- residential - 14.2ha.

2.10 As shown on Figure 2, the development of the site will involve industrial development in the larger southern portion of the former Hoxton Park Airport. There will be residential development to the north with a central commercial/ retail buffer separating the industrial development from the residential. It is envisaged that there will be further residential development to the north which will link to residential areas in Cecil Hills.

2.11 Access to the site will ultimately be provided onto Cowpasture Road at two locations. One will be located to the north of the M7 interchange, and will replace the existing airport entrance. The second will be located approximately 500 metres south of Green Valley Road across Hinchinbrook Creek. Both access points will incorporate signalised intersections with Cowpasture Road. Ultimately Middleton Grange will also be connected with a road link beneath the M7 Motorway.

2.12 The residential component of the former Hoxton Park Airport will have access via the two proposed intersections onto Cowpasture Road plus secondary access via future connections to existing and future residential development to the north, west and north-east.

2.13 An internal north-south access road will be developed linking Cowpasture Road in the south to the residential development in the north. A secondary east-west connection will be provided at the northern end of the industrial development, and at a point in time in the future, eventually linking to Cowpasture Road across Hinchinbrook Creek and to the M7.

2.14 The previous studies prepared by SKM have assessed the regional and local traffic effects of the entire proposed Hoxton Park Airport redevelopment. These studies identified that the two local access points of the proposed development onto Cowpasture Road (whilst subject to detail design and approval by the RTA), will be signalised and will incorporate two through traffic lanes on Cowpasture Road, a right turn lane in Cowpasture Road of 100 metres, a left turn slip lane and a double right turn out of the site. The assessment (SKM 2006) found that under future traffic conditions these access points would operate at a satisfactory level of intersection operation.

Road Network Changes

2.15 The M7 Motorway is the most recent project in the vicinity of the Hoxton Park Airport site. It opened in late 2005, and captured some of the traffic that would otherwise use the north-south roads in the vicinity of the site, such as Cowpasture Road. The construction of the interchange with Cowpasture Road included an upgrade to Cowpasture Road on either side of the M7. This involved widening Cowpasture Road to two traffic lanes in each direction.

2.16 The RTA is in the process of widening Cowpasture Road to a four lane divided carriageway north of the M7. As part of the upgrade, the intersection of Cowpasture Road and Green Valley Road will be signalised.

2.17 The RTA has also prepared a Review of Environmental Factors for the widening of Hoxton Park Road to provide two traffic lanes in each direction from Cowpasture Road and to connect with the already upgraded sections east of Whitford Road.

2.18 In association with the development of the site, a new signalised access will be located on Cowpasture Road, to the north of the M7 interchange, which will replace the existing airport entrance. This southern signalised access, as shown on plans prepared by ADW Johnson, is being constructed in association with the current upgrading of Cowpasture Road, between North Liverpool Road to Westlink M7. Previous studies have also recommended that the northern east-west access from the site on Cowpasture Road (located some 500 metres south of Green Valley) should also be signalised.

Public Transport

2.19 Bus services in the area are provided by Metrolink and Busabout. All bus routes passing near to the development site are shown on Figure 3. There are currently no bus services operating along Cowpasture Road between North Liverpool Road and Hoxton Park Road. Nearby bus routes mainly access local residential developments to the north, east and south of the development site. However, with the increase in residential development to the north and west of the site, local bus operators have indicated that new bus routes and modifications to existing routes will be made to service these developing areas in the future.

2.20 Bus services in the area include:-

- Route 841 – Liverpool to Cecil Hills via Heckenberg and Bonnyrigg Heights;
- Route 842 – Liverpool to Hinchinbrook via Sadleir, Ashcroft and Busby;

- Route 844 – Liverpool to The Valley Plaza via Ashcroft, Heckensberg and Busby;

- Route 845 – Liverpool to The Valley Plaza via Bonnyrigg and Green Valley;

- Route 853 – Liverpool to Carnes Hill – Middleton Grange via Hoxton Park Road;

- Route 854 – Liverpool to Carnes Hill (Greenway Drive) via Hoxton Park Road; and

- Route 855 – Liverpool to Austral via Prestons and Churchill Gardens.

2.21 The closest existing bus route for the southern industrial land is Route 845 (operated by Metrolink) with a walking distance to this service of some 600 metres, measured from the southern boundary of the site. On weekdays buses on this route operate on a 30 minute headway in each direction and on a 60 minute headway on weekends, with more frequent services during the weekday peak periods.

2.22 All bus services through the area terminate/originate at Liverpool Station. Liverpool Station is located seven kilometres to the east and is serviced by trains on the City via Regents Park, Bankstown and Granville Lines, as well as Cumberland Line trains to Parramatta, Blacktown and Campbelltown. It is also two stations north of Glenfield interchange, which provides access to both the East Hills and Airport Lines.

2.23 The T-Way express bus route from Liverpool to Parramatta runs along Hoxton Park Road, turns right at Banks Road in Miller, then proceeds north towards

Parramatta. Buses generally operate on a 20 minute headway during weekday/weekends and on a 10 to 15 minute headway during weekday peak periods. The closest T-Way bus stop for the southern industrial land is located in Banks Road, Miller (near TAFE), which is some 2 kilometres from the southern boundary of the development site. Access to the T-Way from the development would require use of supplementary bus services or private transport (car, walk, or cycle).

3. TRANSPORT ASSESSMENT OF PROPOSED DEVELOPMENT

3.1 Mirvac Projects proposes to develop a number of lots within the 45.7ha portion of identified industrial land located on the southern portion of the Hoxton Park Airport. A project application has been developed for these lots and associated road works, including a Big W distribution facility of some 89,000m^2, a Dick Smith distribution facility of some 50,000m^2 (ultimately) and two warehouse developments of some 22,400m^2. The proposed development incorporates an area of some 35.6ha of the overall 45.7ha of industrial land.

3.2 The associated roadworks within the site include the development of an internal north-south access road linking Cowpasture Road in the south to the future residential development in the north. A secondary east-west connection will ultimately be provided at the northern end of the industrial development linking to Cowpasture Road across Hinchinbrook Creek.

3.3 Access to the site will ultimately be provided onto Cowpasture Road at two locations. One will be located at the northern end of the M7 interchange, and will replace the existing airport entrance. As previously discussed in Chapter 2, this access is being constructed in association with the upgrading of Cowpasture Road between North Liverpool Road and the Westlink M7. The second access would be located approximately 500 metres south of Green Valley Road across Hinchinbrook Creek. Both access points will incorporate signalised intersections with Cowpasture Road.

3.4 A project application has been prepared for the infrastructure and civil works and the first stage of development including the Big W and Dick Smith distribution facilities and the two warehouse developments. The associated roadworks for the first stage of development include the construction of the southern signalised

access onto Cowpasture Road, at the northern end of the M7 interchange, and the development of that portion of the internal road network linking to the southern access and servicing the two distribution facilities. Access arrangements for the Big W and Dick Smith distribution facilities will be provided onto the internal road network.

3.5 This chapter examines the transport implications of the proposed development through the following sections:-

- public transport;
- parking provision;
- internal road network;
- b-double routes;
- access, internal circulation and car parking arrangements;
- pedestrian and cycle network;
- work place travel plan;
- traffic generation and assessment;
- construction traffic management;
- Director-General's Requirements; and
- summary.

Public Transport

3.6 As previously discussed in Chapter 2, the site has limited access to existing public transport services. In order to encourage the use of public transport, new bus routes and/or modifications to existing routes should be introduced to service the site. It is recommended that discussions be held with Metrolink and Busabout to advance new bus routes and modifications to existing routes.

3.7 The proposed development, with its increase in employment density, will strengthen the demand for new and modified bus routes in the vicinity of the site. The location of the development close to existing and expanding residential areas within Sydney's south-west will reduce the need to travel by private car.

3.8 In association with the proposed development and in accordance with DCP 2008, provision will be made for buses on the internal access roads through the site. The preferred option for servicing the site with public transport would be to extend Metrolink service route 845. This would result in relative minimal disturbance to the existing route and its patrons, while also servicing the industrial section of the development and a large proportion of the proposed residential area located to the north. Re-routing this service would link the development with The Valley Plaza Shopping Centre, Liverpool-Parramatta T-Way and the suburbs of Green Valley, Bonnyrigg, Mt. Pritchard and Liverpool Station.

3.9 To support accessibility for cyclists, appropriate parking will be provided for bicycles. Pedestrian/cycle paths will be provided on the east-west road, linking to Cowpasture Road and to residential areas to the north of the site.

3.10 The proposed development is therefore consistent with government policy and the planning principles of:-

a) improving accessibility to employment and services by walking, cycling and public transport;

b) improving the choice of transport and reducing dependence solely on cars for travel purposes;

c) moderating growth in the demand for travel and the distances travelled, especially by car; and

d) supporting the efficient and viable operation of public transport services.

Parking Provision

3.11 Section 1.2 of the Liverpool Development Control Plan 2008 indicates that car parking for industrial developments should be provided at the following rates:-

- one space per 35m^2 of office LFA;
- one space per 75m^2 of factory/warehouse LFA or one space per two employees, whichever is the greater.

3.12 By comparison the RTA's *"Guide to Traffic Generating Developments"* suggests a rate of one space per 300m^2 GFA, equivalent to one space per 225m^2 of GLA for warehouses.

3.13 The proposed parking provisions for Big W and Dick Smith distribution centres are some 460 and 330 spaces respectively. This represents 1 space per 193m^2 and 1 space per 152m^2. These rates are in the range between Council and RTA rates and are consistent with government policy of reducing traffic generation.

3.14 In regards to the two warehouse developments of some 22,400m^2, concept plans prepared by the architect identify Lot 1 (some 8,300m^2) and Lot 2 (some 14,100m^2) providing some 85 and 116 spaces respectively. This represents a parking rate of 1 space per 98m^2 and 1 space per 122m^2. These rates are also in the range between Council and RTA rates.

3.15 The proposed parking provisions for the Big W, Dick Smith distribution facilities and the two warehouse developments are therefore considered appropriate.

Internal Road Network

3.16 Access to the site will ultimately be provided onto Cowpasture Road at two locations. One will be located at the northern end of the M7 interchange and will replace the existing airport entrance. The second will be located approximately 500 metres south of Green Valley Road across Hinchinbrook Creek. Both access points will incorporate signalised intersections with Cowpasture Road. The internal access roads connecting to these access points will include a north-south access road linking Cowpasture Road in the south to the residential development in the north. A secondary east-west connection will be provided at the northern end of the industrial development, linking to Cowpasture Road across Hinchinbrook Creek.

3.17 The road network within the southern industrial portion of the site, to be developed in association with the current project application, differs from the DCP 2008 road layout. The DCP 2008 layout incorporated a number of north-south access roads through the industrial area, providing access to smaller industrial developments. These roads converge at the southern end of the site to intersect with Cowpasture Road at a single access point to the north of the M7 interchange. At the northern end of the industrial area, these roads connect to a secondary east-west road linking to Cowpasture Road across Hinchinbrook Creek.

3.18 The road network will ultimately provide two access points onto Cowpasture Road and the secondary east-west road linking across Hinchinbrook Creek, in accordance with the DCP layout.

3.19 A road network, shown on plans prepared by ADW Johnson, incorporating a single north-south internal spine road through the industrial area and linking to the residential and commercial/retail development to the north, was developed providing an undivided industrial road with one traffic lane and one parking lane in each direction, clear of intersections. The east-west connection located at the northern end of the industrial development will also provide a two-way industrial road with one traffic lane and one parking lane in each direction. The future bridge across Hinchinbrook Creek will provide two 4 metre wide traffic lanes.

3.20 In accordance with DCP 2008, roads within the industrial development have been provided with minimum carriageways widths of 13 metres and intersections have been designed to cater for service vehicles including articulated vehicles and b-doubles. Swept paths of service vehicles on the internal road layout and accessing the distribution facilities are shown in Appendix C. The proposed access arrangements, internal intersections and new roads within the site have been provided in accordance with the Australian Standard for Commercial vehicle facilities (AS2890.2-2002) and Austroads Road Design Guide.

3.21 As will be discussed in the following sections, the main north-south spine road north of Cowpasture Road, will carry some 450 to 600 vehicles per hour two-way during the morning and afternoon peak periods. North of the secondary east-west connection, traffic flows will ultimately be some 250 to 300 vehicles per hour two-way during the morning and some 900 to 950 vehicles per hour two-way during the afternoon peak period.

3.22 Peak traffic flows on the future east-west connection to Cowpasture Road will be some 500 to 1100 vehicles per hour two-way.

3.23 The intersection of the main north-south spine road and the future east-west connection to Cowpasture Road, as shown on plans prepared by ADW Johnson, will be controlled by a two lane roundabout. Analysis of the roundabout found that it will operate at a good level of service, with average delays per vehicle, for the movement with the highest average delay, of less than 15 seconds per vehicle during peak periods.

3.24 Our assessment of the internal road network, has found it to be satisfactory and will provide a suitable road network for the proposed development.

B-Double Routes

3.25 Roads within the area approved for use by 25 and 26 metre b-doubles include the M7 Motorway, Cowpasture Road, Elizabeth Drive and Hoxton Park Road. The existing approved routes are shown on Figure 4.

3.26 In association with the development of the Hoxton Park Airport site and the provision of new industrial roads accessing the proposed industrial developments, it would be appropriate to classify all roads within the southern industrial precinct including the main north-south spine road and the east-west connection to Cowasture Road, across Hinchinbrook Creek, for b-double access. The RTA's *"Route Assessment Guidelines for Restricted Access Vehicles"* outlines the procedure for having roads classified for b-double use.

Access, Internal Circulation and Car Parking Arrangements

3.27 The proposed access arrangements for the various industrial developments within the southern industrial area will be designed to cater for the swept paths of

service vehicles including articulated vehicles and b-doubles. Swept paths for the larger b-doubles are shown in Appendix C.

3.28 The Big W distribution centre is expected to generate some 110 trucks per day and the Dick Smith facility some 120 trucks per day. The two warehouse developments would generate up to 60 trucks per day. Some 60% of these truck movements would occur between 6.00am and 2.00pm. The two distribution centres and warehouse developments will generate service vehicles ranging from small commercial vehicles to large rigid trucks and articulated vehicles, including b-doubles.

3.29 For the Big W and Dick Smith distribution centres, separate access driveways are provided for staff/visitor parking and industrial traffic. Security gates within the sites control service vehicle movements to/from the Big W and Dick Smith distribution centres. Each facility provides service vehicle entry driveways incorporating three entry lanes, including two truck queuing lanes and an express entry lane for each facility.

3.30 Exiting trucks will be accommodated within two dedicated exit lanes. The exit configuration will allow these lanes to operate independently, providing manoeuvring area for two trucks to pass. The proposed access arrangements for the distribution centres are considered appropriate and will provide efficient and practical arrangements to cater for the anticipated truck movements generated by the site.

3.31 The proposed car parking areas for the proposed facilities are laid out in a simple and clear manner with car parking dimensions of 2.4 metres wide by 5.4 metres long. Circulation aisle widths are provided at 5.8 to 6.1 metres wide for two-way circulation. These arrangements are considered appropriate and have been

provided in accordance with the Australian Standard for Off-street car parking facilities (AS2890.1-2004).

Pedestrian and Cycle Network

3.32 A network of pedestrian footpaths will be provided within the road reserves within the southern industrial area. The network will incorporate pedestrian footpaths of 1.2 metres in width. Controlled pedestrian crossings will also be incorporated at the two traffic signal controlled intersections on Cowpasture Road.

3.33 Cycleway provision will be made along the east-west link to connect into the cycleways serving the residential areas.

Work Place Travel Plan

3.34 In order to encourage travel modes other than private vehicle, it is proposed to adopt a travel demand management approach, through a work place travel plan to meet the specific needs of the site, future tenants and employees. The specific requirements and needs of the future tenants, including number of employees, hours of work, shift times, etc., will be incorporated in the work place travel plan to support the objectives of encouraging the use of public transport.

3.35 The principles of the work place travel plan, to be developed by the future tenants in consultation with Council, RTA and other stakeholders, will include the following:-

- encourage the use of public transport through new and modified bus services and the provision of conveniently located bus stops within the southern industrial area of the site, to be agreed with Council and local bus operators;

- bus services and bus stops to be provided on the main north-south spine road and the secondary east-west link to Cowpasture Road;

- work with local bus operators and public transport providers to improve services;

- encourage public transport by employees through the provision of information maps and timetables;

- provide appropriate pedestrian facilities which improve accessibility to employment and services from surrounding residential development and/or public transport nodes;

- raise awareness of health benefits of walking (including maps showing safe walking rotes);

- encourage cycling by providing safe and secure bicycle parking, including the provision of lockers and change facilities;

- provide pedestrian/cycle paths within the road reserves and through open space areas, linking to Cowpasture Road and to residential areas in the vicinity of the site; and

- provide appropriate on-site parking provision, consistent with government policy for reducing traffic generation.

3.36 The travel plan may take a variety of forms including a green transport plan or company travel plan. The work place travel plan will assist in delivering sustainable transport objectives by considering the means available for reducing dependence solely on cars for travel purposes, encouraging the use of public transport and supporting the efficient and viable operation of public transport services.

Traffic Generation and Assessment

3.37 The traffic assessment of the development of the Hoxton Park Airport site has been undertaken through previous studies (SKM September 2006 and SKM April 2007). For the industrial component of the development, the assessment has used a traffic generation rate of 15 trips per developed hectare of site area per hour during the morning and afternoon peak hour periods. This translates to a traffic generation of the proposed industrial development of some 686 vehicles per hour two-way during the morning and afternoon peak hour periods. This compares to a total traffic generation of the whole of the Hoxton Park Airport development of some 1044 vehicles per hour two-way during the morning and some 1652 vehicles per hour two-way during the afternoon peak periods.

3.38 The largest traffic effects of the proposed industrial development within the Hoxton Park Airport site will be at the intersection of Cowpasture Road/M7 intersection and the site access points onto Cowpasture Road. The SKM assessment found that these intersections (incorporating the proposed Cowpasture Road upgrading), would operate at satisfactory levels of service during peak periods in 2016.

3.39 The proposed Big W and Dick Smith distribution centres, and the two warehouse developments located adjacent to the southern boundary of the site represent

some 161,300m^2 of industrial development and cover some 35.6ha of industrial site area. Based on the traffic generation of 15 trips per developed hectare, the sites for the proposed distribution centres and two warehouse developments have been assessed by SKM with a total traffic generation of some 535 vehicles per hour two-way during peak periods.

3.40 Surveys of the Woolworths distribution centre at Minchinbury found that the facility has a traffic generation of 0.3 trips per 100m^2 GFA of the building during the morning and afternoon peak periods. The RTA Guidelines, based on extensive surveys, gives a rate of 0.5 trips per hour per 100m^2 for warehouses. Based on these rates, the estimated traffic generation for the two distribution centres and two warehouses would be some 530 vehicles per hour two-way during peak periods. The proposed development is therefore expected to generate similar traffic during the morning and afternoon peak periods than that which was previously assessed. As a result, the proposed development is in accordance with the traffic assessment for the rezoning.

3.41 Hence, the surrounding road network and signalised access points onto Cowpasture Road will operate at similar levels of service during peak periods to that previously assessed, with full development in 2016.

3.42 Based on the traffic assessment and distribution for the proposed overall development undertaken by SKM September 2006 and SKM April 2007, the estimated future traffic flows on the internal road network are shown on Table 3.1. It can be seen from this table that the north-south spine road will carry some 450 to 600 vehicles per hour two-way during peak periods through the industrial development and some 900 to 950 vehicles per hour two-way during the afternoon peak period accessing the northern commercial/retail and residential

development. Peak hour flows on the east-west connection to Cowpasture Road will be some 500 to 1100 vehicles per hour two-way.

3.43 In order to assess the operation of the internal road network, the intersection of the main north-south spine road and the east-west connection to Cowpasture Road was analysed using the SIDRA computer program. The analysis found that the roundabout controlled intersection will operate with average delays for the movement with the highest average delay, of less than 15 seconds per vehicle during the morning and afternoon peak periods. This represents a level of service A/B, which is a good level of intersection operation.

Table 3.1 Future Internal Two-Way Traffic Flows

Roads	Morning	Afternoon
North-South Spine Road		
- north of Cowpasture Road	435	590
- south of east-west road	290	560
- north of east-west road	275	970
East-West Road		
- east of north-south spine road	620	1070
west of north-south spine road	450	580

3.44 Construction of the industrial area will be staged. In accordance with the project application, the first stage development will include the construction of the Big W and the first stage (some 43,000m^2) of Dick Smith distribution facilities, construction of the southern signalised access onto Cowpasture Road at the northern end of the M7 interchange and the development of that portion of the internal road network linking to the southern access and servicing the two

distribution facilities (including the roundabout controlled intersection of the north-south spine road and the east-west connection to Cowpasture Road).

3.45 As previously noted, the two distribution facilities and two warehouse developments on the southern portion of the site, will generate some 530 vehicles per hour two-way during the morning and afternoon peak periods. This traffic generation is less than the ultimate two-way traffic flow (with full development of the site) on the north-south spine road, of some 600 to 900 vehicles per hour two-way, assessed by SKM 2006 and SKM 2007 for the ultimate 2016 traffic conditions.

3.46 The internal road network and the single signalised access onto Cowpasture Road at the southern end of the site will therefore have capacity to cater for the traffic generation of the two distribution facilities and the two warehouse developments. It should be noted that the southern signalised intersection is the subject of a detailed design with the Roads and Traffic Authority, and is being constructed in association with the upgrading works on Cowpasture Road. It is understood that the traffic signals will be introduced and operational prior to the completion of the Big W and Dick Smith distribution centres and the two warehouse developments.

Construction Traffic Management

3.47 A construction management plan for the proposed development has been prepared by Mirvac Construction Pty Ltd. The principles of traffic management during construction are as follows:-

- provide a convenient and appropriate environment for pedestrians/workers;
- minimise effects on pedestrian movement and amenity;

- manage and control construction traffic on the adjacent road network and truck movements to and from the construction activity;

- construction work will commence with the construction of the internal access roads and its connection onto Cowpasture Road;

- the introduction of traffic signals at the intersection of Cowpasture Road and the main north-south spine road, will be undertaken in association with the current upgrading works on Cowpasture Road;

- security gates and appropriate construction fencing will be located around the perimeter of the industrial area;

- construction access will be controlled onto Cowpasture Road at the southern end of the site;

- traffic capacity will be maintained at intersections and mid-block on the surrounding road network in the vicinity of the site;

- maintain safety for workers;

- restrict construction activity to designated truck routes through the area;

- work zones to be managed and controlled by qualified site personnel;

- provide appropriate parking for construction workers; and

- construction activity to be carried out in accordance with the approved hours of work.

3.48 It is understood that the construction of the distribution centres, the two warehouse developments and the internal road network within the site will be staged. As set out in the construction management plan prepared by Mirvac Construction Pty Ltd, the construction of the internal roads will typically generate some 40 to 50 truck movements per day, associated with the delivery of road base and construction material.

3.49 The construction of the distribution centres and the warehouse developments will generate a further 200 to 250 truck/light commercial vehicle movements per day, associated with the delivery of reinforcement, formwork, blockwork, concrete and other construction materials, including the removal of waste bins. This translates to an average of some 25 to 30 truck/light commercial vehicles per hour or one truck delivery every 2 minutes over the day. This is significantly less than the traffic generation of the ultimate development assessed by SKM 2006 and SKM 2007 for the ultimate 2016 traffic conditions. The surrounding road network and the southern signalised access onto Cowpasture Road will therefore be able to cater for the construction traffic generated during the construction process.

Director General's Requirements

3.50 The Director-General's Environmental Assessment Requirements include:-

"Transport

- ***robust predictions of the traffic volumes likely to be generated during construction and operation; and***
- ***an assessment of the predicted impacts of this traffic on the capacity, efficiency, and safety of the surrounding road network, with modelling of key intersections."***

3.51 With regard to traffic effects, these are discussed in the traffic generation and assessment section in Chapter 3.

3.52 With regard to construction traffic, this is discussed in the construction traffic management plan section in Chapter 3.

3.53 In addition to the Director General's Requirements, Liverpool City Council and the Roads and Traffic Authority have raised a number of matters. Liverpool City Council's matters include:-

"Traffic and Roads

A detailed traffic report, prepared by a suitably qualified consultant, assessing future traffic volumes, car parking demands and the proposed road network is adequate to cater for the overall future traffic volumes of the locality are required.

Liverpool Development Control Plan 2008 Part 2.9 – Land Subdivision in Former Hoxton Park Airport Site provides the required road network for the former West Hoxton Aerodrome site. It is noted the proposed road layout does not conform to the DCP road layout, in particular the deletion of the "runway street". Appropriate justification for the deletion of the 'runway street" is required as this was originally implemented as a marking for interpretation on the history of the site. In addition, it is recommended the western access cul-de-sac road to the warehouse and distribution centres be extended to connect to the access road so as to reduce the conflict of heavy vehicles and light traffic at the proposed east west road and any future residential development adjacent to the proposed detention basin and bridge.

It should also be noted the signalised intersection entering the site via Cowpasture Road (southern entrance) is the subject of a detailed design with the Roads and Traffic Authority (RTA) and is required to be provided prior to the development of more than 25 hectares of industrial land. As the project would see the development exceeding 37 hectares, the intersection will be required to be completed as part of the development."

3.54 With regard to the detailed traffic report the overall traffic assessment of the development of the Hoxton Park Airport site has been undertaken through previous studies (SKM September 2006 and SKM April 2007). Copies of these studies are appended. This CBHK report assesses the traffic and parking implications of the project application.

3.55 With regard to internal road network and the operation of the proposed internal roundabout, these aspects are discussed in the internal road section in Chapter 3 of this report. The JBA planning report addresses the historical aspects of the *"runway street"*

3.56 With regard to the signalisation of the main southern site access onto Cowpasture Road this is the subject of a detailed design by the Roads and Traffic Authority, and is being constructed in association with the upgrading works on Cowpasture Road. It is understood that the traffic signals will be operational prior to the opening of the Big W and Dick Smith distribution centres and two warehouse developments.

3.57 The Roads and Traffic Authority have raised the following matters:-

"1. It is noted that the transport and traffic impacts for the site were addressed in the 'Traffic Impact Assessment' prepared by Sinclair Knight

Merz and dated April 2007. These impacts should be reviewed and updated where necessary to reflect the impacts of the proposed industrial park.

2. ***The RTA has agreed in principle to the two access points on Cowpasture Road, however the intersections will need to be remodelled, with the latest modelling being compared against the modelling included in the 'Traffic Impact Assessment' prepared by Sinclair Knight Merz, dated April 2007.***

3. ***Details of the proposed accesses and the parking provisions associated with the proposed development including compliance with the requirements of the relevant Australian Standards (ie: turn paths, sight distance requirements, aisle widths, etc).***

4. ***Proposed number of car parking spaces and compliance with the appropriate parking codes.***

5. ***Details of service vehicle movements (including vehicle type and likely arrival and departure times).***

6. ***The RTA requires the EA report to assess the implications of the proposed development for non-car travel modes (including public transport use, walking and cycling); the potential for implementing a location-specific sustainable travel plan (eg 'Travelsmat' or other travel behaviour change initiative); and the provision of facilities to increase the non-car mode share for travel to and from the site. This will entail an assessment of the accessibility of the development site by public transport.***

7. ***It is noted that the Traffic Management and Accessibility Plan (TMAP) requirements for this site were addressed in the 'Traffic Impact Assessment' prepared by Sinclair Knight Merz, dated September 2006, which was undertaken as part of the rezoning of the site. The requirements contained in the previously prepared TMAP should be reviewed and updated where necessary for the proposed industrial park development.***

8. ***The RTA will require in due course the provision of a traffic management plan for all demolition/construction activities, detailing vehicle routes, number of trucks, hours of operation, access arrangements and traffic control measures."***

3.58 With regards to RTA points 1 and 2, as discussed in the traffic generation and assessment section of Chapter 3, the proposed development will generate a similar level of traffic to that assessed by SKM. The SKM modelling is therefore appropriate for the assessment of the traffic effects of the proposed development.

3.59 We have reviewed the SKM assessment. The largest traffic effects of the proposed industrial development within the site will be at the intersection of Cowpasture Road/M7 intersection and the site access points onto Cowpasture Road. Our review of the SKM assessment found that these intersections (incorporating the proposed Cowpasture Road upgrading), would operate at satisfactory levels of service during peak periods in 2016.

3.60 Hence, the surrounding road network and signalised access points onto Cowpasture Road will operate at similar satisfactory levels of service during peak periods to that previously assessed by SKM, with full development in 2016.

3.61 With regards to RTA point 3, details of the proposed access, internal circulation and car parking arrangements, including compliance with the relevant Australian Standard, have been provided in the access, internal circulation and car parking arrangements section in Chapter 3. Swept paths of service vehicles including articulated vehicles and b-doubles are shown in Appendix C.

3.62 With regards to RTA point 4, the number of car parking spaces for the distribution centres and the two warehouse developments are discussed in the parking provision section in Chapter 3.

3.63 With regards to RTA point 5, service vehicles movements have been discussed in the access, internal circulation and car parking arrangements section in Chapter 3.

3.64 With regards to RTA point 6, public transport, pedestrians and cyclists aspects are discussed in the public transport and pedestrian/cycle network sections in Chapter 3. A work place travel plan has also been discussed in Chapter 3.

3.65 With regards to RTA point 7, TMAP requirements contained in the SKM 2006 report have been reviewed and addressed in Chapter 3.

3.66 With regards to RTA point 8, the principles for the construction traffic management report have been discussed in Chapter 3.

Summary

3.67 In summary, the main points relating to the transport implications of the project application are as follows:-

i) the project application comprises two distribution centres and two warehouse developments;

ii) appropriate parking provisions have been made for the proposed development;

iii) the proposed road network will be able to cater for the traffic generation of the development;

iv) the Director General's requirements and matters raised by Liverpool Council and RTA have been addressed.

APPENDIX A

Hoxton Park Airport Redevelopment

Hoxton Park Airport Redevelopment

TRAFFIC IMPACT ASSESSMENT

- Final
- September 2006

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Hoxton Park Airport Redevelopment

TRAFFIC IMPACT ASSESSMENT

- Final
- September 2006

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1. Introduction

1.1 Background

This report has been prepared for HPAL Freehold Pty Ltd to support the application for the rezoning of the airport from its current use as an airport to a subdivision, primarily consisting of an industrial subdivision with a residential component on the northern end of the site. The site is also proposed to contain a small retail component to provide local services to the industrial and residential areas. The Cecil Hills residential area is located to the north of the site, with the M7 forming the western boundary, Hinchinbrook Creek the eastern boundary and Cowpasture Road the southern boundary. It is proposed to provide two entrances to the site from Cowpasture Road. A copy of the land use plan is shown in **Figure 1-1**.The site location is shown in **Figure 2-1**.

The report presents advice regarding the traffic impact assessments, parking, public transport and potential access arrangements for the development of the Hoxton Park Airport Site and addresses relevant sections of a Transport Management and Accessibility Plan (TMAP). In addition to the content of this report, a TMAP would address, where necessary, off and on-site road and public transport access, pedestrian and cycle access, freight re-assignment and broader regional impacts of the development, including future year scenario planning.

The advice is presented in the context of the RTA's proposal to widen Cowpasture Road, and the constraints to site access imposed by the M7 interchange and Hinchinbrook Creek. We have assessed the development scenario shown on the land use plan dated September 2006 with two points of access onto Cowpasture Road.

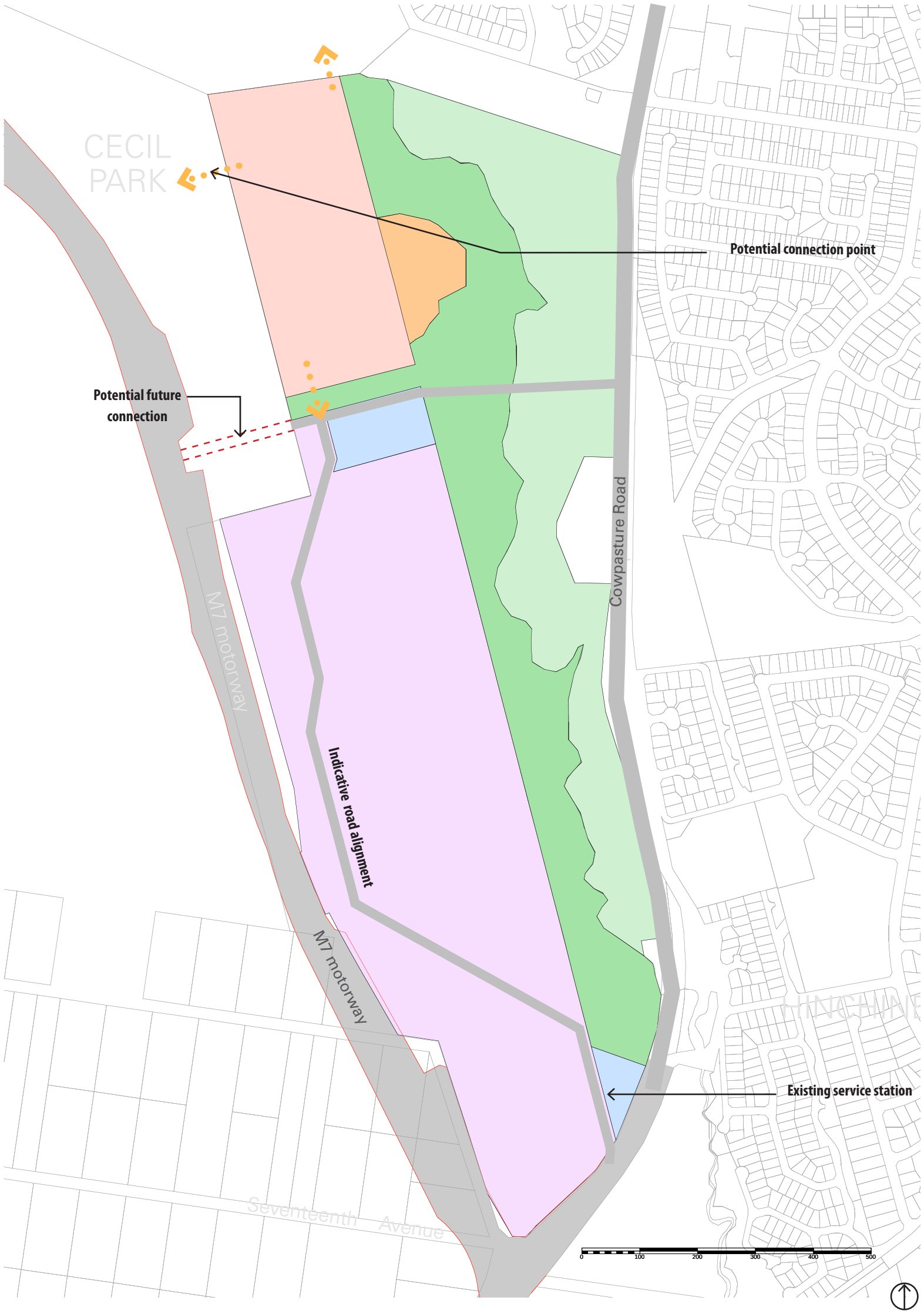
The parking provision proposed for the various land uses has been reviewed against Liverpool Council's Development control Plan (DCP) and the RTA's Guide to Traffic Generating Developments. The Department of Planning released the new Metropolitan Strategy in December 2005 and the parking provision has been considered in the light of the Strategy's intent that "infrastructure and services must be complemented by management strategies to influence travel choices."[1]

1.2 Outline of Report

This report has been prepared on behalf of HPAL Freehold Pty Ltd. It presents the findings of a review of existing traffic conditions and the implications of the proposed development with regard to traffic volumes and movements.

[1] Metropolitan Strategy-Transport Strategy for Sydney, Department of Planning

Land use	Net Developable areas	Road area
Residential	9.74 ha	4.31 ha
Industrial	37.70 ha	7.08 ha
Retail	2.13 ha	0.34 ha
TOTAL	49.57 ha	11.73 ha



Land use	Gross areas	Percentage of site area
Low density residential	12.13 hectares	14.9%
Medium density residential	2.06 hectares	2.5%
Local Centre	2.47 hectares	3.1%
General Industrial	45.74 hectares	56.0%
Local Open Space- Public	19.20 hectares	23.5%
TOTAL	81.60 hectares	100%

HOXTON PARK

LANDUSE PLAN

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The report is set out as follows:

- **Chapter 2 Existing Conditions:** describes the existing site location, traffic and road arrangements adjacent to the site and intersection operation;
- **Chapter 3 Future Conditions:** describes the proposed development and its potential trip generation, distribution, access arrangements and intersection operation;
- **Chapter 4 Parking Requirements:** assesses the proposed parking revision for the development;
- **Chapter 5 Access to Public Transport:** reviews current public transport services in the area and potential enhancements to the local bus network to serve the site; and
- **Chapter 6 Conclusion:** provides a summary of the report and presents a conclusion with regard to the proposed development.

2. Existing Conditions

Cowpasture Road is classified as a Main Road (MR648) by the RTA and operates as an arterial road running north-south in the vicinity of the airport. Signalised intersections are provided at the intersections of Cowpasture Road with Green Valley Road, the Airport Access Road (Dec 05), Westlink M7 (Dec 05), Sixteenth Avenue (Dec 05) and Hoxton Park Road (Dec 05). The Annual Average Daily Traffic (AADT) recorded in 2002 by the RTA[2] showed that Cowpasture Road carried 26,890 vehicles per day. A service station is located on the south eastern corner of the site with access provided from the north and south off Cowpasture Road. A right turn bay is provided for southbound traffic to wait and turn into the service station.

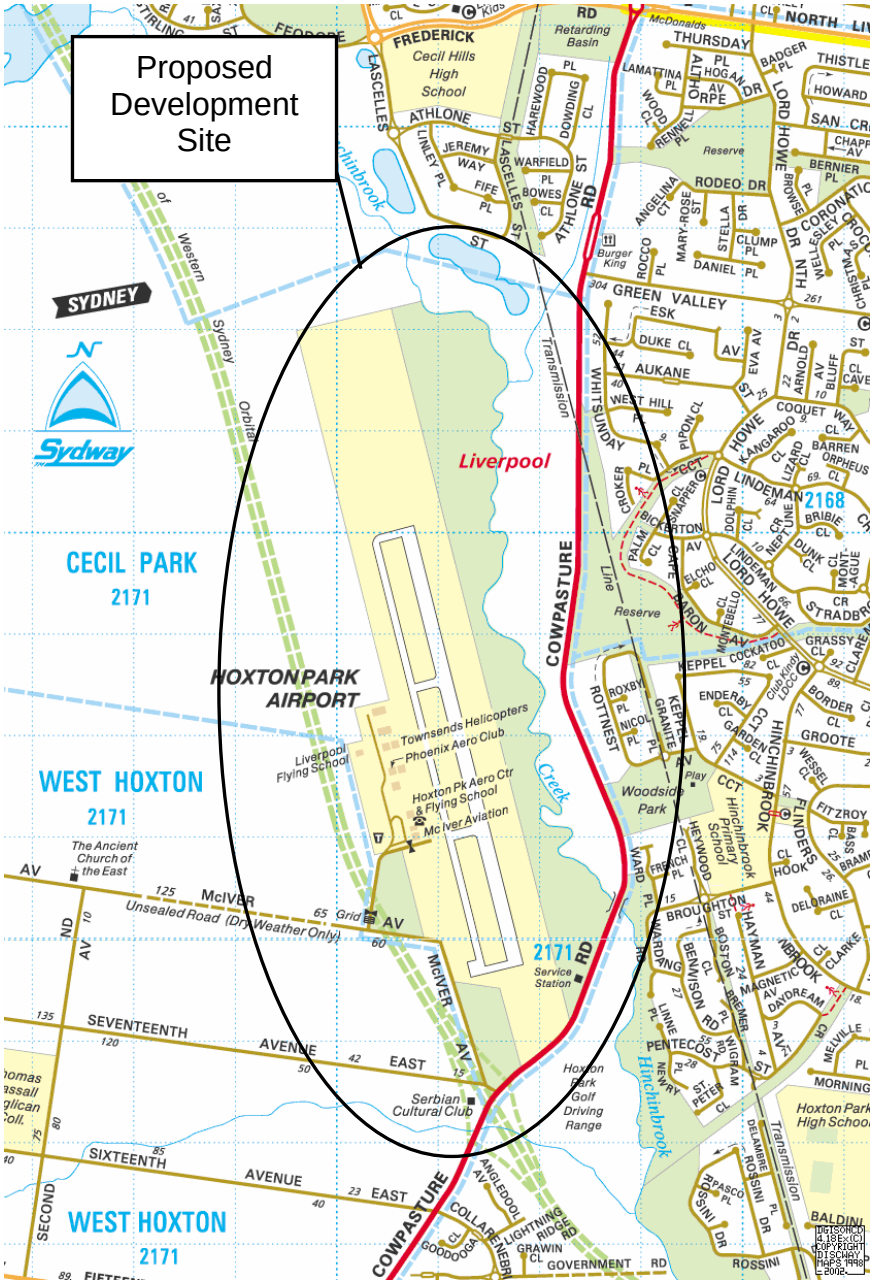
Adjacent to the site, between the M7 construction works and Green Valley Road, Cowpasture Road is a 2-lane single carriageway road with a speed limit of 70km/h. However, the RTA is proposing to upgrade this section of Cowpasture Road to a 4-lane dual carriageway with a wide median in 2007. Recent works carried out in conjunction with the construction of the Westlink M7, included widening of Cowpasture Road to a six lane divided road with signalised intersections as listed above.

SKM conducted peak hour (7-9am and 4-6pm) traffic counts on Tuesday 23rd August 2005, at the intersections of Cowpasture Road with Hoxton Park Road, Seventeenth Avenue East, Green Valley Road and North Liverpool Road. These counts showed that the peak volume on Cowpasture Road adjacent to the Hoxton Park Airport Site is around 1,300 vehicles per hour northbound in the morning peak, and just under 1,000 vehicles per hour southbound in the afternoon peak. It would be expected that these traffic volumes will change with the opening of the Westlink M7.

The site location is shown in **Figure 2-1** on the following page.

[2] RTA Traffic Volume Data 2002 – Sydney Region Volume 1

- **Figure 2-1 Site Location**



3. Future Conditions

The Hoxton Park Airport site is adjacent to the recently opened M7 Motorway, which will have a significant impact on local and regional traffic patterns. It is likely that there will be a reduction in traffic volumes on routes that run parallel to the M7, such as Cowpasture Road. A report prepared for DIPNR in 2002 by Masson Wilson Twiney provided forecasts of peak hour volumes on Cowpasture Road in 2016, with the M7 in place. These forecast volumes are less than the existing peak hour flows. For this reason, the traffic impact assessment of the proposed development has been undertaken using existing volumes, with a lower threshold for satisfactory intersection operation.

3.1 Traffic Generation from the Proposed Development

Three types of land-use have been proposed within the Hoxton Park Airport Development site. An approximate mix of land uses in each option is shown in **Table 3-1**.

- **Table 3-1 Land Use Allocation**

Land Use	Gross Area (ha)
Light Industrial	45.7
Retail	2.5
Residential – Low and Medium Density	14.2
Total	**62.4**

The traffic generation from the site has been assessed to determine the impact on Cowpasture Road. Traffic generation rates have been derived from the RTA Guide to Traffic Generating Developments. Light Industrial traffic generation is based on employee density per gross hectare, and trips per employee. This resulted in generation rates of 9 trips per gross hectare during the AM peak period and 10 trips per gross hectare during the PM peak period. However, surveys carried out by SKM for light industrial developments have indicated trip generation rates are generally higher at 15 trips per gross hectare during the AM and PM peak periods. Both these generation rates were tested, with the higher rate used for assessment.

Retail traffic generation is determined by the Gross Leasable Floor Area (GLFA). A retail floor area of 10,700 m^2 was assumed. A development rate of 16 lots per gross hectare has been assumed for the residential area, with trips determined on a per household basis.

The total traffic generation from the proposed development is shown in **Table 3-2**. Further detail of the traffic generation assumptions is provided in **Appendix A**.

- **Table 3-2 Traffic Generation Volumes**

Total Trips – AM	1,082
- in	*723*
- out	*359*
Total Trips – PM	1,692
- in	*664*
- out	*1028*

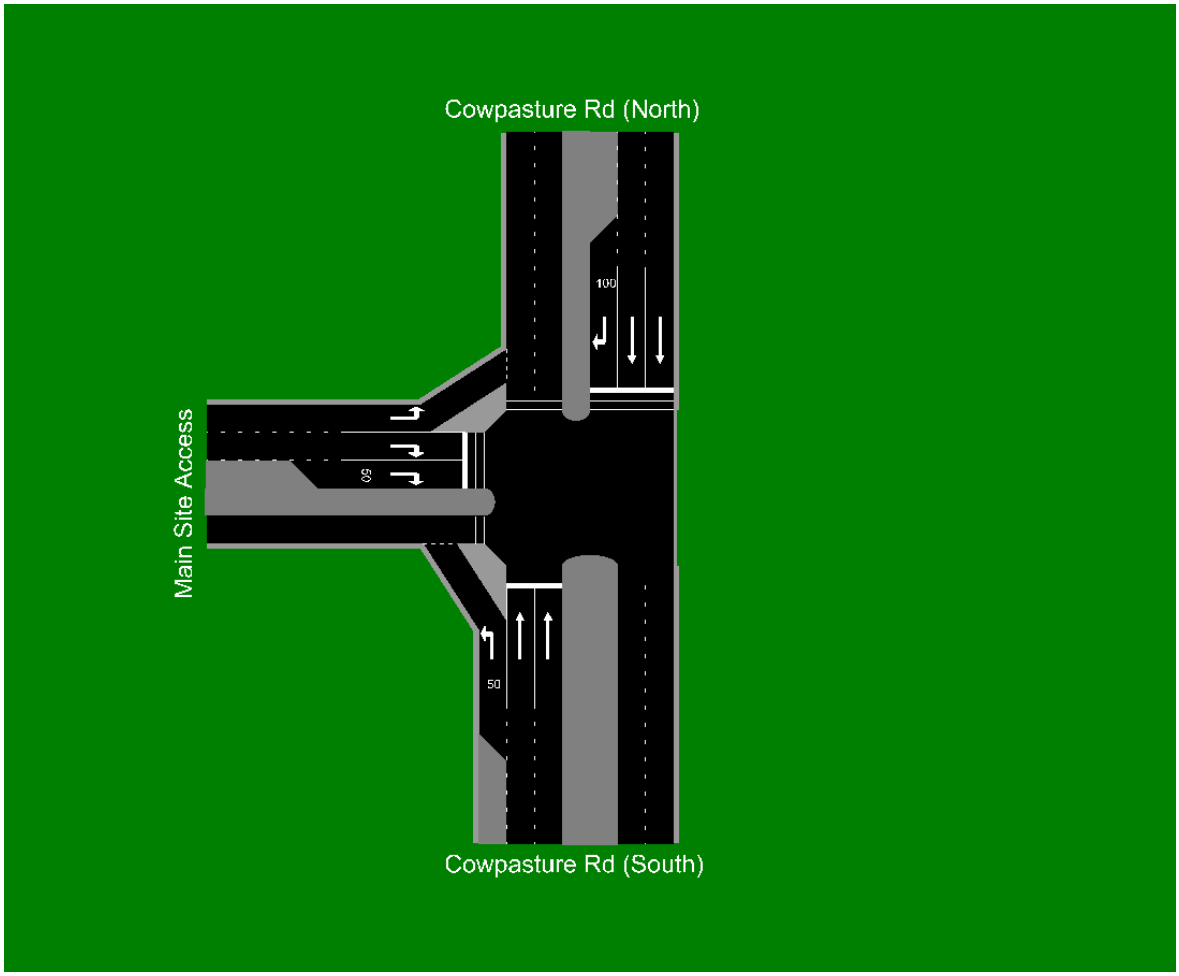
3.2 Access Arrangements

Two points of access from Cowpasture Road have been investigated for the proposed development. One would be located at the southern end of the development, adjacent to the existing service station. This is assumed to be sufficiently remote from the influence of the M7 interchange so that queuing from the two intersections will not affect each other's operation. The main site access would be located in the vicinity of the proposed bus depot site. Both are proposed as signalised intersections with all movements allowed. The layout of the main site access is shown in **Figure 3-1**. Key features are a 100m right turn bay from Cowpasture Road southbound, left turn slip lanes and a double right turn out of the site.

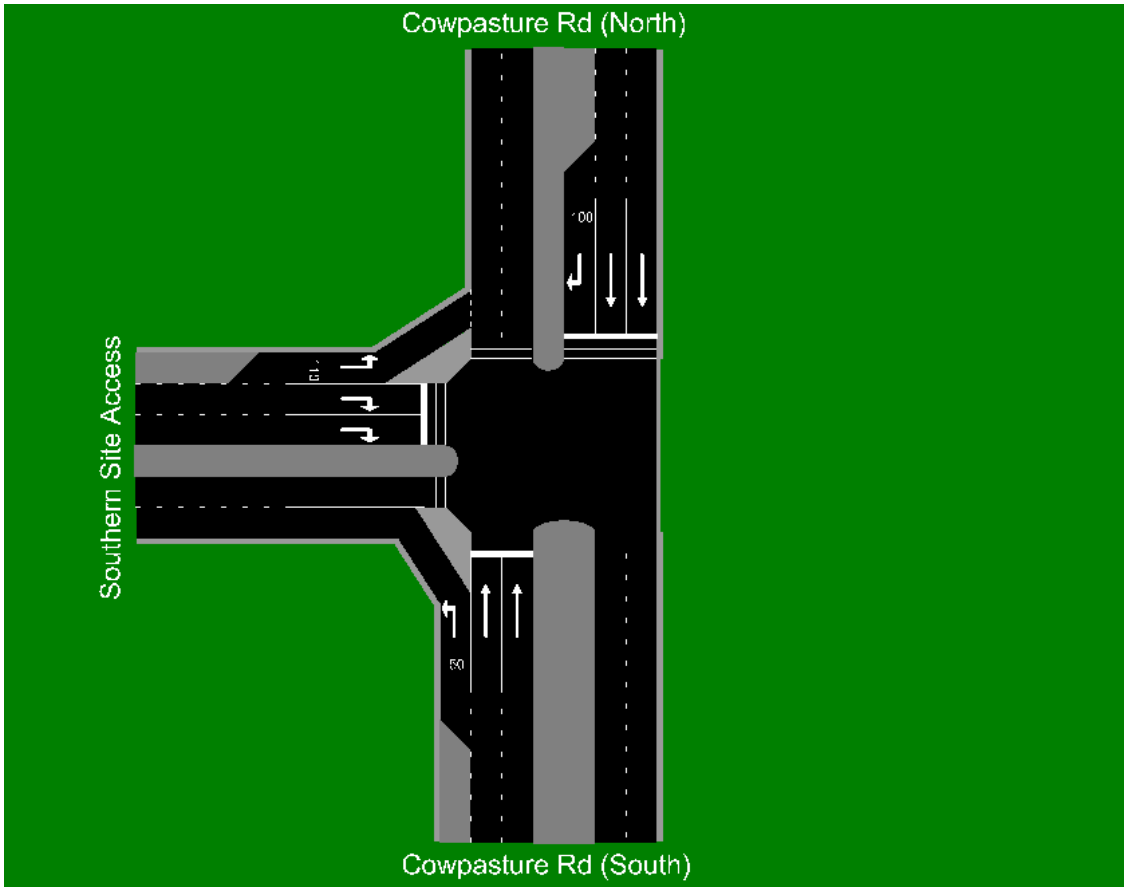
The layout of the southern site access is shown in **Figure 3-2**. It has a single 100m right turn bay for southbound traffic to turn into the site, although the RTA may insist on a double right turn bay, due to the high levels of heavy vehicle activity likely at the intersection. This could be accommodated given the proposed median width. There are left turn slip lanes both into and out of the site.

Provision of a single access point was also investigated, using the same configuration as the proposed main access point. Although a theoretically acceptable Level of Service would be achieved, extensive queuing on the southbound right turn movement would occur, which would disrupt the through movement. This situation could be alleviated through the provision of a 200m long right turn bay, or with a double right turn bay. However, two access points are preferable, due to improved operation of site activities and also due to safe access / egress should an incident occur on site.

- **Figure 3-1 Main Site Access Intersection Layout**



- **Figure 3-2 Southern Site Access Intersection Layout**



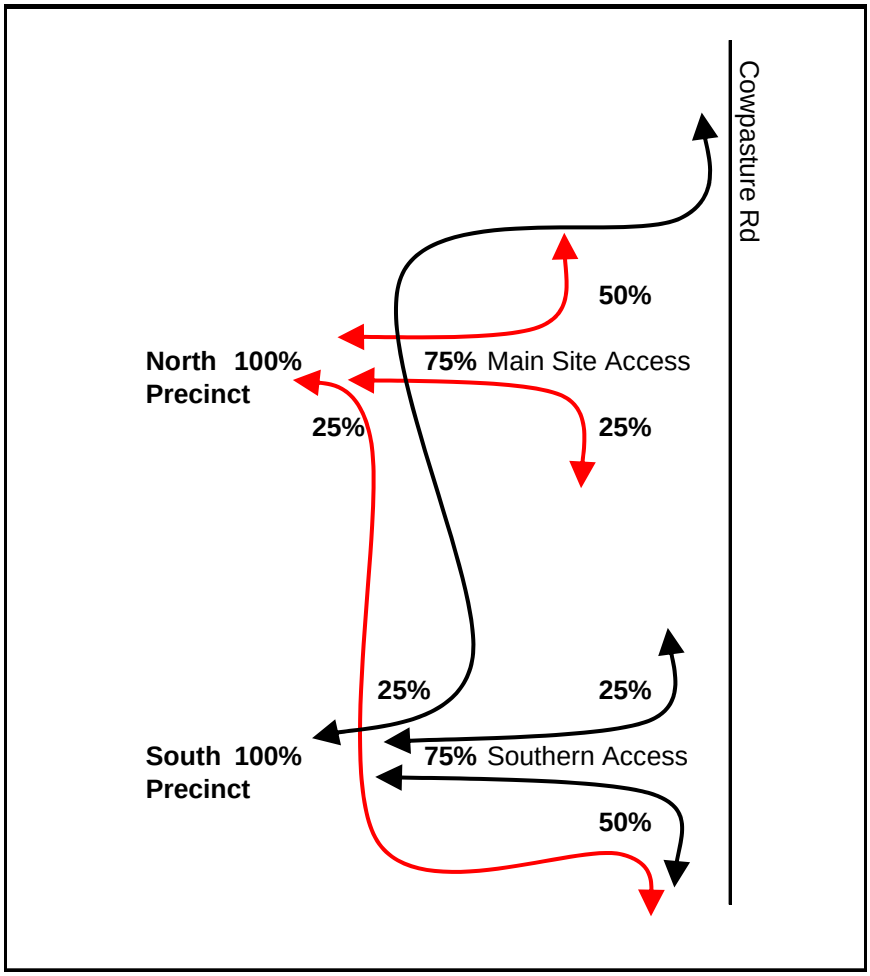
3.3 Intersection Operation

The operation of each of the site access intersections has been analysed for the AM and PM peak periods, with site traffic generation overlaid on existing traffic levels. As indicated in **Section 3**, this represents a conservative case, as the M7 is likely to result in a reduction in Cowpasture Road traffic volumes. It has been estimated that with the opening of the M7 traffic volumes will decrease and only approach existing levels in 2016.

In order to assess the distribution of traffic into and out of the site, the traffic from each of the landuse zones within the site was allocated to each entry based on its relative location within the development. A 50% / 50% split of north and south external origins and destinations were assumed. It was further assumed that half of the traffic travelling north from the southern precinct, and vice versa from the northern precinct, would travel via the internal road network as opposed to Cowpasture Road. This represents 25% of the traffic from each of the north and south precinct travelling through the development to access Cowpasture Road. This is represented in **Figure 3-3**.

In this regard it is considered that the current traffic volumes with the two site access intersections adequately represents conditions into the future.

- **Figure 3-3 Assignment of Site Traffic to Access Points**



Results of the intersection analysis are shown in **Table 3-3**. Level of Service is defined by the NSW RTA based on the average delay per vehicle, as shown in **Table 3-4**. The results of this intersection analysis show that the worst level of service is experienced at the main site access in the morning peak, with a Level of Service B. The operation of these intersections is therefore considered to be acceptable.

Table 3-3 Intersection Analysis Results

	Main Site Access		Southern Site Access	
	Average Delay (seconds / vehicle)	Level of Service	Average Delay (seconds / vehicle)	Level of Service
AM Peak	17	B	12	B
PM Peak	18	B	15	B

Table 3-4 Level of Service Criteria

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays	At capacity, requires other control mode
F		Roundabouts require other control mode	

Source: Guide to Traffic Generating Developments, RTA 2002.

4. Parking Requirements

The development of the airport site for the landuses outlined in **Section 3.1** requires the provision and assessment of the required parking to accommodate employees and visitors to the industrial area. The parking requirement for a development can be determined by reference to Liverpool Council's Development Control Plan (DCP) No. 3 or, in the absence of a DCP, the RTA's Guide to Traffic Generating Development. There are various terms used in the assessment of carparking requirements for developments. Some generally available explanations of the terms are provided in a Glossary of Terms at **Appendix B**.

The proposed parking provision has been compared with both RTA[3] and Liverpool Council[4] requirements. The RTA and Liverpool Council parking rates were defined in terms of Gross Floor Area (GFA). The proposed parking provision for the development has been calculated for the Gross Leasable Area (GLA) for the warehouse uses and Net Leasable Area (NLA) for the Office components. Gross Leasable Area is considered to represent the same as Gross Leasable Floor Area (GLFA) for the purpose of this assessment.

The Gross Floor Area (GFA) was converted to GLFA based on RTA Guide to Traffic Generating Development's advice that the GLFA is 75% of the GFA. The NLA is considered to represent approximately 92% of the GLFA. The requirements of the RTA and Liverpool Council and the proposed parking provision are shown in **Table 4-1** below.

Table 4-1 Parking Provision

	Proposed Parking Provision	**RTA Guide to Traffic Generating Developments**	**Liverpool Council DCP 03**
Office	1 space per 25 sq.m of office NLA	1 space per 30 sq.m of GLFA	1 space per 35 sq.m of GFA
Warehouse	1 space per 100 sqm of Warehouse (up to 3,000sqm GLA)	1 space per 225 sq.m of GLFA	1 space per 75 sq.m of GFA
Warehouse	1 space per 250 sqm of Warehouse (over 3,000sqm GLA)	1 space per 225 sq.m of GLFA	1 space per 75 sq.m of GFA

[3] RTA Guide to Traffic Generating Developments, 2002

[4] Liverpool City Council, Development Control Plan No.3, 1997

For the Office component, converting the council provision of 1 space per 35 sq.m of GFA to NLA is represented by the equation GFA x 0.75 (=GLFA) x 0.92 = NLA. This provides a requirement of 1 space per 24 sq.m. Converting the RTA requirement from GLFA to NLA provides 1 space per 27 sq.m. The proposed parking provision is considered to generally comply with the RTA and Council requirements.

For the Warehouse component the conversion is represented by the equation GFA x 0.75 = GLA. This provides a requirement of 1 space per 56 sq.m of GLA. While the proposed provision of 1 space per 100 sq.m (< 3,000 sq.m) and 1 space per 250 sq.m (> 3,000 sq.m) for the development does not comply with the figures provided in the Council's DCP and the RTA Guide it is anticipated that this development will encourage a mode shift away from car drivers through a variety of means. This would be further examined and quantified with the development of a Transport Management and Accessibility Plan (TMAP) for the development. This falls in line with the intent of the Department of Planning's Metropolitan Strategy published in December 2005.

5. Access to Public Transport

5.1 Existing public transport services

5.1.1 Bus Services

The development site lies on the border of the areas served by Metrolink and Busabout. All bus routes passing near to the development site are displayed in **Figure 5.1.** There are currently no bus services operating along Cowpasture Road between North Liverpool Road and Hoxton Park Road. Nearby bus routes mainly access local residential developments to the north and east of the development site, with a substantial proportion of routes concentrated around the Valley Plaza Shopping Centre in the suburb of Green Valley, approximately one kilometre from the eastern border of the development.

The three privately owned bus companies that service the surrounding area are:

- Metrolink - servicing the Northern and Western areas of the Liverpool LGA;
- Busabout - servicing the Southern and Western areas of the Liverpool LGA; and
- Westbus - servicing the Fairfield LGA.

All services terminate/originate at Liverpool station, except for the Westbus service, which terminates/originates at Cabramatta station.

The minimum distances to the closest bus routes, measured from the eastern entry of the site on Cowpasture Road, are shown in **Table 5-1**. A bus stop servicing the site, should be located within 400m (or 5-min walk) of a bus stop or 800m (10-min walk of a rail station). **Table 5-1** shows that currently no service operates within this distance of the development site.

- **Table 5-1 Distance of Bus Routes from the site, at their closest point.**

Bus Route	Operator	Closest location	Approx. Distance from development site
835/836	Busabout	Cowpasture Rd/Hoxton Park Dr	1.0km
841	Metrolink	Lascelles St	1.3km
845	Metrolink	Lord Howe Dr (near Cape Baron Ave)	0.6km
842/844	Metrolink	The Valley Plaza	1.3km

The closest existing bus route for the northern residential section of the development is the route 841 (operated by Metrolink). The route originates at Cecil Hills Shopping Centre at the northern end of Feodore Dr, loops through the suburb of Cecil Hills, and then proceeds through Green Valley, Bonnyrigg and Mt Pritchard to Liverpool station. As a link road between Cecil Hills and the development is not planned, the walking distance to and from this route would be greater than

one kilometre. On weekdays, buses leave Liverpool twice an hour between 4:56 am and 11:47 pm. Buses leave Cecil Hills twice an hour between 5:27 am and 12:10 am. On weekends, buses leave Cecil Hills once an hour between 6:05 am and 11:47 pm (Saturdays) and between 7:07 am and 10:17 pm (Sundays). Buses leave Liverpool once an hour between 6:35 am and 21:47 pm (Saturdays) and 6:35 am and 9:37 pm (Sundays).

The closest existing bus route for the southern industrial section of the development is the route 845 (operated by Metrolink), operating between Liverpool and The Valley Plaza (Green Valley). This service originates at The Valley Plaza Shopping Centre in Wilson Rd in Green Valley, loops through Green Valley via Lord Howe Dr and Green Valley Rd. It then proceeds through Bonnyrigg and Mt Pritchard to Liverpool station. There is a walkway through the reserve, which makes this bus stop accessible. . However, as the minimum distance to this service is 600 metres, this service is currently of minimal benefit to the development. While the 842 service (operated by Metrolink) operates within a similar distance from the development site, there are no connecting roads or footpaths for potential patrons to use.

On weekdays, bus 845 departs Liverpool twice an hour between 5:12 am and 7:24 pm. Buses depart Cecil Hills twice an hour between 6:07 am and 11:17 pm. On weekends, buses depart Liverpool once an hour between 7:19 am and 12:07 am (Saturdays) and between 7:05 am and 10:07 pm (Sundays). Buses depart Cecil Hills once an hour between 6:37 am and 9:41 pm (Saturdays) and 4:50 am and 9:15 pm (Sundays).

The frequency of buses on these two routes is shown in **Table 2**. The AM peak is represented by the 7:30 to 9:30am period, with the 4:30 to 6:30 period reflective of the PM peak. There are two buses per hour operating in each direction all day.

- **Table 2 Frequency of Bus Routes.**

Route	Bus Company	Time of Day	Buses per hour in each direction		
			Mon-Fri	Sat	Sun
841 Liverpool-Cecil Hills	Metrolink	Am Peak:	2	1	1
		Inter Peak:	2	1	1
		Pm Peak:	2	1	1
845 Liverpool - Valley Plaza via Bonnyrigg	Metrolink	Am Peak:	2	1	1
		Inter Peak:	2	1	1
		Pm Peak:	2	1	1

5.1.2 T-way Services

The T-Way express bus route from Liverpool to Parramatta runs along Hoxton Park Road, turns right at Banks Rd in Miller, then proceeds north towards Parramatta. Buses depart Liverpool and Parramatta every 10-15 minutes during peak periods and every 10-20 minutes during inter peak

periods. The closest stops and their distances from the closest entry to the development site are shown in **Table 3**. Accessing the T-Way from the development site would require use of supplementary bus services or private transport (car, walk, or cycle).

- **Table 3 Distance from closest T-Way stops to development site.**

T-Way stop	Location	Distance from closest entry to site
Ash	Hoxton Park rd, Cartwright	2.2 km
Miller	Banks Rd, Miller (near TAFE)	1.9 km
Hinchinbrook	Banks Rd (near reserve)	1.8 km
Cartwright	Cnr Banks Rd & Cartwright Ave	1.9 km
Busby	Rundle Rd (near Primary School)	2.0 km

5.1.3 Rail Services

The closest railway station to the development is Liverpool, located seven kilometres to the east. Liverpool station is served by trains on the City via Regents Park, Bankstown and Granville lines, as well as Cumberland line trains to Parramatta and Blacktown and trains to the southern suburbs towards Campbelltown. It is also two stations north of the Glenfield interchange, which provides access to both the East Hills and Airport lines. Due to the distance between the development and Liverpool station, users who wish to access rail services will have to use buses or private transport to reach the station.

Based on the low proximity of all forms of public transport to the site, it is concluded that the development site is currently not well served by public transport.

5.2 Future Development - Approved Bus Depot

A new Metrolink bus depot has been approved on Cowpasture Road, between the southern and eastern entries to the site. However, consultation with the bus company has revealed that no new routes are proposed along Cowpasture Road[5]. There will be out-of-service buses travelling between the depot and Green Valley Road, but they will not be picking up or setting down passengers.

5.3 Options for serving the site with public transport

Public transport access to the site could be provided by re-routeing or extending an existing bus service through the proposed development site, or by introducing a new bus route.

[5] Telephone advice received by SKM on 20th April 2006.

As the development site lies on the border of the service areas of both the Busabout and Metrolink operators, there is the potential for one or both of these to service the site. However, Metrolink services pass closer to the site, meaning that re-routing their services are likely to have a lesser impact on established routes.

Options have been considered for altering the two closest routes to the development, 841 and 845, with the aim of serving the development through an integrated enhancement to the local bus network.

The current proposed development plan does not contain a link road with the southern end of Cecil Hills (Lascelles Street)[6]. As this link is not available, route 841 cannot easily be extended to serve the development.

However, route 845 could be redirected to serve the development site, as an extension of its current route, with minimal disturbance to its present patronage. As is visible in **Figure 5.1**, the route currently travels along Green Valley Road, turns left onto Lord Howe Drive and left onto Wilson Road where it terminates at the Valley Plaza. The route could be redirected to:

- Turn left at Wilson Road, stop at the Valley Plaza then continue south to turn right onto Lord Howe Drive;
- Turn left onto Green Valley Road, left onto Cowpasture Road and turn into the eastern entry to the development site;
- Once in the development the buses would make a stop near the entrance to the residential section;[6]
- Turn left onto the main road through the development site, with bus stops located every 6-800 metres; and
- Terminate in the southernmost loop of the development. The location of bus stops within the development site would be dependant on the final road layout.

5.4 Preferred option for servicing the site with public transport

The preferred option for servicing the Hoxton Park Airport Development Site with public transport would be to extend route 845. This would result in minimal disturbance to the existing route and its patrons, while also servicing the industrial section of the development and the majority of the proposed residential area. Re-routing this service would link the development with The Valley Plaza Shopping Centre and the suburbs of Green Valley, Bonnyrigg, Mt Pritchard and Liverpool

[6] Based on Subdivision Plan Revised Sept 2006.

station and shopping centres. This route would also provide a link for the development to T-Way and rail services at Busby and Liverpool respectively.

Such an alteration would be subject to negotiations with the operator, development of a business case for the change, a route test, and suitable highway and bus stop infrastructure provision.

The construction of the proposed bus depot on Cowpasture Road may, in the future, result in new routes in the vicinity of the development.

6. Conclusion

This report has investigated the traffic impacts of the proposed development of the Hoxton Park Airport site on the surrounding road network, which will form part of a Transport Management and Accessibility Plan for the site. It has reviewed the different components for the proposed development, including traffic generation, operation of the proposed intersections and the level of service at these intersections. The proposed parking provision has been considered against the guidelines provided by the RTA and Liverpool Council.

Our analysis has shown that the traffic access requirements of the proposed development options can be satisfied with two signalised intersections on Cowpasture Road. These intersections would operate with acceptable Levels of Service both now and in the future.

Serving the development site with public transport could be achieved by a slight re-routeing and extension of route 845. Such an alteration would be subject to negotiations with the operator, development of a business case for the change, a route test, and suitable highway and bus stop infrastructure provision.

Appendix A Traffic Generation Assumptions

	Option 1	Option 2
Industrial Area (ha)	45.74	45.74
Employees per hectare	*28*	
Trips per Employee - AM	*0.318*	
Trips per Hectare - AM	*8.904*	*15*
Trips per Employee - PM	*0.365*	
Trips per Hectare - PM	*10.22*	*15*
Trips - AM	*407*	*686*
% in - AM	*85%*	*85%*
Trips in - AM	346	583
Trips out - AM	61	103
Trips - PM	*467*	*686*
% in - PM	*15%*	*15%*
Trips in - PM	70	103
Trips out - PM	397	583
Retail Area (ha)	2.47	2.47
GLFA / Site Area	*38%*	*38%*
GLFA (m2)	*9263*	*9263*
Trips per 100m2 GLFA - AM	*3.075*	*3.075*
Trips per 100m2 GLFA - PM	*12.3*	*12.3*
Trips - AM	*285*	*285*
% in - AM	*50%*	*50%*
Trips in - AM	142	142
Trips out - AM	142	142
Trips - PM	*1,139*	*1,139*
% in - PM	*50%*	*50%*
Trips in - PM	570	570
Trips out - PM	570	570

	Option 1	Option 2
Residential Area (ha) - Low & Medium Density	12.13	12.13
Lots / ha	*13.9*	*13.9*
Lots	*168.607*	*168.607*
Trips per dwelling - AM	*0.85*	*0.85*
Trips per dwelling - PM	*0.85*	*0.85*
Trips - AM	156	156
% in - AM	*20%*	*20%*
Trips in - AM	31	31
Trips out - AM	125	125
Trips - PM	156	156
% in - PM	*80%*	*80%*
Trips in - PM	125	125
Trips out - PM	31	31
Residential Area (ha) - Medium Density	2.06	2.06
Lots / ha	*10.4*	*10.4*
Lots	*21.424*	*21.424*
Trips per dwelling - AM	*0.6*	*0.6*
Trips per dwelling - PM	*0.6*	*0.6*
Trips - AM	12.8544	12.8544
% in - AM	*20%*	*20%*
Trips in - AM	3	3
Trips out - AM	10	10
Trips - PM	12.8544	12.8544
% in - PM	*80%*	*80%*
Trips in - PM	10	10
Trips out - PM	3	3

Appendix B Glossary of Terms

Annual Average Daily Traffic (AADT) is the total volume of traffic recorded at a specific location in a whole calendar year, divided by the number of days in that year.

Gross Floor Area (GFA) the sum of the areas of each floor of a building where the area of each floor is taken to be the area within the outer face of the external enclosing walls as measured at a height of 1,400 mm above each floor level excluding –

- Columns, fin walls, sun control devices and any elements, projections or works outside the general lines of the outer face of the external wall;
- Lift towers, cooling towers, machinery and plant rooms and ancillary storage space and vertical air conditioning ducts;
- Car parking needed to meet any requirements of the council and any internal access thereto;
- Space for the loading and unloading of goods; and,
- Internal public arcades and thoroughfares, terraces and balconies with outer walls less than 1,00 mm high and the like.

Gross Leasable Floor Area (GLFA) is the net GFA excluding common or shared areas such as toilets and corridors. It is the area on which rental or lease arrangements are calculated. GLFA is used to define the share of parking generation attributable to different components of a composite development such as a shopping mall

Net Leasable Area (NLA) means the sum the sum of the areas of each floor of a building where the area of each floor is taken to the area within the internal faces of the walls, excluding stairs, amenities, lifts, corridors, public areas, toilets, standard service areas and separate stock storage areas.

APPENDIX B

Hoxton Park Airport Regional Modelling

Hoxton Park Airport Regional Modelling

TRAFFIC STUDY

- Final
- April 2007

Hoxton Park Airport Regional Modelling

TRAFFIC STUDY

- Final
- April 2007

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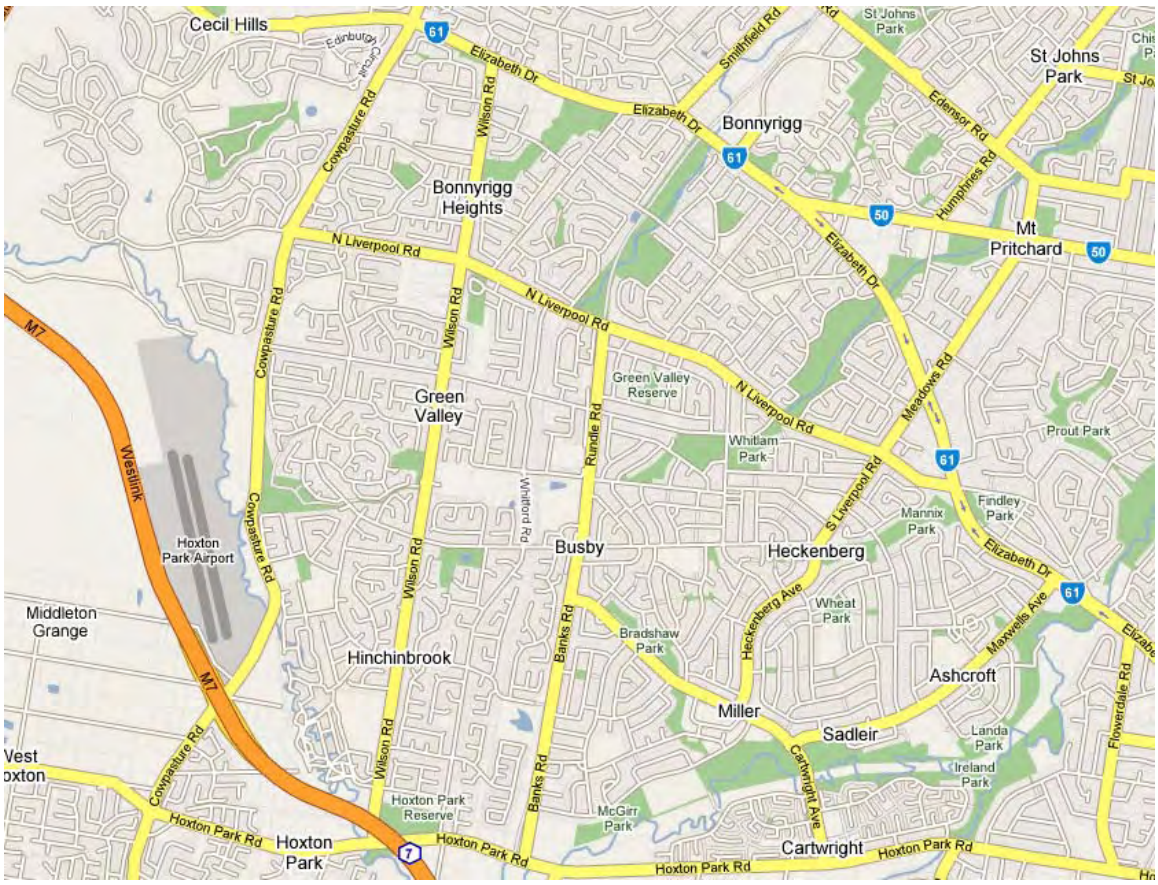
1. Introduction

This report was prepared by Sinclair Knight Merz for HPAL Freehold Pty Ltd, who is responsible for the redevelopment of the Hoxton Park Airport site after aviation uses are discontinued in 2008. HPAL is proposing a development containing general industrial, residential and retail land uses. The location of the proposed development is shown in **Figure 1-1**.

The objective of this report is to identify the impact of the proposed development on the regional road network. The key measure of this impact will be intersection operation during the weekday peaks.

Other developments in the area, including the Middleton Grange and Cecil Hills South residential developments, were incorporated into the assessment, as well as background traffic growth, which was estimated with reference to a strategic network model of the region.

- **Figure 1-1 Study Area Location**



Source: www.maps.google.com.au

2. Existing Conditions

The site of the proposed development is the Hoxton Park Airport. The airport is located on Cowpasture Road, north of the M7 motorway. The Airport will cease operating in 2008, after which redevelopment will commence.

2.1 Local Road Network

Main roads in the vicinity of the Hoxton Park Airport site include Cowpasture Road, the M7 Motorway, Hoxton Park Road and Elizabeth Drive. Local collector roads, such as Green Valley Road and North Liverpool Road, connect Cowpasture Road with the residential areas of Green Valley and Bonnyrigg. Each of these roads is described below.

Cowpasture Road

Cowpasture Road is classified as a Main Road (MR648) by the RTA and operates as an arterial road running north-south between the Horsley Drive and Camden Valley Way. Between the M7 interchange and North Liverpool Road, it comprises one northbound and one southbound lane on an undivided carriageway. South of the M7 interchange and north of North Liverpool Road, Cowpasture Road has been upgraded to comprise two lanes in each direction with a median island. The posted speed limit on Cowpasture Road is 70 km/hr. **Table 2-1** illustrates the results of traffic counts undertaken for this project in February 2007.

Table 2-1 Peak Hour Traffic Volumes on Cowpasture Road north of the M7 Interchange (February 2007)

Peak Hour	Northbound	Southbound	Combined
AM	1,583 (4% HV)	875 (6% HV)	**2,458 (4% HV)**
PM	892 (5% HV)	1,336 (4% HV)	**2,228 (5% HV)**

Based on Austroads capacity guidelines for single-lane roads, these peak hour volumes provide a Level of Service E on the single-lane sections of Cowpasture Road. This is close to the physical capacity of the road. The RTA has plans to upgrade Cowpasture Road to provide two lanes per direction (see **Section 3.3**).

M7 Motorway

The M7 Motorway was opened in late 2005 connecting the M5 Motorway at Casula with the M2 Motorway at Baulkham Hills, and intersecting with the M4 Motorway at Eastern Creek. It's 40km length has two lanes of traffic in each direction, and a 100 km/hour speed limit (although this can be varied to suit conditions if required). A toll is charged based on the distance travelled, with the maximum charge per trip currently set at $6.22. The M7 has an interchange at Cowpasture Road immediately adjacent to the airport site.

Hoxton Park Road

Hoxton Park Road connects Cowpasture Road, south of the M7 interchange, with Liverpool. At its western (Cowpasture Road) end, it has one lane in each direction, but closer to Liverpool, and in conjunction with the Liverpool – Parramatta Bus Transitway, it has been widened to provide two lanes per direction, separated by the Transitway. The RTA has plans to provide two lanes per direction between Cowpasture Road and the Transitway (see **Section 3.3**).

Elizabeth Drive

Elizabeth Drive links The Northern Road at Badgery's Creek with Liverpool, and intersects with Cowpasture Road north of the Hoxton Park airport site. East of Cowpasture Road, it is predominantly a 4-lane road, with a 70km/hour speed limit.

North Liverpool Road and Green Valley Road

North Liverpool Road and Green Valley Road run parallel to each other from Cowpasture Road towards Liverpool, through the residential areas of Green Valley and Bonnyrigg. Both roads are 2-lane collector roads, with residential driveways having direct access to the roadway. Intersections along both these roads are generally controlled by roundabouts or give-way signs, although traffic signals are used where these roads intersect with the Liverpool – Parramatta Bus Transitway to provide priority to bus movements.

2.2 Intersection Operation

Intersections are generally considered the major capacity constraint in urban areas. Intersection operation is assessed by reference to the Level of Service, which is dependant on the average delays experienced by vehicles at the intersection. Level of Service is defined by the NSW RTA based on the average delay per vehicle, as shown in **Table 2-2**. For signalised intersections, average delay is calculated over all movements at the intersection. For unsignalised intersections, the average delay is based on the worst-performing movement. It is generally accepted by the RTA that in the long term, when future conditions have been taken into account, an intersection should operate at Level of Service D or better. Where future traffic volumes have not been included, the intersection should operate at Level of Service C or better.

SKM

- **Table 2-2 Level of Service Criteria**

Level of Service	Average Delay (seconds/vehicle)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays	At capacity, requires other control mode
F	More than 70	Roundabouts require other control mode	

Source: Guide to Traffic Generating Developments, RTA 2002.

Note: At delays greater than 70 seconds, reporting of specific values is no longer appropriate due to instability in the modelling paradigm when modelling congested conditions.

Surveys of peak-hour traffic volumes were completed on 7 February 2007 at the following intersections, and allow assessment of the current Level of Service to be undertaken:

- Cowpasture Road / Elizabeth Drive;
- Cowpasture Road / North Liverpool Road;
- Cowpasture Road / Green Valley Road;
- Cowpasture Road / M7 Interchange; and
- Cowpasture Road / Hoxton Park Road.

Table 2-3 shows the existing Levels of Service at these intersections as modelled using the SIDRA intersection analysis software.

- **Table 2-3 Intersection Analysis Results- Existing Conditions**

Intersection	Control	AM Peak Hour		PM Peak Hour	
		Average Delay (sec)	LoS	Average Delay (sec)	LoS
Cowpasture / Elizabeth	Signals	**60**	**E**	**54**	**D**
Cowpasture / North Liverpool	Signals	**60**	**E**	**51**	**D**
Cowpasture / Green Valley	Stop Sign	**64**	**E**	**>70**	**F**
Cowpasture / M7	Signals	10	A	12	A
Cowpasture / Hoxton Park	Signals	**44**	**D**	**47**	**D**

These results show that at present, the signalised intersections of Cowpasture Road with Elizabeth Drive, North Liverpool Road and Hoxton Park Road are operating above their nominal (short-term) capacities in the morning and afternoon peak hours. The Cowpasture Road intersection with Green Valley Road, currently controlled by a stop sign on the Green Valley Road approach, also experiences significant delays for turning movements.

3. Future Developments

The proposed development on the Hoxton Park Airport site is for industrial and residential lands, with small pockets of retail. Other developments in the vicinity include Middleton Grange, a residential area west of the M7, and Cecil Hills South, a residential area located between Hoxton Park Airport and Cecil Hills.

3.1 Access to the Road Network

The Hoxton Park Airport redevelopment would have two signalised access points onto Cowpasture Road. One would be located to the north of the M7 interchange, in the vicinity of the existing service station. It would replace the existing airport entrance, as its proximity to the M7 restricts turn bay capacities for both the M7 and proposed new intersection. It is likely that a 5.4 hectare site on the eastern side of Cowpasture Road, currently occupied by a golf driving range, would be redeveloped in the future, with 2.4 hectares of land developed for general industrial uses. Current expectations are that this site would not be a high generator of traffic activity. The RTA has expressed a preference that access to this land should be at the same location as the southern Hoxton Park access point, with a signalised 4-way intersection being constructed. Details of this intersection are still to be negotiated with the developer of the driving range site, the RTA and HPAL.

The main access to the Hoxton Park Airport development would be located in the vicinity of the proposed bus depot, approximately 500m south of Green Valley Road.

Middleton Grange would access onto Cowpasture Road south of the M7, via Fifteenth Avenue and the Cowpasture Road / Hoxton Park Road intersection. Access to the Cecil Hills South development would be via Lascelles Street and Frederick Road, with a connection also to the northern part of the Hoxton Park Airport development.

There is potential for each of these development to be linked, making use of an underpass beneath the M7. This connection would be significantly constrained by the size of the underpass, and would be limited to a single lane in each direction. These constraints are likely to make such a connection unviable, and as such this connection between developments has not included in this current assessment.

3.2 Traffic Generation

Average traffic generation rates for various land uses are provided by the NSW Roads and Traffic Authority in its publication “Guide to Traffic Generating Developments” (2002). Traffic generation rates relevant to the above developments are summarised in **Table 3-1**.

- **Table 3-1 Applicable Traffic Generation Rates**

Land Use	Trips per hour	
	AM Peak	PM Peak
Residential - Low Density	0.85 trips per dwelling[1]	0.85 trips per dwelling[1]
Residential – Medium Density	0.6 trips per dwelling[1]	0.6 trips per dwelling[1]
General Industrial	15 trips per developed hectare[2]	15 trips per developed hectare[2]
Retail – up to 10,000m^2 Gross Leasable Floor Area (GLFA)	3.1 trips per 100m^2 GLFA[3]	12.3 trips per 100m^2 GLFA
Retail – 10,000-20,000m^2 Gross Leasable Floor Area (GLFA)	1.9 trips per 100m^2 GLFA[3]	7.6 trips per 100m^2 GLFA

Source: NSW RTA Guide to Traffic Generating Developments

Notes:
1. Assume similar traffic generation in AM and PM peak hours
2. Based on SKM surveys, and accepted by the RTA for previous assessments, these rates are higher than the rates nominated by the RTA Guide.
3. Assume AM peak is 25% of the PM peak

The proposed Hoxton Park Airport development is comprised of the following land uses:

- General Industrial – 45.74ha;
- Low Density Residential – 12.5ha;
- Medium Density Residential – 1.70ha; and
- Retail Centre – 2.47ha.

The total traffic generation from the Hoxton Park Airport redevelopment is shown in **Table 3-2**.

- **Table 3-2 Hoxton Park Airport Redevelopment Traffic Generation**

	AM			PM		
Land Use	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Industrial	583 *85%*	103 *15%*	686	103 *15%*	583 *85%*	686
Residential	31 *20%*	125 *80%*	156	125 *80%*	31 *20%*	156
Retail	102 *50%*	102 *50%*	204	405 *50%*	405 *50%*	810
Total	**716** ***69%***	**329** ***31%***	**1,044**	**632** ***38%***	**1,019** ***62%***	**1,652**

Similar traffic generation assumptions were made for the Middleton Grange and Cecil Hills South developments. Middleton Grange covers an area of 152 hectares, and would yield around 2,330 residential lots. The 61 hectare Cecil Hills South development would yield around 600 residential lots. The peak hour traffic generation of these developments is shown in **Table 3-3**.

Table 3-3 Middleton Grange and Cecil Hills South Traffic Generation

	AM			PM		
Location	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Middleton Grange	396 *20%*	1,584 *80%*	1,981	1,584 *80%*	396 *20%*	1,981
Cecil Hills South	102 *20%*	408 *80%*	510	408 *80%*	102 *20%*	510

The Hoxton Park Airport development would generate less traffic than Middleton Grange, but more than Cecil Hills South.

3.3 Road Upgrades

The M7 is the most recent road project in the vicinity of the Hoxton Park airport site. It opened in late 2005, and captured some of the traffic that would otherwise use north-south roads in the vicinity of the development such as Cowpasture Road. The construction of the interchange with Cowpasture Road included an upgrade to Cowpasture Road on either side of the M7. This involved widening Cowpasture Road to two through lanes per direction.

The RTA is in the process of widening the whole length of Cowpasture Road to two through lanes per direction. The remaining single-lane sections are located between North Liverpool Road and the M7, and south of Carnes Hill. The RTA has completed concept design plans and a Review of Environmental Factors (REF) for the upgrade of these sections. As part of the upgrade, the intersection of Cowpasture Road and Green Valley Road would be signalised.

The RTA has also prepared an REF for the widening of Hoxton Park Road to provide two lanes per direction from Cowpasture Road and to connect with the already upgraded sections east of Whitford Road.

4. Traffic Impact Assessment

The traffic impact of the proposed development has been assessed with reference to a strategic network model of the area around the development site. The NETANAL strategic network modelling software was used to forecast peak hour traffic conditions in 2016. Details of the NETANAL modelling are provided in **Appendix A**.

The following scenarios were modelled:

- Existing situation (2007);
- 2016 Base Case, without any development at Hoxton Park Airport, Middleton Grange or Cecil Hills South;
- 2016 Partial Development, which includes the Middleton Grange and Cecil Hills South developments only; and
- 2016 Full Development, with the Hoxton Park Airport development, Middleton Grange and Cecil Hills South.

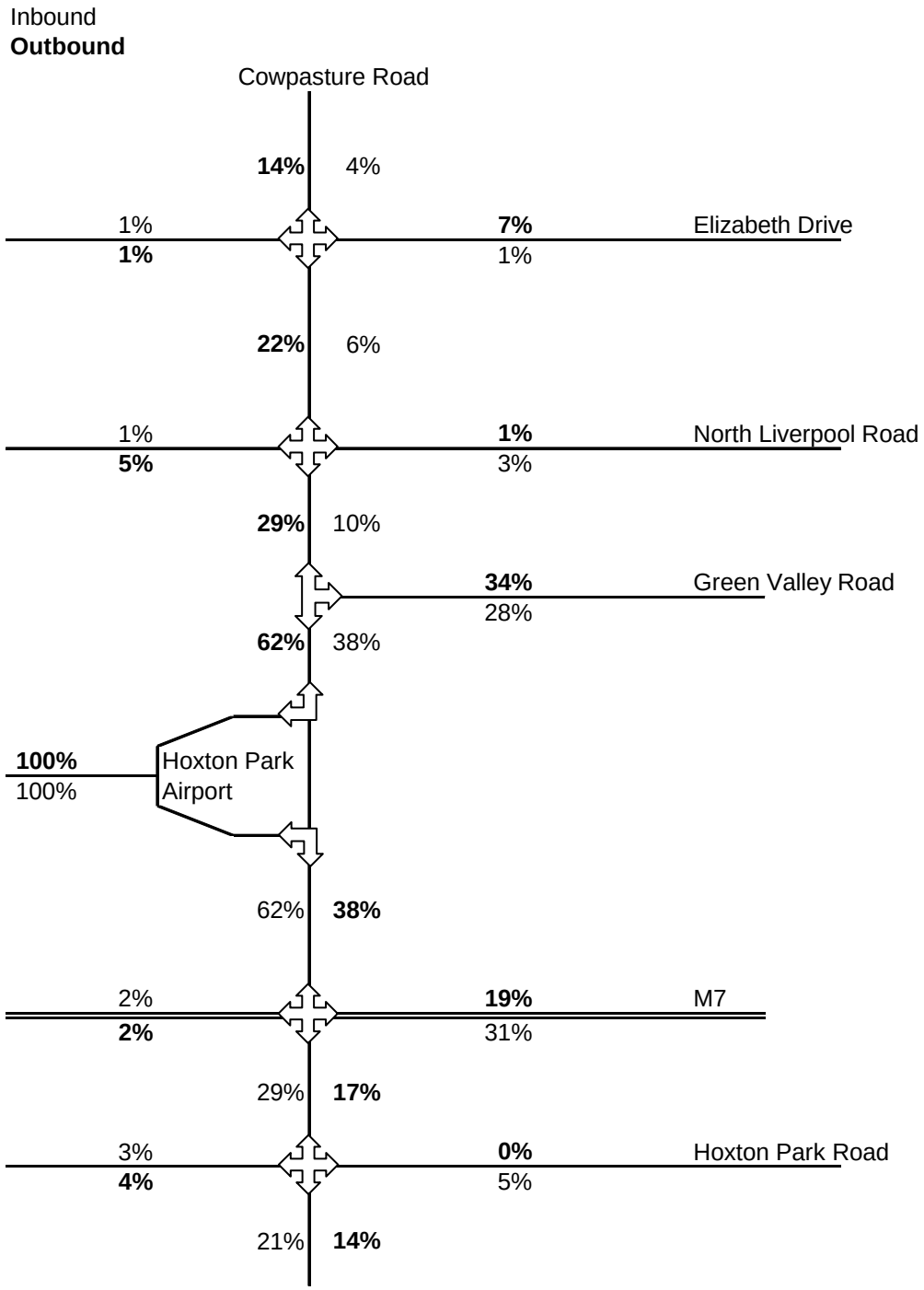
4.1 Distribution of Traffic from the Proposed Development

The NETANAL model was used to assess the impact of development traffic on the operation of the road network. The model assigns traffic to the network, with routes determined by finding the fastest path between the trip origin and destination, taking into account delays at signals, congestion and tolls (which the model treats as a time penalty).

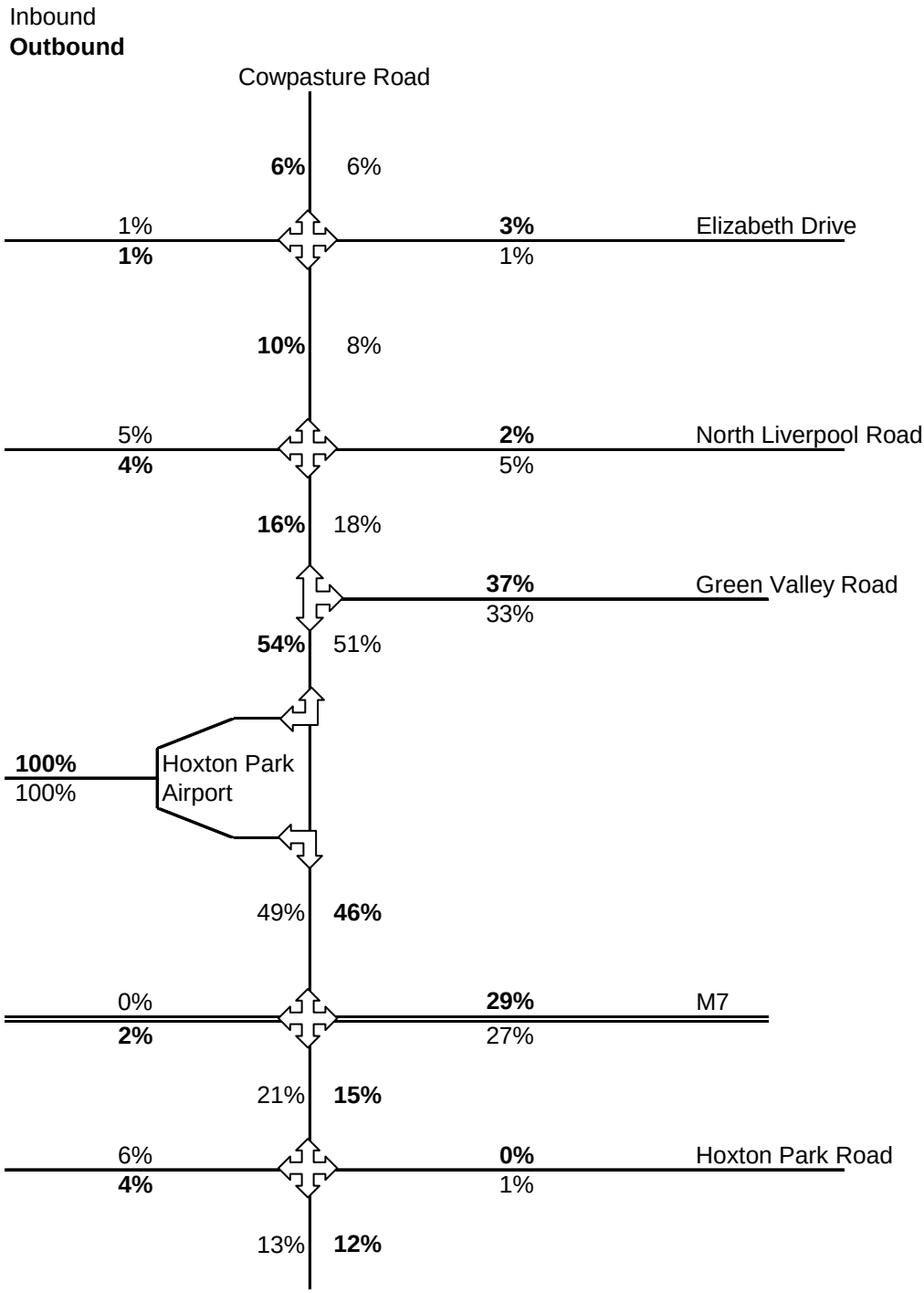
The modelled distribution of traffic related to the proposed development at Hoxton Park Airport is shown schematically in **Figure 4-1** and **Figure 4-2**. Outbound trips are shown in bold. The figures show the proportion of inbound or outbound development traffic using each road. For example, 62% of outbound trips from the Hoxton Park Airport development in the AM peak were forecast to travel northbound on Cowpasture Road. 34% and 29% (total 62%, due to rounding) would turn right into Green Valley Road or proceed north along Cowpasture Road respectively.

In both peaks, the roads with the highest proportion of development-related traffic are Green Valley Road and the M7 Motorway. It should be noted that the impact on Green Valley Road may be overstated by the model, due to its tendency to not account for drivers choosing what NETANAL may regard as a sub-optimal route (i.e. using main roads rather than rat-running through residential streets, even though the distance travelled and time taken may be marginally greater). The actual volumes using Green Valley Road and North Liverpool Road are likely to be more evenly allocated, as both roads have a similar status in the road hierarchy and travel in similar locations. The modelled volumes on Green Valley Road were however adopted as a worst-case scenario.

- **Figure 4-1 Distribution of Hoxton Park Airport Traffic – AM Peak**



- **Figure 4-2 Distribution of Hoxton Park Airport Traffic – PM Peak**



Traffic from the Hoxton Park Airport redevelopment represents only a small increase at most intersections, as detailed in **Table 4-1**. These figures show the number of vehicles associated with the Hoxton Park Airport redevelopment as a percentage of the total traffic passing through each

intersection. **Table 4-1** confirms that the greatest impact from the redevelopment (in terms of the additional number of vehicles on the road) is at the Cowpasture Road intersections with the M7 Interchange and Green Valley Road. It can also be seen that there is a greater impact in the PM peak, due to the higher generation rates compared to the morning.

- **Table 4-1 Marginal Increase in Total Traffic at Key Intersections Associated with Hoxton Park Airport Redevelopment**

Intersection	AM Peak Hour	PM Peak Hour
Cowpasture Road / Elizabeth Drive	1.6%	2.1%
Cowpasture Road / North Liverpool Road	3.0%	6.3%
Cowpasture Road / Green Valley Road	12.2%	24.5%
Cowpasture Road / M7 Interchange	12.2%	20.0%
Cowpasture Road / Hoxton Park Road	3.0%	4.6%

4.2 Intersection Operation

One of the key measures of the traffic impact of the proposal is intersection operation. Future volumes at intersections were estimated using the NETANAL model and assessed using SIDRA. The results of the intersection analysis are shown in **Table 4-2** and **Table 4-3**.

- **Table 4-2 Intersection Operation – Development Scenarios AM Peak**

Intersection	Control	AM Peak							
		2007	2016 Base Case		2016 Partial Development		2016 Full Development	
		LoS	Av. Delay (sec)	LoS	Av. Delay (sec)	LoS	Av. Delay (sec)	LoS
Cowpasture / Elizabeth	Signals	**E**	**>70**	**F**	**>70**	**F**	**>70**	**F**
Cowpasture / North Liverpool	Signals	**E**	**>70**	**F**	**>70**	**F**	**>70**	**F**
Cowpasture / Green Valley	Stop Sign / Signals[1]	**E**	**67**	**E**	**>70**	**F**	**>70**	**F**
Cowpasture / M7	Signals	A	18	B	31	C	32	C
Cowpasture / Hoxton Park	Signals	**D**	**>70**	**F**	**>70**	**F**	**>70**	**F**

Notes: 1. Intersection to be signalised in all 2016 scenarios as part of Cowpasture Road upgrade by RTA

- **Table 4-3 Intersection Operation – Development Scenarios PM Peak**

Intersection	Control	PM Peak							
		2007	2016 Base Case		2016 Partial Development		2016 Full Development		
		LoS	Av. Delay (sec)	LoS	Av. Delay (sec)	LoS	Av. Delay (sec)	LoS	
Cowpasture / Elizabeth	Signals	**D**	**>70**	**F**	**>70**	**F**	**>70**	**F**	
Cowpasture / North Liverpool	Signals	**D**	**>70**	**F**	**>70**	**F**	**>70**	**F**	
Cowpasture / Green Valley	Stop Sign / Signals[1]	**F**	**>70**	**F**	**>70**	**F**	**>70**	**F**	
Cowpasture / M7	Signals	A	15	B	18	B	21	B	
Cowpasture / Hoxton Park	Signals	**D**	**>70**	**F**	**>70**	**F**	**>70**	**F**	

Notes: 1. Intersection to be signalised in all 2016 scenarios as part of Cowpasture Road upgrade by RTA

The analysis shows that in 2016, all of the intersections modelled, with the exception of the M7 / Cowpasture Road interchange, would be operating above an acceptable Level of Service in the AM and PM peak hours under the 2016 "Base Case" scenario. Most of the intersections are also over-saturated under existing conditions. The cumulative impact of the Hoxton Park Airport development on intersection operation was forecast to be minor.

The focus of any impacts from the Hoxton Park Airport development would be on the M7 interchange, which is shown to operate satisfactorily with the full development in place, and at the Cowpasture Road intersections with Green Valley Road and North Liverpool Road. Only a small proportion of Hoxton Park Airport development traffic, as shown in **Figure 4-1** and **Figure 4-2**, would use the Cowpasture Road intersections with Hoxton Park Road and Elizabeth Drive.

From an intersection operation perspective, the inclusion of a left-turn slip lane from Green Valley Road into Cowpasture Road would cater for one of the major movements by Hoxton Park Airport development traffic, and would result in satisfactory operation (Level of Service B) of the intersection in 2016 with full development. This would require a modification to the proposed upgrade design to this intersection.

At North Liverpool Road, one of the main constraints to efficient intersection operation is the scale of movement to and from the Frederick Road approach, which includes some traffic associated with the Cecil Hills South development traffic. Through the SCATS signal co-ordination system, signal priority would be assigned to north-south traffic, although east-west traffic would be of a similar magnitude, and the size of the Frederick Road approach is a significant limiting factor to

the capacity of the intersection. This issue is independent of any development on the Hoxton Park Airport site. Widening of the Frederick Road approach to the intersection will improve intersection operation, but not to a point where Level of Service would be considered satisfactory. Other minor treatments, such as extensions to turn bays, may also be considered, although the overall impact would be small. More extensive intersection improvements works may improve overall Level of Service to D or better, although the benefit of such works outside of the peak hours would be limited.

4.3 Managing Traffic Impacts

The traffic impacts of the proposed development, and others nearby, could be managed in a number of different ways. The first would be to upgrade road infrastructure to provide more capacity, such as intersection upgrades and road widening. However, the effect of these is limited, and the benefit – cost relationship of such works would need to be carefully considered, as capacity at intersections is not as constrained during off-peak times.

A reduction in traffic generation from the proposed development will also reduce the traffic impact of the development. This can be accomplished in a number of ways, including:

- Reducing the need to travel;
- Encouraging use of transit as a mode of travel; and
- Promoting walking and cycling to nearby destinations.

The proposed development is in an ideal position to encourage non-car modes for short trips, with the inclusion of both residential and employment land uses in reasonable proximity to one another. This current assessment has assumed a worst-case of no trips internal to the development, by treating the residential and industrial lands as separate entities. The promotion of internal transport options, and encouraging people to work and live in the development, would reduce the traffic impact of the development. Moreover, the promotion of walking and cycling for such travel would reduce the overall impact of the development.

Public transport provision to the development site has been explored at an initial level, and options would be further developed during the approval process. As a worst case, however, this current assessment assumes no changes to local public transport over existing service levels. Offering public transport with high levels of service (in terms of reliability, coverage, hours of service, frequency etc.) would ensure that an alternative to car travel remains competitive and would reduce overall car travel.

5. Conclusion

The proposed redevelopment of the Hoxton Park Airport to light industrial, residential and retail land, is one of three major developments in the vicinity. The others, Middleton Grange and Cecil Hills South, would provide a total of 2,900 new residential lots. The Hoxton Park Airport site would include approximately 228 residential lots, a 2.5 hectare retail precinct, and 45 hectares of light industrial development.

The Hoxton Park Airport development would be expected to generate approximately 1,044 trips in the morning peak hour and 1,652 trips in the evening peak hour. This is less than the anticipated trip generation from Middleton Grange, and more than from Cecil Hills South.

Access to the Hoxton Park Airport site would be via two new signalised intersections on Cowpasture Road, between the M7 interchange and Green Valley Road.

Most intersections along Cowpasture Road are currently operating above or close to a satisfactory level of service. Background growth in traffic, without the influence of developments such as Middleton Grange and Cecil Hills South, will result in further peak-hour congestion at these locations, although outside of the peak periods congestion is not as severe. The marginal impact of these developments, as well as the Hoxton Park Airport development, would be felt in different ways and at different locations.

The greatest impacts from Hoxton Park Airport traffic would be at the M7 interchange with Cowpasture Road, and the intersections with Green Valley Road and North Liverpool Road. Satisfactory intersection operation, catering for all development traffic, can be achieved at Green Valley Road by providing a left turn slip lane for movements from Green Valley Road to Cowpasture Road. This is a modification to the proposed upgrade design proposed by the RTA.

Satisfactory operation of the Cowpasture Road / North Liverpool Road intersection is constrained by the volume of east-west traffic across the intersection, which includes the Cecil Hills South development. This affects the balance of the intersection and the relative amount of green time that can be allocated to each movement. Enhancement of the Frederick Road approach will assist traffic flow, but overall intersection operation is likely to remain at an unsatisfactory level.

The M7 interchange with Cowpasture Road is anticipated to continue operating satisfactorily with the full development at Hoxton Park Airport. Intersection Level of Service at other intersections is not expected to change with the redevelopment of Hoxton Park Airport.

Appendix A Regional Transport Modelling

Transport modelling is a core component of this study. NETANAL road network modelling software was used to assess the impact of the proposed development on the surrounding road network.

NETANAL is a shortening of NETwork ANALysis Assignment Modelling Program. The NETANAL model is a computer based traffic forecasting software used extensively for assessment of road projects in Sydney. (It was first used by the NSW Roads & Traffic Authority as part of the assessment of traffic projections for the Sydney Harbour Tunnel.)

The NETANAL model covers the entire Sydney region. It models traffic by representing the road network as a series of links (roads) and nodes (intersections); and the traffic generating land uses as a number of travel zones connected to the network. Links and nodes are coded with various characteristics regarding their hierarchy, free-flow speed, number of lanes, intersection control etc. NETANAL assigns trip origins and destinations (trip matrices) in the network to the travel zones. The trip tables used divide Sydney into more than 950 traffic generating and attracting zones.

NETANAL assigns trips travelling between each origin-destination pair for a particular time period according to minimum travel times. Travel time calculations reflect the impact of road type, average speed, number of lanes and type of intersection control along each route. This is usually undertaken in several iterations to allow the congestion at intersections and on road links to be included in the travel time calculations.

The impact of the development was derived from a NETANAL model calibrated by local traffic surveys, modelling natural growth projections for the area (base 2007 and future 2016), and assigning the traffic generated by the proposed development into the future road network based on projected activity.

A.1 Model Development

Traffic forecasts were produced from a NETANAL transport modelling package running a strategic level road network and trip table for the time periods modelled. While the model covers the entire Sydney Metropolitan area, particular attention was paid to the immediate vicinity of Hoxton Park.

A.1.1 Modelled Time Periods

The impact of the project during both AM and PM peak hours has been assessed. Traffic counts indicated that the AM peak hour is approximately 7:45 – 8:45am and the PM peak hour is approximately 4:30 – 5:30pm.

These periods are representative of peak loadings on the network under various conditions. The AM and PM peak periods are traditionally when demand is highest, and most traffic impact assessment is based on these periods.

A.1.2 Base Model

A base NETANAL model was developed for the existing (2007) situation to ensure that the model is reasonably replicating the real life situation. Separate models were developed for the AM and PM peak hours.

The AM and PM base model networks were checked particularly in the vicinity of Hoxton Park and modified to represent the existing network configuration.

Surveyed traffic volumes from manual counts were used to calibrate the model to the existing situation. Trips tables were adjusted where it was found that the trip table was over or under-estimating the number of trips between zones.

The following data was collected for the purpose of calibrating the strategic network model and intersection models:

- Manual Classified intersection counts for the AM and PM peak periods on Wednesday 7 February 2007 at the following intersections:
    - Cowpasture Road / Elizabeth Drive
    - Cowpasture Road / North Liverpool Road
    - Cowpasture Road / Green Valley Road
    - Cowpasture Road / M7 Interchange
    - Cowpasture Road / Hoxton Park Road
    - Cowpasture Road / Gloucester Road
    - Cowpasture Road / Camden Valley Way
    - Hoxton Park Road / Banks Road
    - North Liverpool Road / Rundle Road
    - Elizabeth Drive / Cabramatta Road

These intersections were selected because of their potential interaction with the proposed development traffic.

A.1.3 Assessment Criteria

The criteria for assessing the calibration process were base on the GEH Statistic.

The GEH Statistic is described in the UK Design Manual for Roads and Bridges (Volume 12, Section 2, Part 1 Traffic Appraisal of Roads Schemes – Traffic Appraisal in Urban Areas Assignment Validation: Acceptability Guidelines). These criteria are described below:

Statistic 1: GEH Statistic: less than 5 for greater than 85% of cases

Statistic 2:

1) Individual flows within 15% for flows 700-2,700vph
2) Individual flows within 100vph for flows < 700vph
3) Individual flows within 400vph for flows >2,700vph

} greater than 85% of cases

The GEH Statistic (a form of Chi-squared statistic) is given by the formula:

$$GEH = \sqrt{\frac{(M-C)^2}{(M+C)/2}}$$

Where:

	GEH	is the GEH statistic
	M	is the modelled flow; and
	C	is the observed flow.

The results of the calibration process are shown in **Table 5-1** and **Table 5-2** below for the AM and PM peak hours.

Table 5-1 Model Calibration Results – AM

Street Name	Location	Direction	Actual Volume	Modelled Volume	GEH Statistic
Cowpasture Road	North of Bringelly Rd	NB	983	1,286	9.00
Cowpasture Road	North of Bringelly Rd	SB	782	732	1.82
Elizabeth Drive	West of Cowpasture Rd	EB	1,645	1,934	6.83
Elizabeth Drive	West of Cowpasture Rd	WB	805	818	0.46
Elizabeth Drive	West of Cabramatta Rd	EB	1,445	1,378	1.78
Elizabeth Drive	West of Cabramatta Rd	WB	991	1,005	0.44
Hoxton Park Road	East of Cowpasture Rd	EB	863	738	4.42
Hoxton Park Road	East of Cowpasture Rd	WB	635	551	3.45
Cowpasture Road	South of Hoxton Park Rd	NB	1,506	1,510	0.10
Cowpasture Road	South of Hoxton Park Rd	SB	669	695	1.00
Cowpasture Road	North of M7	NB	1,583	1,391	4.98
Cowpasture Road	North of M7	SB	875	855	0.68
Hoxton Park Road	East of Banks Rd	EB	1,406	1,314	2.49
Hoxton Park Road	East of Banks Rd	WB	1,381	1,344	1.00
Banks Road	North of Hoxton Park Rd	NB	548	592	1.84
Banks Road	North of Hoxton Park Rd	SB	406	496	4.24
North Liverpool Road	West of Rundle Rd	EB	858	904	1.55
North Liverpool Road	West of Rundle Rd	WB	381	405	1.21
North Liverpool Road	East of Cowpasture Rd	EB	559	515	1.90
North Liverpool Road	East of Cowpasture Rd	WB	583	511	3.08
Frederick Road	West of Cowpasture Rd	EB	761	690	2.64
Frederick Road	West of Cowpasture Rd	WB	468	432	1.70
Green Valley Road	East of Cowpasture Rd	EB	337	261	4.40
Green Valley Road	East of Cowpasture Rd	WB	148	103	4.02
Cowpasture Road	North of Green Valley Rd	NB	1,286	1,235	1.44
Cowpasture Road	North of Green Valley Rd	SB	868	857	0.37
Cowpasture Road	North of Elizabeth Dr	NB	1,607	1,745	3.37
Cowpasture Road	North of Elizabeth Dr	SB	866	823	1.48
M7 off-ramp	East of Cowpasture Rd	NB	148	211	4.70
M7 on-ramp	East of Cowpasture Rd	SB	207	281	4.74
M7 on-ramp	West of Cowpasture Rd	NB	250	334	4.92
M7 off-ramp	West of Cowpasture Rd	SB	103	115	1.15
Cowpasture Road	North of Hoxton Park Rd	NB	1,529	1,565	0.92
Cowpasture Road	North of Hoxton Park Rd	SB	720	742	0.81
Hoxton Park Road	West of Cowpasture Rd	EB	591	655	2.56
Hoxton Park Road	West of Cowpasture Rd	WB	391	460	3.35
Rundle Road	South of Nth Liverpool Rd	NB	276	244	1.98
Rundle Road	South of Nth Liverpool Rd	SB	273	322	2.84
Cabramatta Road	East of Elizabeth Dr	EB	666	556	4.45
Cabramatta Road	East of Elizabeth Dr	WB	445	410	1.69
Elizabeth Drive	East of Cabramatta Rd	EB	971	821	5.01
Elizabeth Drive	East of Cabramatta Rd	WB	739	595	5.58

Table 5-2 Model Calibration Results – PM

Street Name	Location	Direction	Actual Volume	Modelled Volume	GEH Statistic
Cowpasture Road	North of Bringelly Rd	NB	667	691	0.92
Cowpasture Road	North of Bringelly Rd	SB	940	985	1.45
Elizabeth Drive	West of Cowpasture Rd	EB	1034	1,060	0.80
Elizabeth Drive	West of Cowpasture Rd	WB	1495	1,664	4.25
Elizabeth Drive	West of Cabramatta Rd	EB	1125	1,013	3.43
Elizabeth Drive	West of Cabramatta Rd	WB	1829	2,000	3.91
Hoxton Park Road	East of Cowpasture Rd	EB	540	441	4.47
Hoxton Park Road	East of Cowpasture Rd	WB	805	682	4.51
Cowpasture Road	South of Hoxton Park Rd	NB	896	862	1.15
Cowpasture Road	South of Hoxton Park Rd	SB	1276	1,187	2.54
Cowpasture Road	North of M7	NB	892	908	0.53
Cowpasture Road	North of M7	SB	1336	1,236	2.79
Hoxton Park Road	East of Banks Rd	EB	956	787	5.72
Hoxton Park Road	East of Banks Rd	WB	2436	2,262	3.59
Banks Road	North of Hoxton Park Rd	NB	624	698	2.88
Banks Road	North of Hoxton Park Rd	SB	466	579	4.94
North Liverpool Road	West of Rundle Rd	EB	490	571	3.52
North Liverpool Road	West of Rundle Rd	WB	652	653	0.04
North Liverpool Road	East of Cowpasture Rd	EB	538	401	6.32
North Liverpool Road	East of Cowpasture Rd	WB	480	534	2.40
Frederick Road	West of Cowpasture Rd	EB	314	316	0.11
Frederick Road	West of Cowpasture Rd	WB	459	363	4.74
Green Valley Road	East of Cowpasture Rd	EB	200	131	5.36
Green Valley Road	East of Cowpasture Rd	WB	120	91	2.82
Cowpasture Road	North of Green Valley Rd	NB	753	776	0.83
Cowpasture Road	North of Green Valley Rd	SB	1342	1,144	5.62
Cowpasture Road	North of Elizabeth Dr	NB	787	788	0.04
Cowpasture Road	North of Elizabeth Dr	SB	1483	1,514	0.80
M7 off-ramp	East of Cowpasture Rd	NB	141	178	2.93
M7 on-ramp	East of Cowpasture Rd	SB	149	249	7.09
M7 on-ramp	West of Cowpasture Rd	NB	136	146	0.84
M7 off-ramp	West of Cowpasture Rd	SB	166	205	2.86
Cowpasture Road	North of Hoxton Park Rd	NB	931	990	1.90
Cowpasture Road	North of Hoxton Park Rd	SB	1237	1,305	1.91
Hoxton Park Road	West of Cowpasture Rd	EB	354	370	0.84
Hoxton Park Road	West of Cowpasture Rd	WB	542	601	2.47
Rundle Road	South of Nth Liverpool Rd	NB	228	249	1.36
Rundle Road	South of Nth Liverpool Rd	SB	258	274	0.98
Cabramatta Road	East of Elizabeth Dr	EB	333	292	2.32
Cabramatta Road	East of Elizabeth Dr	WB	985	1,088	3.20
Elizabeth Drive	East of Cabramatta Rd	EB	902	721	6.35
Elizabeth Drive	East of Cabramatta Rd	WB	954	912	1.38

The modelled link flows were compared with the link counts for both AM and PM peak hours and it was found that the models achieved satisfactory results as shown below:

AM Peak Hour

- Statistic 1: The GEH statistic was less than 5 for 90% of cases
- Statistic 2: Individual flow criteria was satisfied in 88% of cases

PM Peak Hour

- Statistic 1: The GEH statistic was less than 5 for 86% of cases
- Statistic 2: Individual flow criteria was satisfied in 86% of cases

The AM and PM peak base models met all of the calibration criteria, and it was therefore accepted that the base models were reasonable representations of existing conditions in the study area.

During the calibration adjustment process 16 iterations were used for each calibration step. The stability of the model was tested by rerunning the model with 17 iterations. For both AM and PM peak hours, the mean absolute differences of volumes at all calibration locations between 16 and 17 iterations were approximately 2.5%. This indicates that both AM and PM models are stable.

A.1.4 Future Model

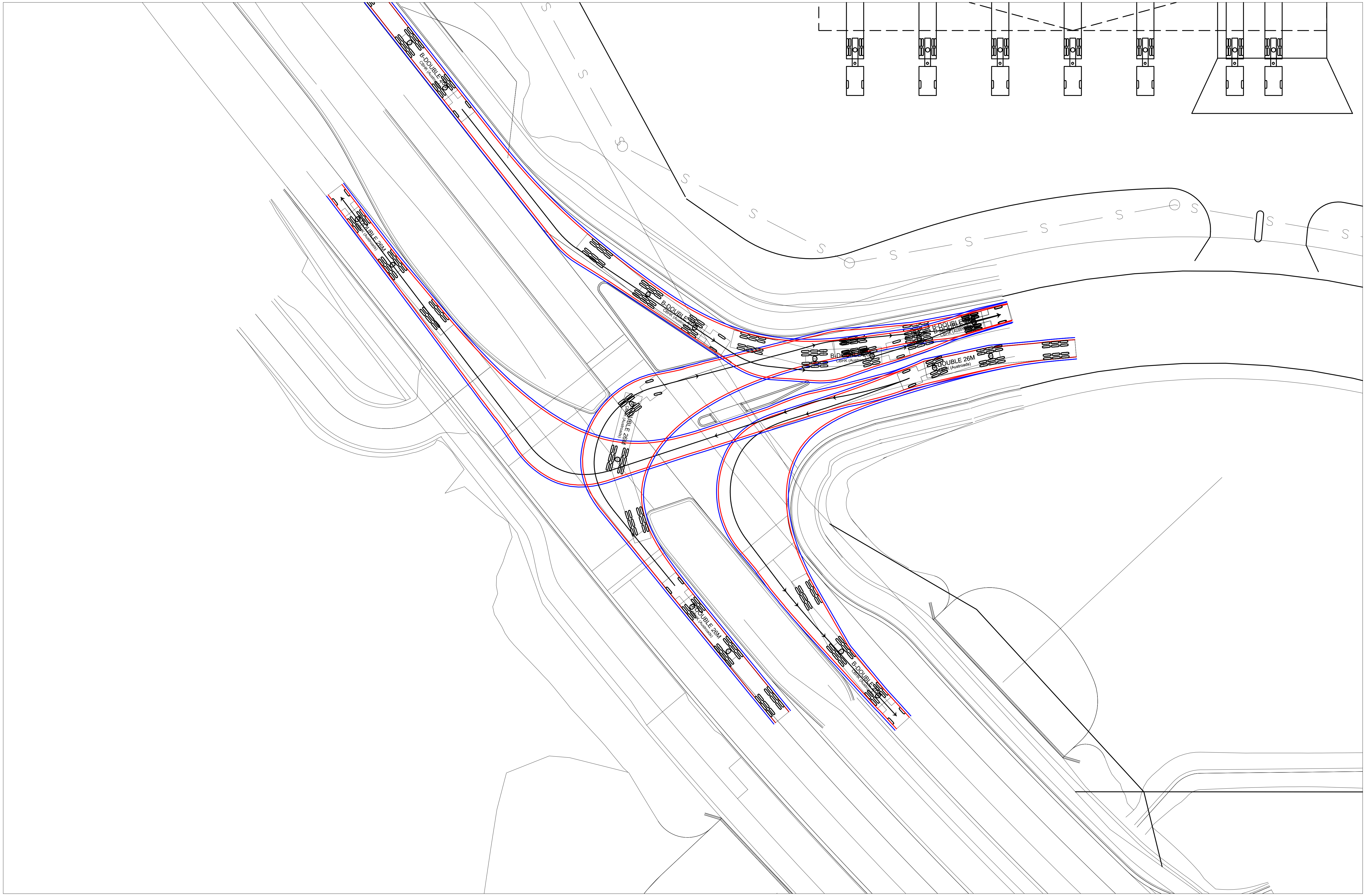
Current forecast 2016 AM and PM trip matrices developed by the Transport and Population Data Centre (TPDC) for the Sydney and Central Coast area were used in the future models. TPDC estimated the future trip matrices based on their population and employment forecasts.

Base future trip matrices were adjusted to reflect the changes made between the 2007 base and calibrated trip matrices.

The future trip matrices were adjusted to reflect the changes made between the 2007 base and calibrated trip matrices; and were checked for the projected traffic generation by planned future developments such as Middleton Grange and Cecil Hills South.

APPENDIX C

Swept Paths



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26.0m B-DOUBLE VEHICLE SWEPT PATHS

- INTERNAL CIRCULATION ROADS

C1

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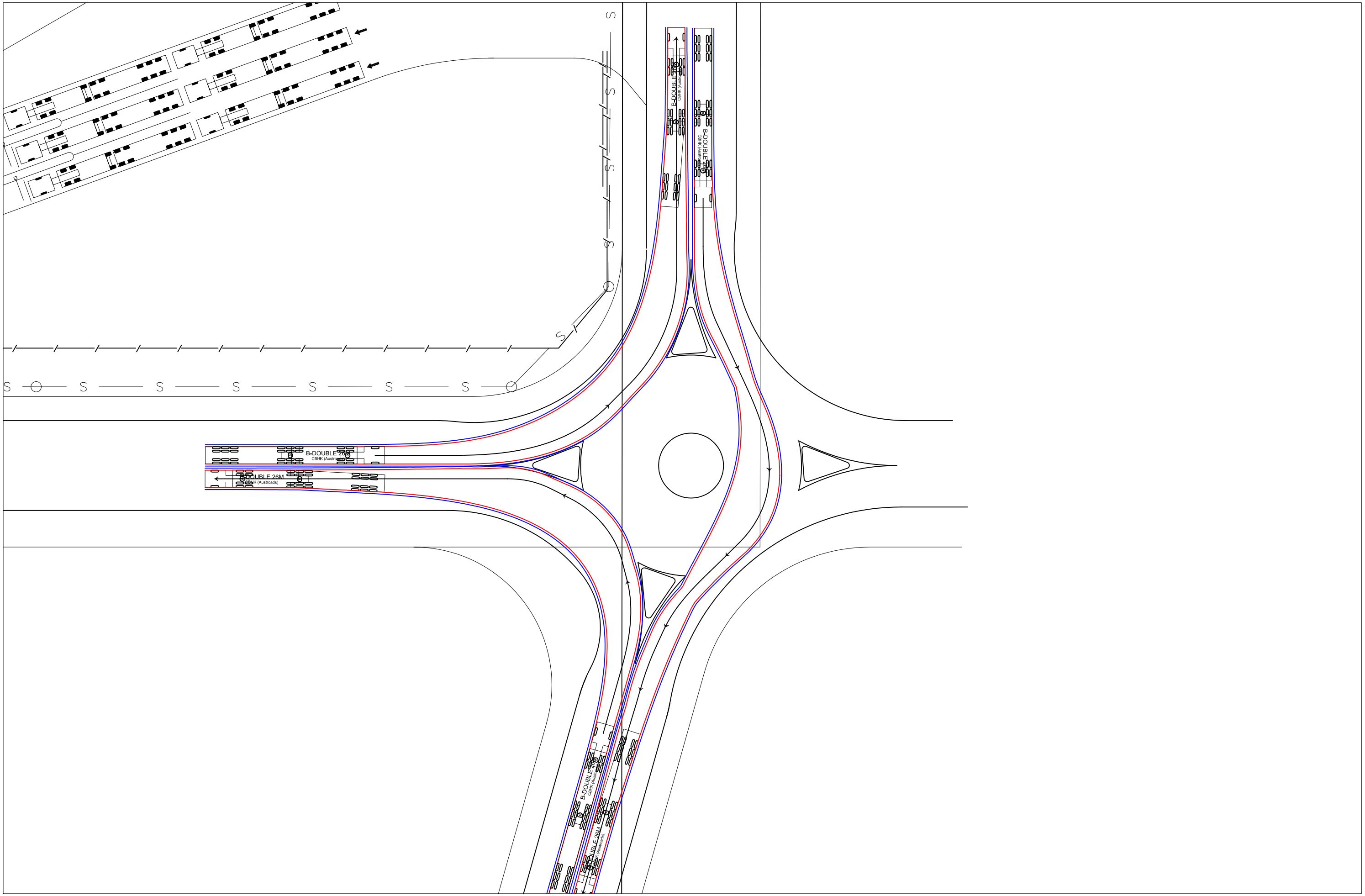

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26.0m B-DOUBLE VEHICLE SWEPT PATHS

- INTERNAL CIRCULATION ROADS

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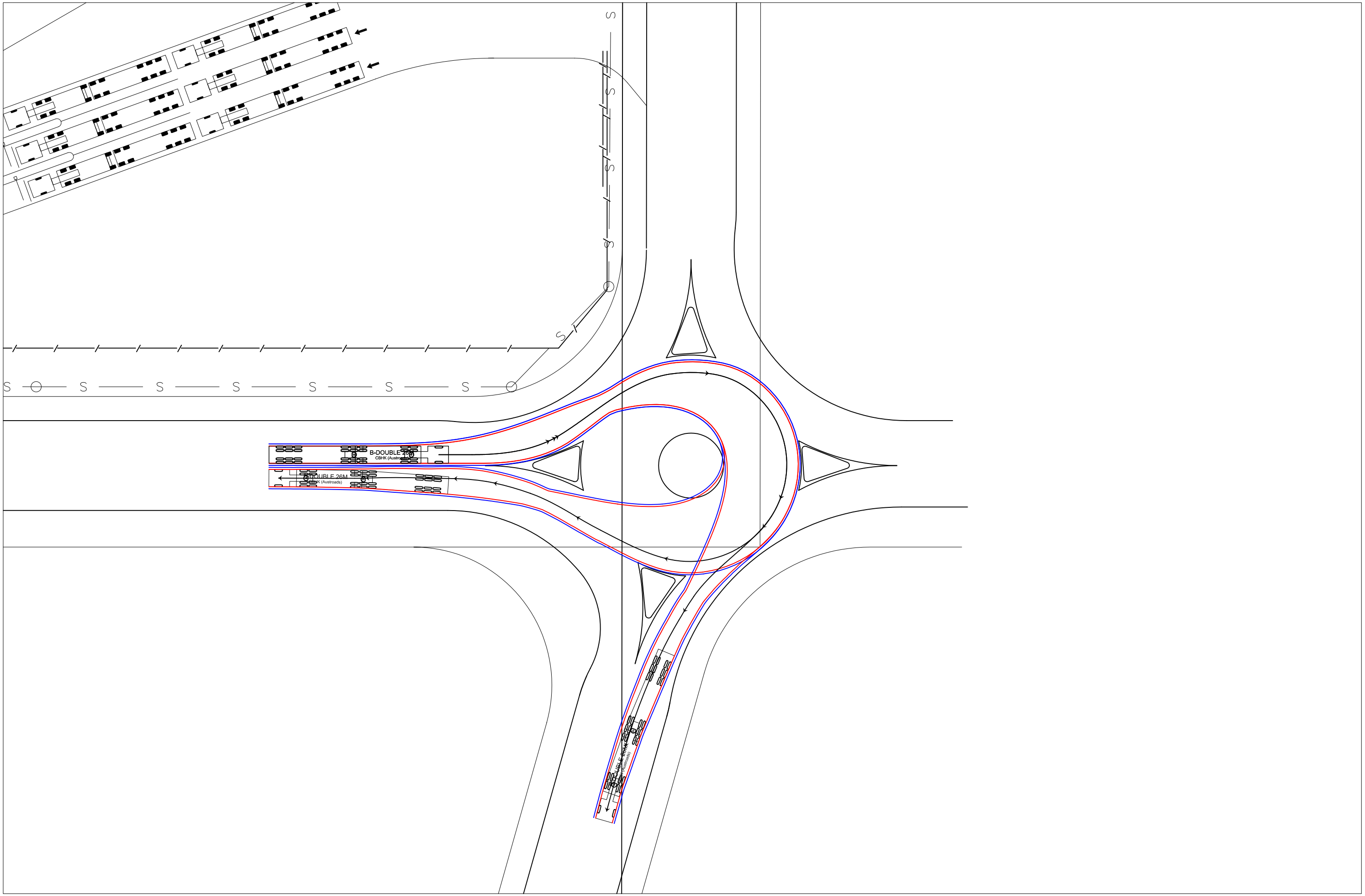
C2



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26.0m B-DOUBLE VEHICLE SWEPT PATHS

- INTERNAL CIRCULATION ROADS

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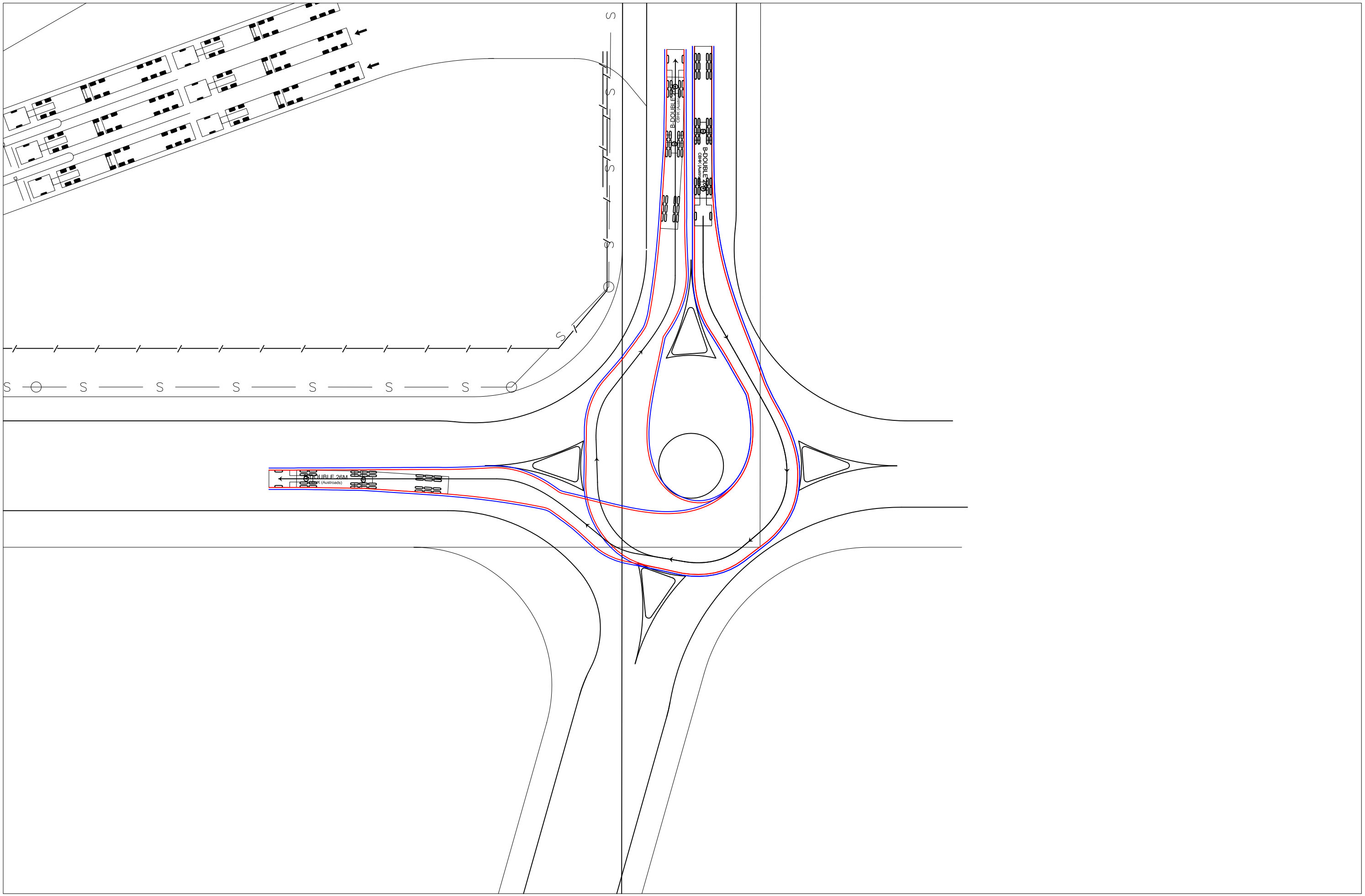
C3



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26.0m B-DOUBLE VEHICLE SWEPT PATHS

- INTERNAL CIRCULATION ROADS

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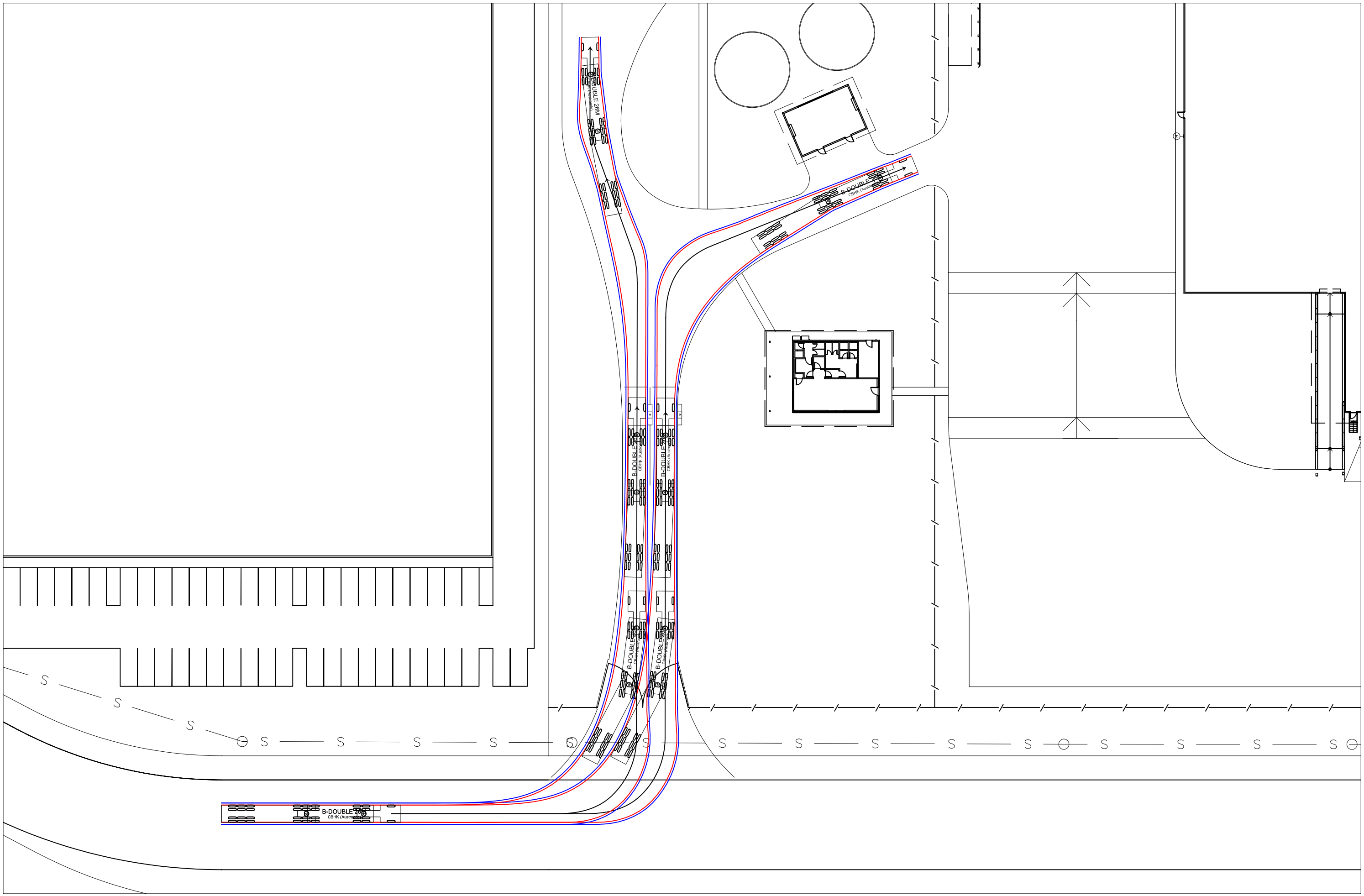
C4



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26.0m B-DOUBLE VEHICLE SWEPT PATHS - BIG W

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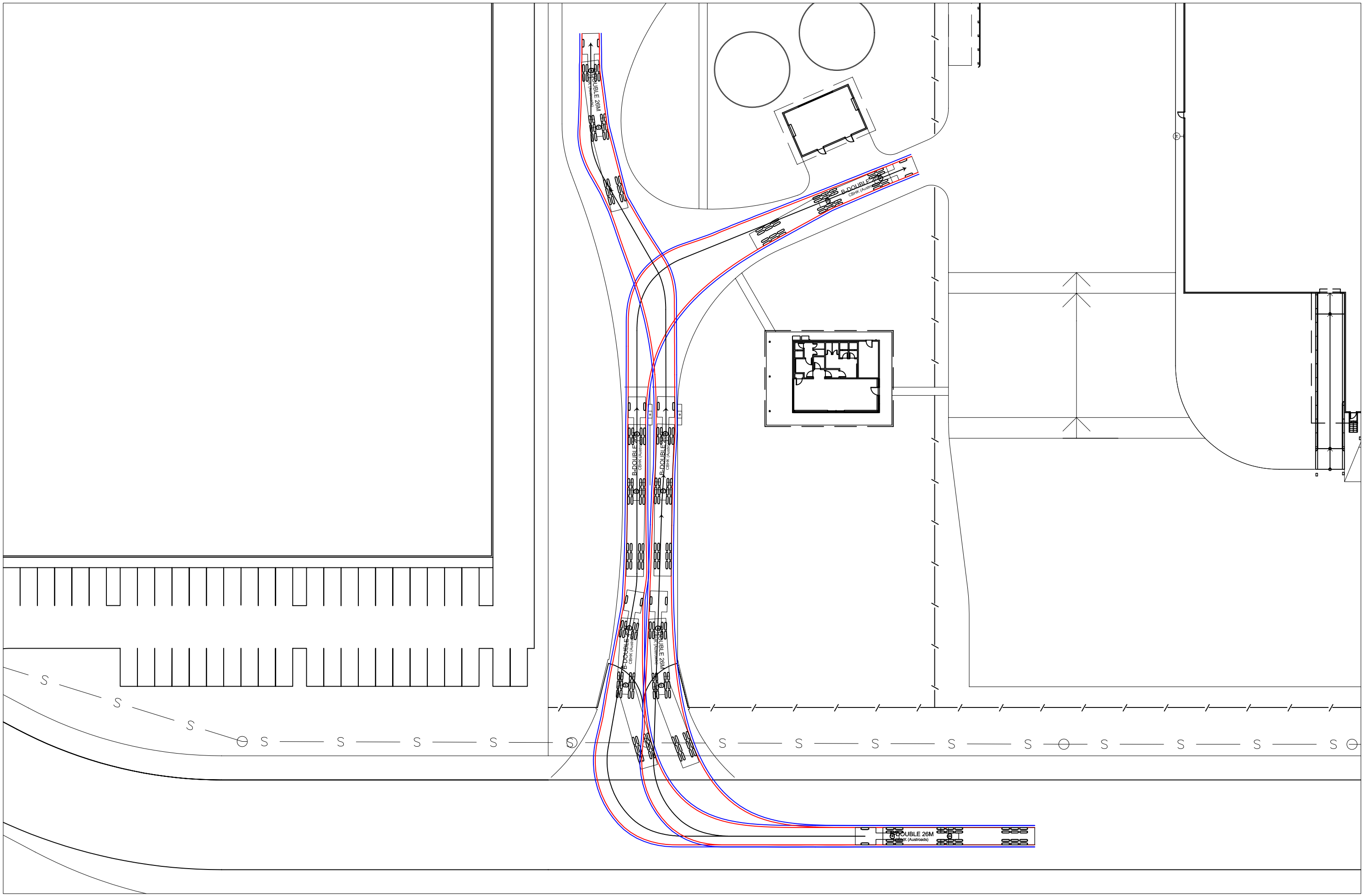
C5



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26.0m B-DOUBLE VEHICLE SWEPT PATHS - BIG W

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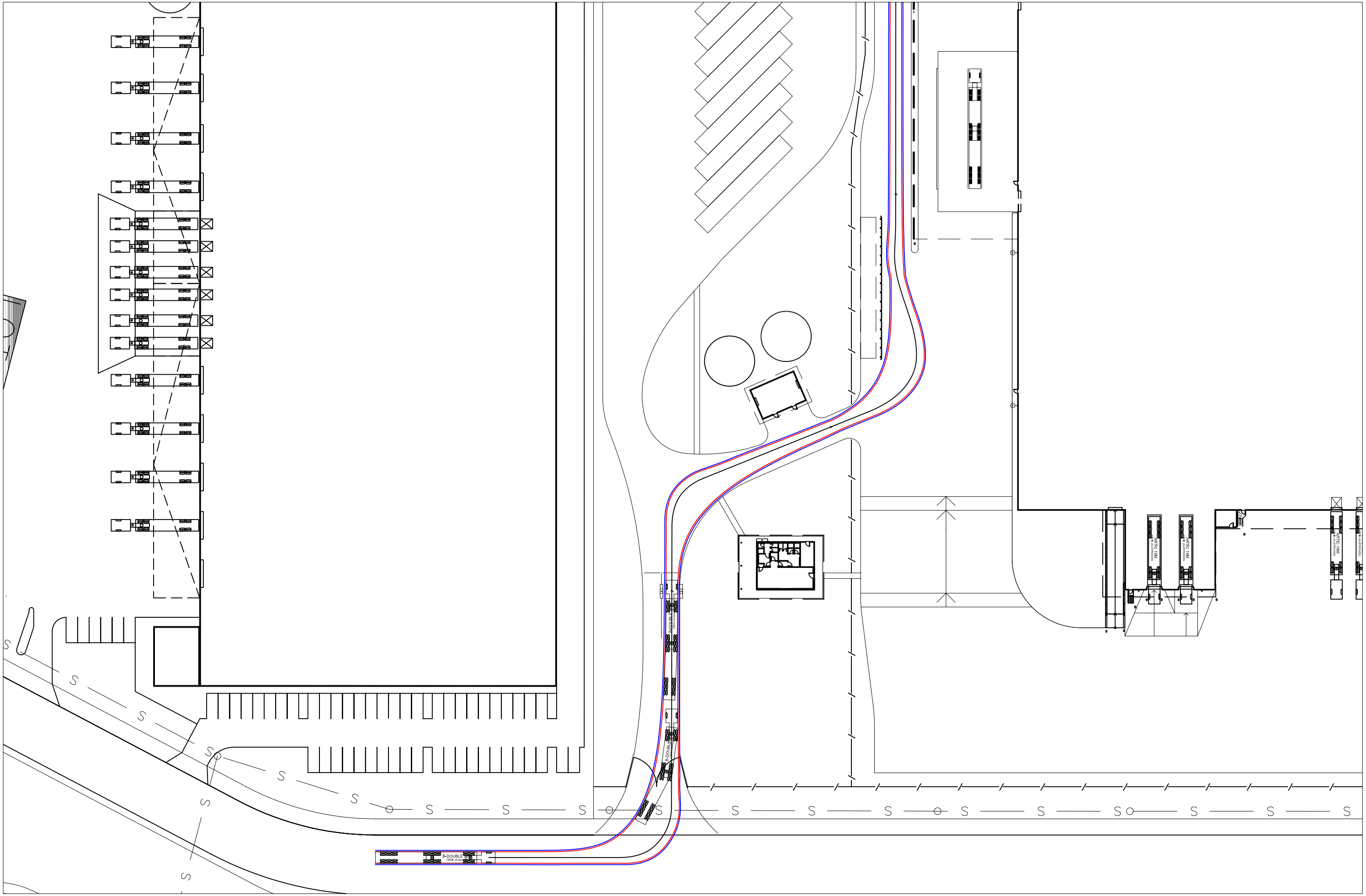
C6



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26.0m B-DOUBLE VEHICLE SWEPT PATHS - BIG W

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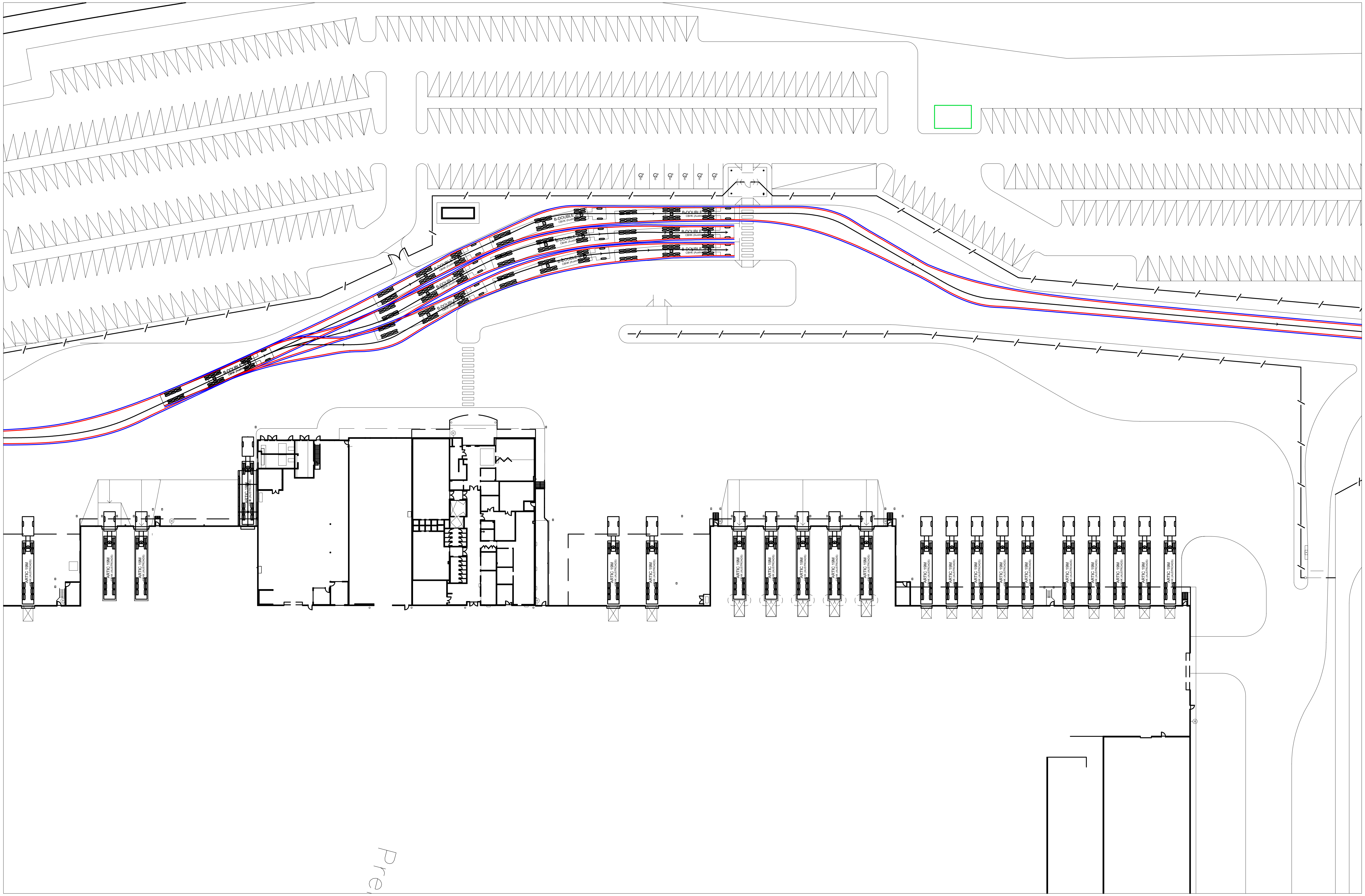
C7



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26.0m B-DOUBLE VEHICLE SWEPT PATHS - BIG W

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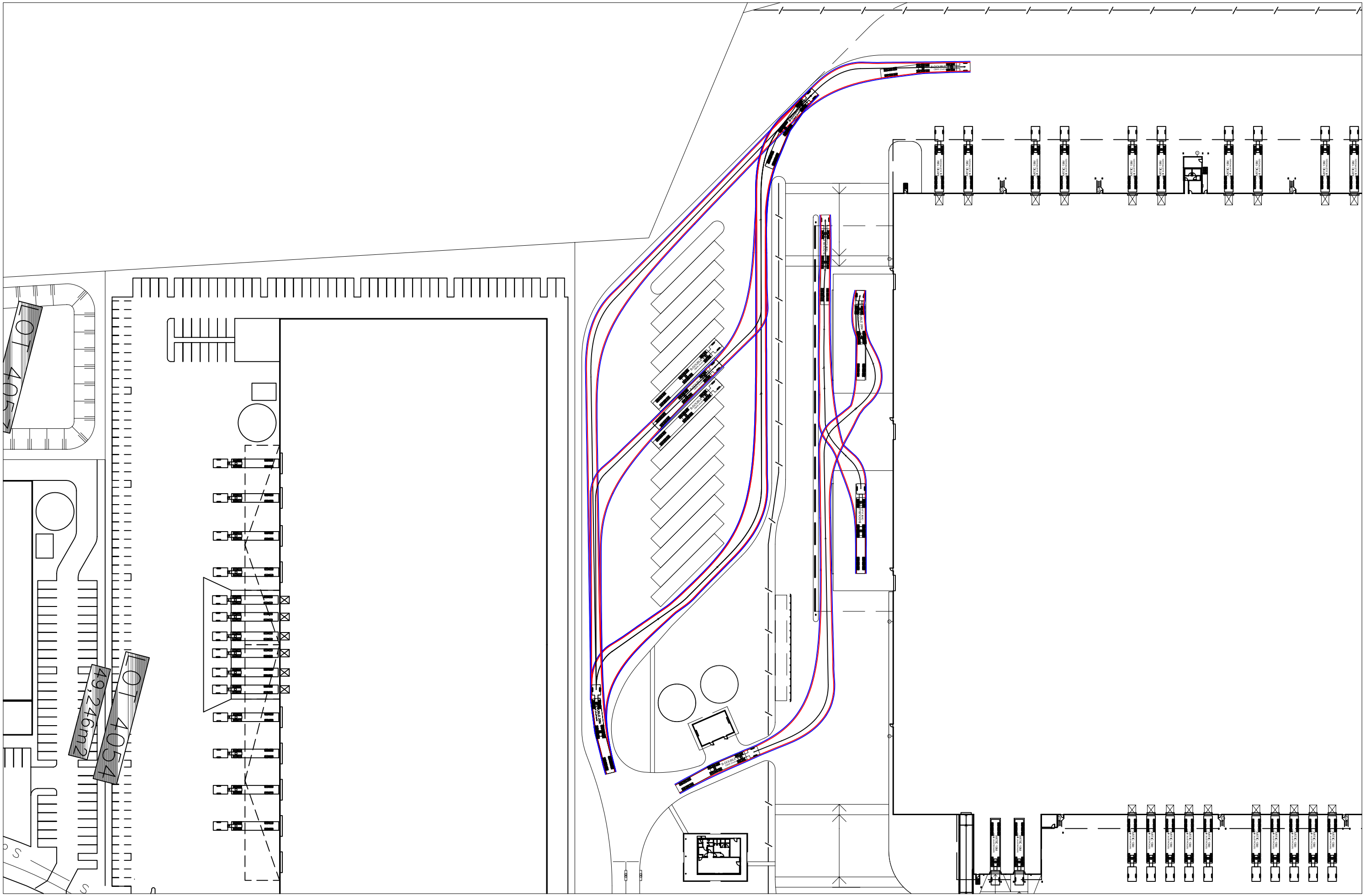
C8



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26.0m B-DOUBLE VEHICLE SWEPT PATHS - BIG W

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C9