

Appendix F **Central Traffic Management Plan**





CBD Metro TA 2108 Transport and Access Advisor

Central Station – Traffic Management Plan

Sydney Metro

24 August 2009

Document Reference: **CBD-2108-MSM-EP-DO-077**

Central Station – Traffic Management Plan

Prepared for

Sydney Metro

Prepared by

AECOM Australia Pty Ltd

Level 11, 44 Market Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 2 8295 3600 F +61 2 9262 5060 www.aecom.com

ABN 20 093 846 925

In association with

Sinclair Knight Merz and MVA Asia

24 August 2009

60096953

© AECOM Australia Pty Ltd 2009

The information contained in this document produced by AECOM Australia Pty Ltd is solely for the use of the Client identified on the cover sheet for the purpose for which it has been prepared and AECOM Australia Pty Ltd undertakes no duty to or accepts any responsibility to any third party who may rely upon this document.

All rights reserved. No section or element of this document may be removed from this document, reproduced, electronically stored or transmitted in any form without the written permission of AECOM Australia Pty Ltd.

Quality Information

Document	Central Station – Traffic Management Plan
Revision	4
Document Reference	CBD-2108-MSM-EP-DO-077
Purpose	Final for Issue
Issue Date	24 August 2009
Prepared by	Bev Atkinson
Reviewed by	Tom Brimson
Authorised by	Richard Merrett

Revision Number	Purpose	Revision Date	Prepared By	Reviewed By
A	Initial Draft	29 May 2009	Bev Atkinson	Tom Brimson
B	Final Draft	24 June 2009	Bev Atkinson	Tom Brimson
1	Final for Issue	20 July 2009	Bev Atkinson	Tom Brimson
2	Final for Issue	29 July 2009	Bev Atkinson	Tom Brimson
3	Final for Issue	19 August 2009	Bev Atkinson	Tom Brimson
4	Final for Issue	24 August 2009	Bev Atkinson	Tom Brimson

Table of Contents

Glossary	a
Executive Summary	i
1.0 Introduction	1
1.1 Project Background	1
1.2 Scope of this report	2
1.3 Hierarchy of construction traffic management plans	2
1.4 Report Structure	2
2.0 Existing Situation	3
2.1 Pedestrian movements and volumes	3
2.1.1 AM and PM Peak Hour Surface Network	6
2.1.2 Surface flows	7
2.1.3 Sub-Surface Flow- Devonshire St Tunnel	10
2.2 Bus routes and stops	10
2.3 Coaches	12
2.4 Light Rail	12
2.5 Taxis	13
2.6 Cyclists	13
2.7 Parking	15
2.8 Traffic signals	15
2.9 Existing Road Network	15
2.9.1 Traffic volumes and turning movements	15
2.10 Adjacent developments	19
2.10.1 Vehicular access	19
2.11 Bus Arrangements during CityRail Construction Affecting Central Station or Track Possessions	19
3.0 Proposed Work Method	20
3.1 Work Method	20
3.2 Indicative Construction Timeframe	21
4.0 Worksite Operation and Management	22
4.1 Worksite locations	22
4.2 Site access and egress	23
4.2.1 Truck Access Locations	23
4.2.2 Truck Manoeuvring Requirements	24
4.2.3 Access for workers	24
4.2.4 On Site Parking	24
4.2.5 Approach and Departure Routes for Trucks	24
4.2.6 Truck Manoeuvring Requirements	26
4.3 Management of worksite access	26
4.3.1 Site Security	26
4.3.2 Truck Access	26
4.4 Management of Pedestrians	27
4.4.1 Western forecourt Central Station	27
4.4.2 Eddy Ave at Belmore Park	27
4.5 Hours for Truck Movements	28
4.6 Truck movements associated with spoil excavation	29
4.6.1 Other activities generating truck movements	29
4.7 Provision for Over-Dimensional Vehicles	30
4.8 Spoil Disposal Locations and Proposed Haulage Routes	30
4.9 Other Temporary Worksites	30
4.9.1 Trenchless Construction Methods	32
5.0 Management of Impacts and Mitigation Measures	33
5.1 Primary Construction Impacts	33
5.2 Incidents and Events	33
5.2.1 Incidents	33

	5.2.2	Emergency vehicle access	33
	5.2.3	Size of emergency vehicles	34
5.3		Events	34
	5.3.1	Christmas Retail	34
	5.3.2	Other scheduled events	34
5.4		Pedestrian Management	34
	5.4.1	Western Forecourt Worksite	35
	5.4.2	Pedestrian Walkway Capacity	35
	5.4.3	Existing pedestrian movements	36
	5.4.4	Resultant Footway widths	36
	5.4.5	Provision for vulnerable users (school children, elderly and mobility impaired)	36
5.5		Servicing	37
5.6		Provision for Adjacent Development	37
5.7		Cash In Transit	37
5.8		Cycle Route and Access	37
5.9		Bus Routes and Stops	37
	5.9.1	Alternative Locations for Buses/ Coaches during Construction and Track Possessions	39
5.10		Coaches	39
5.11		Taxis	39
5.12		Kiss and Ride	40
5.13		Parking	40
5.14		Traffic	40
	5.14.1	Vehicle Speeds	40
	5.14.2	Road Network Changes	40
	5.14.3	Intersection Operation	40
	5.14.4	Freight and Commercial Vehicles	40
	5.14.5	Impact of Construction Traffic on Frontage Roads	41
5.15		Network modelling	42
	5.15.1	Cumulative Impacts	42
6.0		TMP Compliance and Approvals	43
6.1		Compliance with Director General's Requirements	43
Appendix A	Kerbside Changes		
Appendix B	Central Station Forecourt Parking		

Glossary

Term	Acronym / Abbreviation	Description
Acoustic		Pertaining to the sense of organs of hearing, or to the science of sound.
Ambient		Surrounding or existing.
Bored tunnel		An underground tunnel constructed by a tunnel boring machine.
CityRail Station		Existing rail station on the CityRail network
Construction site (or worksite)		Land required for construction activities associated with the project (including storage, amenities, site offices, etc), and may be required for the construction and commissioning phases. A construction site may be temporary (e.g. for Enabling Works such as adjustment to a water main) or long term (e.g. a station construction worksite).
Construction Environmental Management Plan	CEMP	A document setting out the management, control and monitoring measures to be implemented during construction of a development, to avoid or minimise the potential environmental impacts identified during an environmental impact assessment process
Construction Traffic Management Plan	CTMP	Construction Traffic Management Plan is a document prepared by the PRI or IMO contractor (once appointed) for each stage of construction work, and describes the impact and mitigation measures to address changes to traffic conditions resulting from discreet elements and stages of construction activity.
Crossover		Track form to allow trains to move to an adjacent track.
Cut and cover construction		Method of construction for underground structures where a hole is excavated from the surface down, the structure is built and then covered.
Director-General's requirements		Requirements for an environmental assessment issued by the Director-General of the Department of Planning in accordance with the Environmental Planning & Assessment Act 1979.
Diamond Crossover		Two crossovers located adjacent to each other in a diamond formation.
Earth Pressure Balance Machine		Is a mechanised tunnelling method in which spoil is admitted into the tunnel boring machine (TBM) via an arrangement which allows the pressure at the face of the TBM to remain balanced without the use of slurry.
Framework Traffic Management Plan	FTMP	Framework Traffic Management Plan is a document which outlines the processes and systems to be established to control traffic issues which are common to all Metro Worksite locations.
Integrated Metro Operations	IMO	Integrated Metro Operations is responsible for running the Metro Operation, within the permanent route infrastructure and refers to all running systems and operations required to operate the Metro.
IMO contractor		Integrated Metro Operations contractor responsible for rollingstock, rail systems, tunnel services, and station building works, fitout and services including mechanical and electrical.
IMO construction contract		The agreement between the project company and the construction contractor to undertake the IMO works

Term	Acronym / Abbreviation	Description
IMO site access plan		The plans of that name that form part of the project management plans and must be updated by the project company in accordance with the plan and reports schedule
IMO construction traffic management plan	IMO CTMP	Plan for site access for contractors and public during construction and operation phases.
Geotechnical conditions		Relating to the form, arrangement and structure of geology, soils etc.
Kiss-and-ride		Where a car passenger is dropped off at a public transport station/bus interchange by a private car. This is generally by a family member, hence the 'kiss' goodbye.
Maintenance depot		Land including buildings and facilities for the maintenance of the Metro system, including rolling stock and the infrastructure.
Metro railway		A guided system designed to transport passengers on a railway track, together with its infrastructure and associated sidings, that: (a) provides high-frequency commuter and other passenger services, and (b) is operated using automated systems, that are integrated with trains, from one or more central control points, and (c) is operated using dedicated rail infrastructure facilities that are not operationally connected with other types of rail infrastructure facilities.
Metro railway system		(a) a metro railway and its rail infrastructure facilities, and (b) stations, platforms, maintenance facilities, depots and other transport interchanges, works, structures and facilities associated with or incidental to the metro railway or rail infrastructure facilities (including commercial and retail facilities).
Ministry of Transport	MOT	NSW Government Ministry of Transport.
Paid concourse		Area of the station that can only be accessed by ticket holders.
Network Coordination Liaison Group	NCLG	The Network Coordination Liaison Group is a group of stakeholders who are to be formed to ensure that construction related impacts of the CBD Metro are managed with respect to changing road demands and competing interests in the CBD over the life of the construction of the project.
Proponent		The person proposing to carry out development comprising all or any part of the project, including any person certified by the Minister for Planning to be the proponent (such certification to be obtained prior to commencement of the relevant part of the project). Sydney Metro is the proponent for the CBD Metro project.
Permanent Route Infrastructure	PRI	Comprises the civil, tunnelling works and station excavations to be designed and constructed by the PRI Contractor on behalf of Sydney Metro, for handover to the IMO contractor for construction of the IMO Works.
PRI Contractor		(PRI) contractor, responsible for surface works for construction of the Stabling and Maintenance Depot, tunnelling works, and excavation and retaining structures associated with the station boxes
Product		The new metro railway in total including assets, brand, systems, intellectual property, interfaces and metro services

Term	Acronym / Abbreviation	Description
Road header		Machine used to excavate tunnels with a boom-mounted cutting head.
Road User		A road user is any person who uses a road, driveway or footpath, and includes motorists, buses, pedestrians, cyclists, taxis etc.
Rolling stock		Standard single deck metro trains used on the metro railway.
Road Occupancy Licence	ROL	A Road Occupancy Licence is a process whereby an Authority (primarily RTA) gives its approval for an activity which involves removing one or more lane of the road from traffic or parking use to another use – usually temporary construction.
Spoil		Excess material resulting from the cut and fill balance. Generally comprises soil and rock material. All volumes refer to solid volume.
Stabling facility		Location where rolling stock (trains) are stored when not in service.
Station		Refers to proposed Metro station infrastructure, including platforms, concourse, entrance, pedestrian connections, staff facilities and associated requirements/facilities to service the station.
Station Plan		Plans that may be prepared for land on which metro railway stations are to be situated, and land in the vicinity of such metro railway stations, with respect to development, traffic and parking management arrangements, pedestrian links and access facilities, retail and commercial development associated with metro railway stations, public domain amenities and improvements, and other matters ancillary to the operation of metro railway stations and any associated transport or other facilities.
Sydney Metro		Sydney Metro is the NSW Government agency constituted under the Transport Administration Act 1988 to develop a metro railway system, including procuring the CBD Metro and possible future extensions of it.
Speed Zone Authorisation	SZA	A speed Zone Authorisation is a process whereby the RTA gives permission for a change to the speed limit.
Traffic Management Plan	TMP	A traffic management plan is a document which describes the traffic impact and management measures for a specific work area.
Traffic and Transport Liaison Group	TTLG	The Traffic and Transport Liaison Group is a group of stakeholders which will be formed to ensure those stakeholders have the opportunity to review and comment on the traffic management measures and road changes proposed to be put into place to manage traffic on and adjacent to the project.
Tunnel boring machine	TBM	Machine used to excavate tunnels with a circular cross section through a variety of soil and rock strata.
Turnback		Configuration of tracks allowing a train to terminate a service and return to its starting point.
Unpaid concourse		Areas of the station that can be accessed by any member of the public.
Virgin excavated natural material	VENM	Natural material (such as clay, gravel, sand, soil and rock) that: (a) is not mixed with any other type of waste; and (b) has been excavated from areas of land that are not contaminated.

Term	Acronym / Abbreviation	Description
Variable Message Sign	VMS	Variable message signs used to provide advance notice of upcoming works and traffic arrangements and alternate routes and traffic arrangements during the works. Subject to prior approval and availability this may include existing RTA VMS and project VMS.

Executive Summary

This Traffic Management Plan outlines the traffic impact and traffic mitigation measures proposed to be put in place to manage construction of the Central worksites for CBD Metro.

This Plan has been developed at an early stage based on the anticipated traffic management measures that could be selected by the successful contractor/s, once awarded.

Traffic impacts have been determined based on worksite layouts and construction methodologies provided by the CBD Metro TA2100 adviser and are current as to the date of this report. PARAMICS modelling will be undertaken by the RTA to determine the traffic impact of the proposed construction traffic, utilising the CBD and Victoria Rd network models.

There are no network adjustments resulting from this Plan. However there are primarily pedestrian impacts and in particular in relation to the potential relocation of bus stops, which are:

Less direct path for pedestrians currently using the western forecourt to access Central Station with pedestrians diverted to the footpath around the worksite;

- Impacts on Central Station during construction, particularly taxi access, passenger access and flow and way-finding. Disruptions to taxi, coach and other vehicular access to the western forecourt areas of Central and diversion to the Hay Street ramp for access to the main concourse;
- Loss of parking on the western forecourt at Central Station and managing the change with RailCorp, along with other transport services;
- Worksite truck movements crossing pedestrian movements on Pitt Street and Lee Street frontage during the cut and cover construction within the forecourt area;
- Maintenance of access to the Medina Hotel car parking, State Rail food preparation area and small retail outlets, during works affecting Ambulance Lane;
- Truck movements crossing the northern footpath of Eddy Avenue to access to the Belmore Park worksite;
- Potential need to relocate shuttle bus UNSW stops on Eddy Avenue, at the Belmore Park worksite frontage to Pitt Street to the north of Eddy Avenue or Chalmers Street. Provision of new facilities (signage, ticketing machines, shelter) and the associated legibility and capacity of pedestrian access routes to the relocated stops;
- Maintaining pedestrian access and amenity for adjacent businesses, retail, schools, accommodation and residences, e.g. Medina Hotel, Railway Square YHA adjacent to the western forecourt site, Country Comfort Hotel, University of Technology and Sydney TAFE College on George Street.
- Potential need for road crossings e.g. on Elizabeth Street and footpath works associated with the establishment of power supply to worksites and other services relocations;
- Oversized loads may be necessary for deliveries and/or removal of equipment/ materials. Hours of operation may be restricted to night-time hours, subject to EPA requirements. Any oversized loads would be limited one-off events and be subject to RTA restrictions on access routes and times and approval;

The major mitigation strategies recommended for implementation to manage construction impacts resulting from this Plan are:

- Truck size limited to single tipper configuration for spoil movement;
- Truck routes have been selected that result in a minimum of disruption to bus and other critical CBD corridors.
- Traffic controllers to monitor and where necessary to manage pedestrian and construction truck conflict at the Pitt Street/ Lee Street and Eddy Avenue frontage to worksites ; and

- Advance notification of upcoming traffic changes, potential bus stop relocation signage and management, advance directional and advisory signage for pedestrians.

The major residual impacts of the construction traffic on the road network highlighted in this Plan are:

- Increase in truck movements on Pitt St and Lee St and to a lesser extent on Eddy Avenue; and
- Increased distance for pedestrians to walk to the UNSW shuttle bus stop, should relocation be required;

1.0 Introduction

1.1 Project background

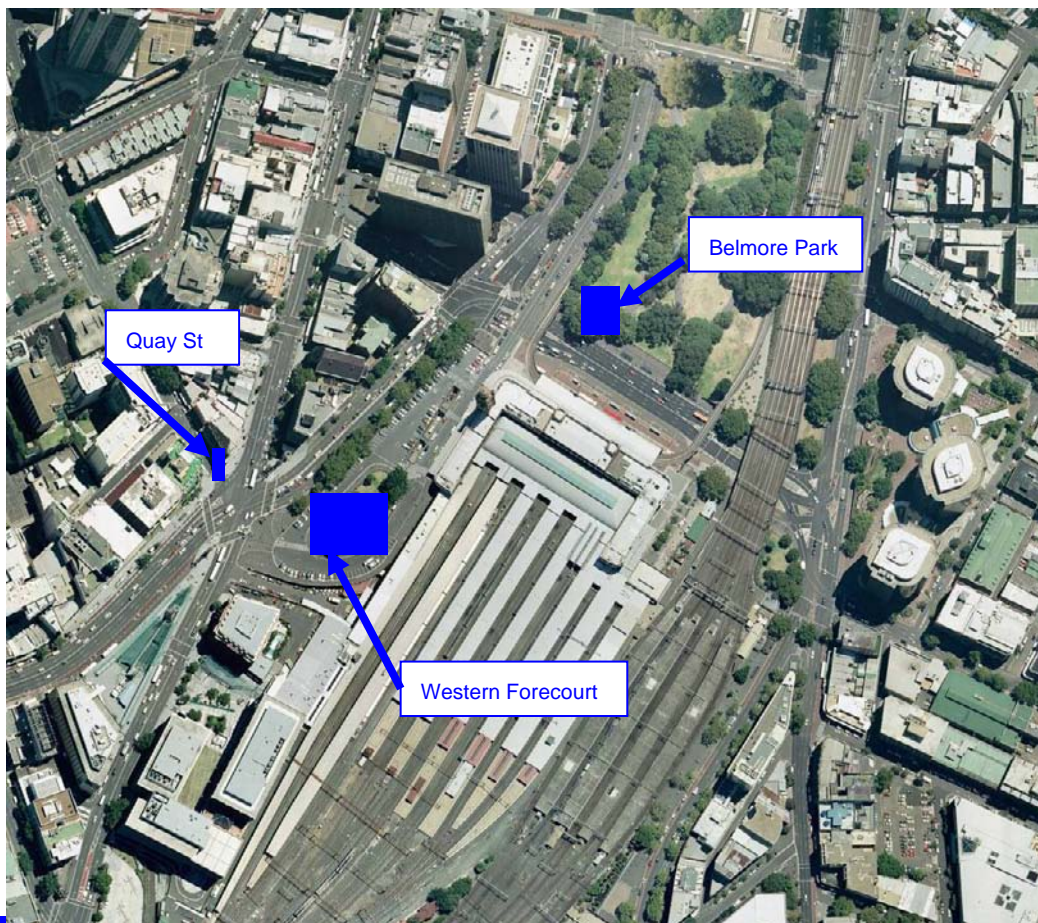
The CBD metro is a 7 km metro line from Central to Rozelle and will be first section in a future Sydney wide metro network. New metro stations are proposed at:

- Central;
- Town Hall Square;
- Martin Place;
- Barangaroo- Wynyard;
- Pyrmont;
- Martin Place; and
- Rozelle

A future station will also be safe guarded at White Bay.

The Metro Central Station is to be located in the southern CBD. The proposed location for the CBD Metro Central Station is shown in **Figure 1.1**. Central is anticipated to be a key interchange station between CBD Metro and CityRail services.

Figure 1.1: Location of Central Station



Source: CBD Base Map, City of Sydney , March 2009, annotated by TA2108, July 2009.

1.2 Scope of this report

This Traffic Management Plan (TMP) for Metro Central Station outlines the construction methodology and timeframes, based on advice from the CBD Metro, Construction Technical Advisors (TA2100); concept staging of works impacting on roads and transport road works; and traffic management measures to mitigate the impacts of construction.

This TMP operates under the Framework Traffic Management Plan (FTMP), which covers traffic management responses and strategic processes, which are common to all work sites, to enable construction of the CBD Metro.

The FTMP identifies a hierarchy of access that was applied in developing traffic management arrangements, i.e.:

- Incidents;
- Events;
- Pedestrians;
- Service Vehicles;
- Cycles;
- Public Transport – Buses;
- Coaches;
- Taxis; and
- Kiss n' Ride.

A further level of traffic management detail will be contained in the Construction Traffic Management Plans (CTMPs), which will be the responsibility of the CBD Metro PRI and IMO contractors, once appointed.

1.3 Hierarchy of construction traffic management plans

This TMP operates under the Framework Traffic Management Plan (FTMP); a further level of traffic management detail will be contained in the Construction Traffic Management Plans (CTMPs), which will be the responsibility of the CBD Metro PRI and IMO contractors, once appointed.

The traffic management plan hierarchy is as follows:

- 1) Framework TMP (Sydney Metro)
- 2) Site Specific TMPs (Sydney Metro)
- 3) Construction TMPs (PRI & IMO Contractors)
- 4) Construction TCPs (PRI & IMO Contractors)

1.4 Report structure

This report operates under the general project requirements and policies outlined in the Framework Traffic Management Plan. The report outlines the site specific strategies for the Pymont Station and is structured as follows:

Section 1	Describes the CDB Metro project and TMP process
Section 2	Describes the Existing Transport context for Pymont Station
Section 3	Outlines the Proposed Work Method
Section 4	Details the Worksite Operation and Management
Section 5	Assesses the Traffic Impact and Mitigation Measures

2.0 Existing Situation

2.1 Pedestrian movements and volumes

Central Station is both the largest and busiest railway station in Sydney. Central is both a catchment and interchange station with significant rail interchange from the Inner West, Liverpool, Bankstown, Airport and East Hills lines; and to a lesser extent the Illawarra and Eastern Suburbs and North Shore Lines and between InterCity services and CityRail services. Compared with the AM peak, services in the PM peak are slightly less intensive, reflecting existing evening passenger demand profiles, which are typically flatter and more spread out in the evenings.

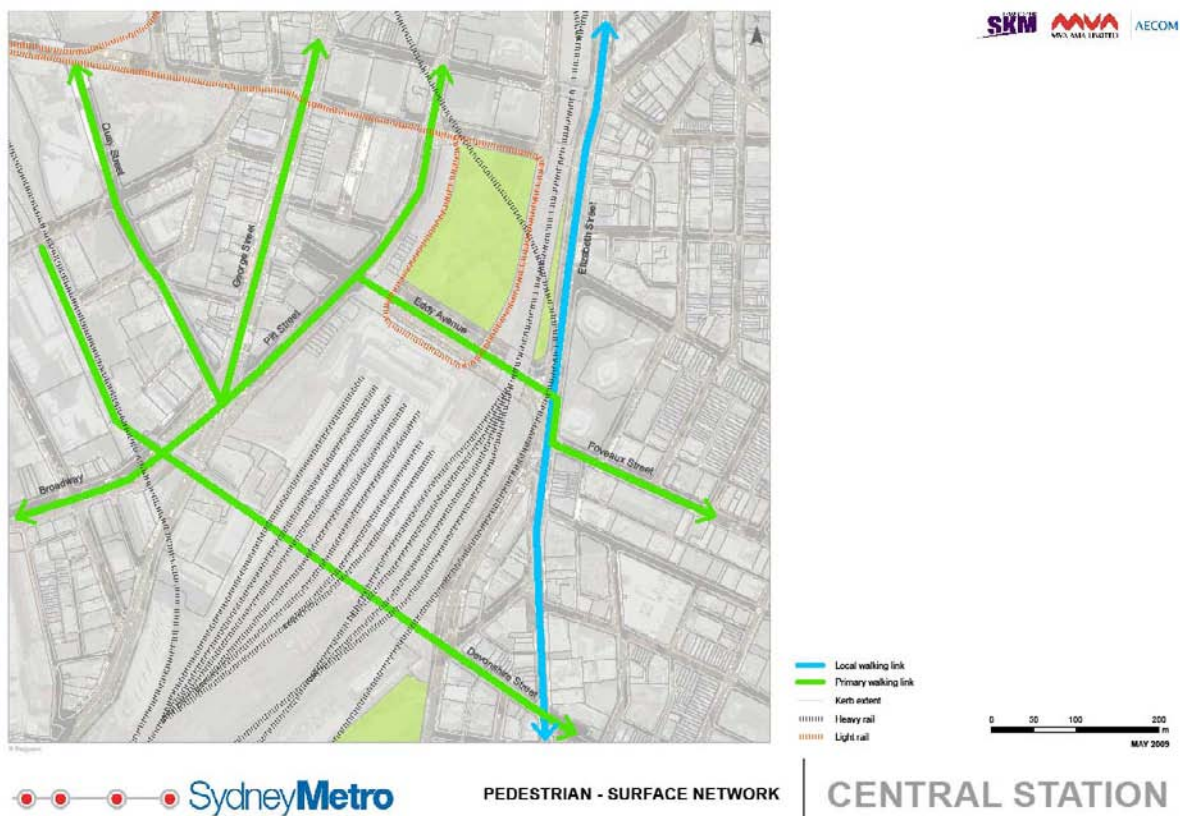
Central Station is also a significant interchange point between rail and bus services (especially to the South-Eastern and Inner-West suburbs. Passenger behaviour at Central varies depending on the type of rail service (terminating or through service) being used. Other key stops for regular route services include Railway Square, Chalmers and Elizabeth Streets.

As well as regular route services to the Eastern and South-Eastern suburbs, Eddy Avenue provides an interchange with express services to UNSW (60 express services depart between 8.00am and 9.00am) during school terms for large volumes of passengers in the morning peak (7.00-10.00am). Refer to Photograph 2.2.

Chalmers Street plays a vital role in the provision of bus services to Sydney Girls and Boys High Schools with 23 direct express bus services carrying a large volume of students each morning.

The pedestrian network in the vicinity of Central is illustrated in **Figure 2.1** following:

Figure 2.1: Pedestrian Surface Network- Central Station



Source: CBD Metro TA2108, March 2009

Central Station is the focus of a dense network of footpaths connecting the station with the CBD, Darling Harbour and Inner Eastern and Western suburbs. All access points into Central Station are connected to the pedestrian network. The Devonshire Street Tunnel provides a key east-west pedestrian link between Surry Hills, Central Station and Railway Square/ Broadway. There are also a number of paid CityRail links that facilitate interchange between the platforms, the main station concourse, the main suburban (northern) concourse and the Devonshire Street (southern) concourse.

Pedestrian connections between the areas east and west of Central Station are limited to Hay Street, Eddy Avenue and the Devonshire Street Tunnel, which puts pressure on footpath capacity and at signalised road crossings.

The footpath on the north side of Eddy Avenue is heavily congested during peak hours, particularly due to students boarding UNSW shuttle services on the northern side of Eddy Avenue and surface connections through Belmore Park, as shown in **Photograph 2.1** and **Photograph 2.2**.

Photograph 2.1: Eddy Ave north side, looking east AM Peak



Source AECOM, April 2009

Photograph 2.2: Eddy Ave north side, looking east at UNSW bus stands, April 2009



Source AECOM, April 2009

Surface crossing of Railway Square can be time consuming due to the two separate signal stages crossing George Street and across Lee Street. The existing pedestrian tunnel below Railway Square is focussed on pedestrians moving between the Devonshire Street Tunnel, Railway Square buses and Broadway.

A number of intersections, including Railway Square, Pitt Street / Eddy Avenue and Foveaux Street / Elizabeth Street currently accommodate high pedestrian volumes, as shown in **Photograph 2.3** and **Photograph 2.4**.

Photograph 2.3: Railway Sq, looking east at George St , April 2009



Source AECOM, April 2009

Photograph 2.4: Pitt St at site access, April 2009



Source AECOM, April 2009

The main (upper level) concourse at the existing station provides access between the eastern and western sides of the station, as well as to the light rail, with approach ramps flanking the eastern and western sides of Belmore Park, as shown in **Photograph 2.5** and **Photograph 2.6**.

Photograph 2.5: Western pedestrian exit from Main Hall , April 2009



Source AECOM, April 2009

Photograph 2.6: Western Forecourt at Station Entry, April 2009



Source AECOM, April 2009

Photograph 2.7: Quay St looking east one way entry from George St, April 2009



Source AECOM, April 2009

2.1.1 AM and PM peak hour surface network

Observations of passengers boarding and alighting bus services were undertaken by AECOM in March / April 2009 during the AM and PM peak periods.

The following observations were made:

- Desire lines of bus passengers and pedestrians are impeded to some degree by congested street furniture and structures within the footpath, for example at Foveaux Street bus stop and Railway Square, when pedestrian movements are concentrated in the AM Peak;
- The outer north-west (M2) bus services which depart from Pitt Street, between Eddy Avenue and George Street, are relatively remote for interchanging rail passengers;
- Poor legibility of the bus network, due to numerous different departure points for buses and poor east west connectivity in the vicinity of the railway station;
- Lack of weather protection on routes to bus stops and at bus stop locations. Limited cover for outbound services on George Street at Railway Square; and
- Issues with lack of way finding and extended walking distances between bus interchanges and rail concourses.

The following observations were made regarding bus stands on Elizabeth St, Foveaux St and Chalmers Streets:

- The bus stops on the southern side of Foveaux Street (westbound) near Terry Street are important alighting stops for bus services from the Eastern Suburbs in the AM peak, i.e. services which proceed on Elizabeth St northbound and do not operate via Eddy Ave;
- The bus stops on the western side of Chalmers Street (northbound) near Devonshire Street are important alighting stops for bus services from the South Eastern suburbs in the AM peak; and
- The bus stops on the eastern side of Elizabeth Street (southbound) near Kippax Street are important boarding stops for South Eastern suburbs.

2.1.2 Surface flows

During AM and PM peak hour, large pedestrian flows are generated by pedestrians exiting and entering Central Station via the ramp between Eddy Avenue, and the suburban concourse, opposite Belmore Park. During the AM and PM peak hours respectively, 7,888 (two-way) and 6,548 (two-way) pedestrians were surveyed (April, 2009) crossing Eddy Avenue, north of the main suburban entrance to Central, as seen in **Table 2.1**.

Table 2.1: Pedestrian flows across Eddy Avenue (north of Central Station exit) during AM, Midday and PM Peak Hours, April 2009

Direction	Eddy Avenue, north of Central station exit (pedestrians per hour)		
	AM	Midday	PM
Northbound	6888	1634	1540
Southbound	1000	1730	5008

Source: AECOM, based on R.O.A.R., Austraffic and SkyHigh survey companies data (April, 2009)

The Pitt Street / Eddy Avenue intersection is heavy utilised by pedestrians, particularly students boarding the University of New South Wales (UNSW) shuttle services and other bus services on the northern side of Eddy Avenue. Peak hourly crossing volumes totalled a total of 1,554, 1,377 and 1,674 pedestrians in the AM, Midday and PM peak hours respectively. North-south movements at the intersection were lower, but also significant. The major pedestrian movement is south of the intersection in both directions, as shown in **Table 2.2**.

Table 2.2: Two-Way Pedestrian Flows at Pitt St/ Eddy Ave intersection during AM, Midday and PM Peak Hours , April 2009

Location	Pitt Street / Eddy Avenue intersection (pedestrians per hour)		
	AM	Midday	PM
North of intersection	513	253	512
South of intersection	1041	1124	1162
East of intersection	444	304	480
West of intersection	571	409	542

Source: AECOM, based on R.O.A.R., Austraffic and SkyHigh survey companies data (April, 2009)

The most significant flow of pedestrians on the western side of the station is via the main station entrance and western forecourt. These flows exceed 2,000 (total in both directions), with the peak flows being westward towards Railway Square in the AM and eastward into the station in the PM. These movements are summarised in **Table 2.3** following.

Table 2.3: Pedestrians crossing Western forecourt at Central Station during AM, Midday and PM Peak Hours, April 2009

Location	Pitt Street / Eddy Avenue intersection (pedestrians per hour)		
	AM	Midday	PM
Inbound (To station)	491	762	1360
Outbound (From station)	2140	818	853
Total Two-way	2631	1580	2213

Source: AECOM, based on R.O.A.R., Austraffic and SkyHigh survey companies data (April, 2009)

Figure 2.2 and **Figure 2.3** following illustrate the AM and PM Peak Hour pedestrian flows respectively.

Figure 2.2: AM Peak Pedestrian Surveys at Central Station-April 2009

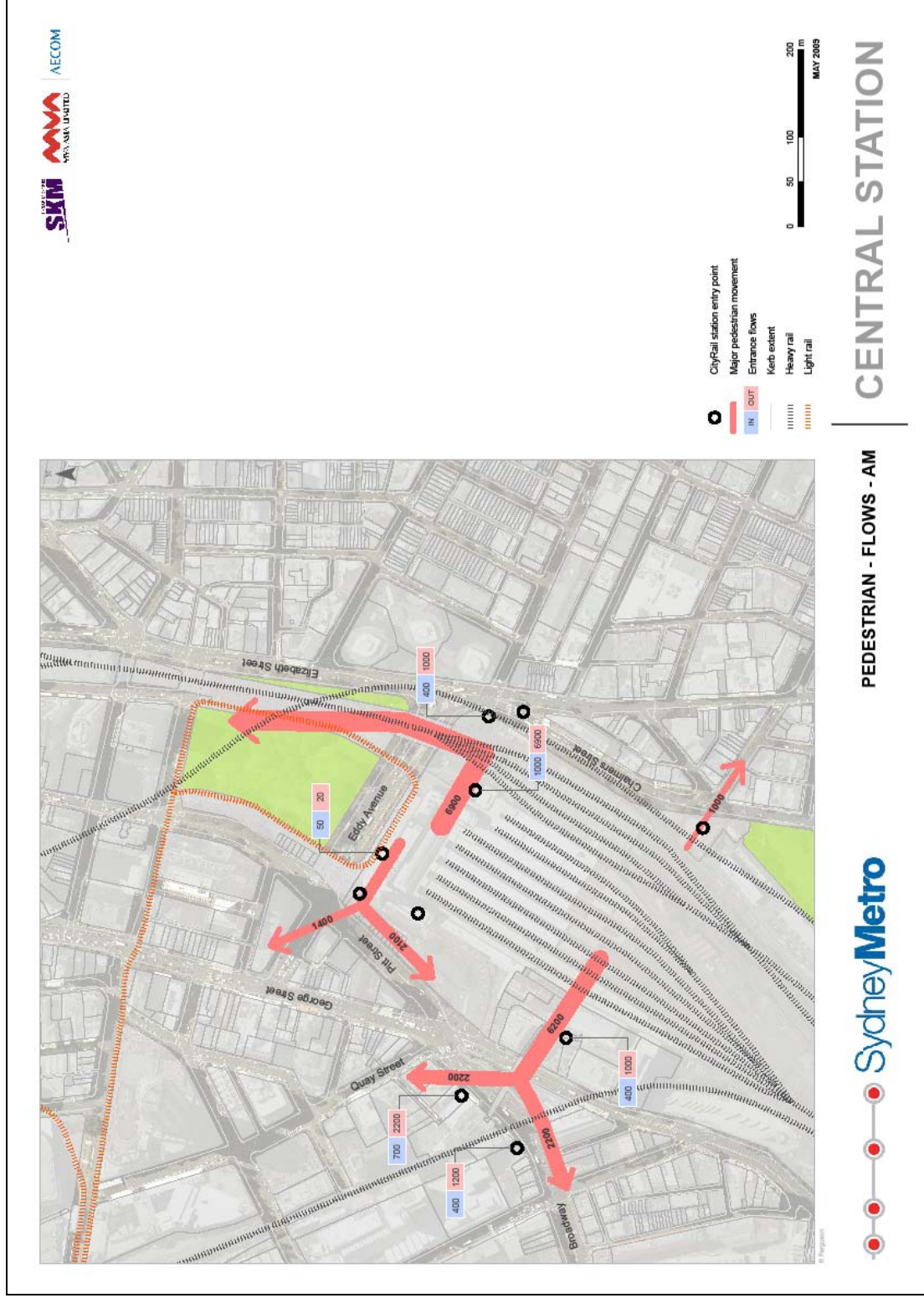


Figure 2.3: PM Peak Pedestrian Surveys at Central - April 2009



2.1.3 Sub-surface flow- Devonshire St Tunnel

The Devonshire Street Tunnel caters for both through pedestrian flows and also for pedestrians going to and from the suburban platforms (16-25) via the concourse at the eastern end.

Pedestrian flows through the Tunnel are highest during the AM peak hour with a total of 7,208 (2-way) pedestrian movements recorded. During the midday and PM peak hours, the flows are also high, although slightly lower than during AM peak hour with 3,849 (midday peak hour) and 6,584 (PM peak hour) pedestrians walking through the Devonshire Tunnel in both directions, as summarised in **Table 2.4**.

Table 2.4: Devonshire Street Tunnel Pedestrian Flows during AM, Midday and PM Peak Hours, April 2009

Direction	Location (pedestrians per hour)								
	Broadway Entrances			Devonshire Tunnel Western entrance			Through the Devonshire Tunnel		
	AM	Midday	PM	AM	Midday	PM	AM	Midday	PM
In	1062	1924	1293	371	630	291	6189 (WB)	2218 (WB)	2104 (WB)
Out	3333	1573	1265	976	547	469	1019 (EB)	4366 (EB)	1745 (EB)
Total	4395	3547	2558	1347	1177	760	7208	6584	3849

Source: AECOM, based on R.O.A.R., Austraffic and SkyHigh survey companies data (April, 2009)

2.2 Bus routes and stops

Interchange at Central Station is available between rail, bus, light rail, taxi and coach. There are currently multiple locations for bus and CityRail interchange, with bus stops located in Railway Square, (George St), Railway Square (Lee Street), Pitt Street, Eddy Avenue, Foveaux Street, Elizabeth Street and Chalmers Street.

The following observations were made at the bus stands on Elizabeth St, Foveaux St and Chalmers St:

- The stop on the southern side of Foveaux Street (westbound) near Terry Street is an important alighting stop for bus services from the Eastern Suburbs in the AM peak;
- The stop on the western side of Chalmers Street (northbound) near Devonshire Street is an important alighting stop for bus services from the South Eastern Suburbs in the AM peak. The stops on the western side of Chalmers Street between Devonshire and Foveaux streets are important boarding stops for students travelling to Sydney Boys and Sydney Girls High Schools at Moore Park; and
- The stop on the eastern side of Elizabeth Street (southbound) near Kippax Street is an important boarding stop for South Eastern suburbs; and

Eddy Avenue (northern side) is an important boarding point for Eastern and South-Eastern suburbs services. In particular, it is the departure point for express services to UNSW (60 direct services between 8.00am and 9.00am during school terms), with large passengers volumes in the morning peak (7.00am-9.00am). Chalmers Street, as mentioned plays a vital role in the provision of school services to Sydney Girls and Boys High Schools with 23 direct express services carrying a large volume of students each morning during school term.

The following observations were made at the bus stands on Eddy Avenue:

- The stops on the northern side (eastbound) near Belmore Park are important boarding stops for express bus services to the University of New South Wales in the AM peak and boarding stops for Eastern Suburbs and South Eastern suburbs in the PM Peak; and
- The stop on the southern side (westbound) opposite Belmore Park is an important alighting stop for bus services from the Eastern Suburbs in the AM peak.

The following observations were made regarding bus stands at Railway Square:

- The stop on the western side of George Street (northbound), south of Quay Street, is an important alighting stop for bus services from the Inner West and South Western suburbs in the AM peak;
- The stops on the eastern side of George Street (southbound) near Lee Street are important boarding stops for bus services to the Inner West and South Western suburbs in the PM peak;
- The stop on the eastern side of Lee Street (southbound) near George Street is an important alighting stop for services from the Northern Beaches, Outer North Western, Eastern and South Eastern suburbs in the AM peak;
- The stop on the western side of Lee Street (northbound) near George Street is an important boarding stop for the Northern Beaches, Eastern and South Eastern suburbs in the PM peak; and
- The stop on the western side of Pitt Street between George Street and Rawson Place is an important boarding stop for the Outer North Western suburbs (M2) in the PM peak.

The location of existing bus routes are shown in **Figure 2.4** and **Figure 2.5**.

Figure 2.4: Existing Bus Routes -AM



Figure 2.5: Existing Bus Routes -PM



Key bus stands in the precinct include:

- Eastern and Western sides of George Street at Railway Square;
- Western and Eastern sides of Lee Street, at Railway Square south of Pitt Street / George Street intersection;
- Western side of Chalmers Street, south of Devonshire St and south of Eddy Ave; and
- Eddy Ave (both sides), between Elizabeth Street and Pitt Street.

2.3 Coaches

The Sydney Coach Terminal was established at Central Station in the 1990's as Sydney's first consolidated but 'interim' coach terminal. It is currently located at street level with coach bays along the southern side of Eddy Avenue and the eastern side of Pitt Street, and ticketing facilities and passenger waiting areas mainly within the Eddy Avenue frontage of Central Station.

Observations during AM and PM peak periods, suggest that the number of available dedicated coach bays accommodates demand, although these peak hours are not necessarily the times of peak demand for coach parking. Observations of the current coach operations at the station frontage are:

- The STC at Central caters for interstate and long distance intrastate coaches;
- Coaches operate out of 14 kerb side bays around Central Station in Eddy Avenue and Pitt Street;
- Passengers boarding or alighting coaches are largely exposed to the elements with little or no protection during inclement weather;
- The recently upgraded ticket booking office at STC is located within the station building with an entrance on Eddy Avenue;
- Railcorp's CountryLink coaches also operate from these bays; its' ticket booking office is located at the CountryLink office within the main station (on the upper level); and
- During CityRail trackwork shutdowns, (typically at weekends), rail replacement buses and coaches generally operate from either Chalmers Street, Eddy Avenue (south side), or from the western Central forecourt on the Railway Square side of the main station.

The Ministry of Transport (MoT) is reviewing the future of the coach station at Central Station with a view to possible future relocation.

2.4 Light rail

The Light Rail runs from Central Station via Hay St, Chinatown and Darling Harbour to the Star City Casino, the Sydney Fish Markets and Wentworth Park and operates 24 hours a day and seven days a week. The Central to Star City services run about every 10-15 minutes between 6.00am and midnight and every 30 minutes between midnight and 6.00am. The Central to Star City Light Rail's principal role is carrying tourists to and from the tourist areas of Star City and Central. The light rail route in the vicinity of Central is shown on **Figure 2.6**.

Figure 2.6: Existing Light Rail Network



Source: CBD Metro TA2104, April, 2009

Interchange volumes between Light Rail and CityRail (from suburban platforms) are low due to long walk distances (more than 250 metres), the absence of fare integration; and relatively infrequent service patterns of Light Rail.

2.5 Taxis

Dedicated taxi drop-off and pick-up facilities are currently located on the ramp to the Grand Concourse and on the western side of Chalmers Street, between Devonshire Street and Eddy Avenue. Taxi ranks service passengers exiting the main entrance of Central Station at the western concourse, as well as via the Chalmers and Devonshire Street entrances on the eastern side of the station.

There are several informal drop-off areas (kiss and ride) near Central Station located on Lee Street, Eddy Avenue, Chalmers Street and Elizabeth Street. **Table 2.5** summarises the taxis ranks in the vicinity of Central.

Table 2.5: Location of Taxi Ranks - Central

Street	Location	Side of street	Hours of operation	Capacity (approximate)
Central Railway	Main entrance (western forecourt (Central Station))	n/a	Full time	23
Chalmers Street	South of Eddy Avenue (Central Station)	West	Full time	5
Chalmers Street	Between Randle Street & Elizabeth Street	East	Full time	5
Chippendale - Lee Street	Between Regent Street & Railway Square	West	Full time	2

Source: CBD Metro TA2104, May 2009

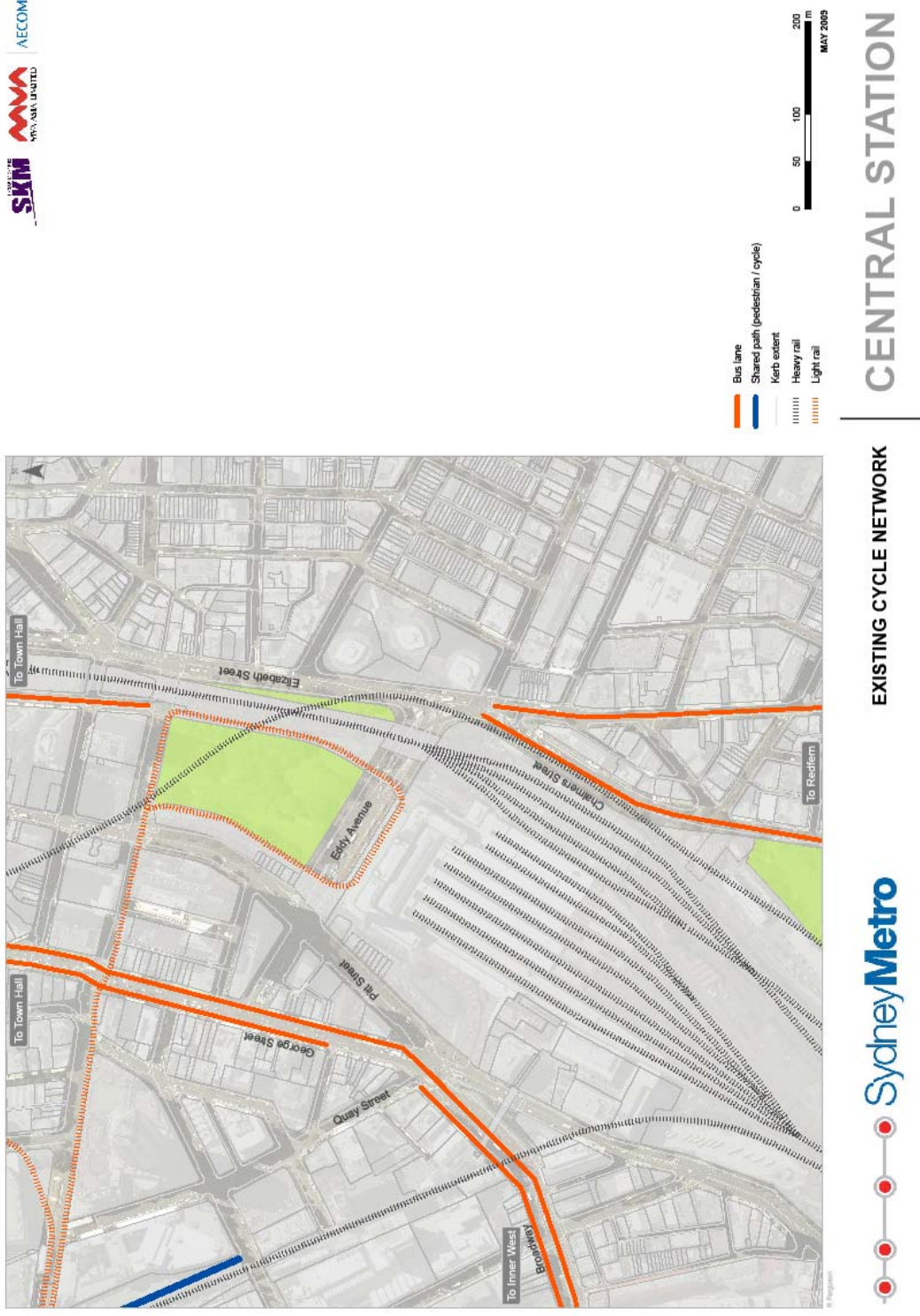
2.6 Cyclists

There are no dedicated cycle lanes on roads surrounding Central station. While bus lanes on George Street, Elizabeth Street and Chalmers Street can legally be used by cyclists, however, high bus volumes impact on cyclist use.

No dedicated bicycle parking is currently available at Central Station limiting public cycle parking to street lighting poles. Bicycle storage is available at the Goulburn Street car park, 600m north of Central.

City of Sydney Council has a strong commitment to increasing cycling mode share. Regional cycle routes (generally segregated on-road) are proposed by City of Sydney on Elizabeth, Regent, Lee, and Devonshire streets. These cycle routes are due for implementation in the next 3 years (by 2012). In addition to those routes, a new regional cycle links are proposed by City of Sydney over the CityRail lines connecting Prince Alfred Park to the CUB site and local cycle routes are proposed through Belmore Park. The existing cycle network is shown on **Figure 2.7**.

Figure 2.7: Existing Cycle Network at Central Station



2.7 Parking

The western forecourt area at Central Station currently provides parking for RailCorp staff, set-down and pick-up facilities for taxis and private vehicles giving access to the Countrylink and InterCity platforms and suburban platforms beyond. There are also few short term spaces available for the public. At the Eddy Avenue frontage, 13 bays dedicated to coach and bus parking are provided, with various small retail outlets, including the Sydney Coach Terminal offices. A further two coach parking bays are located on the Pitt Street frontage, south of Eddy Ave.

The Chalmers Street frontage is allocated to bus zones for private and STA bus operators; at peak times in the morning, the bus zone kerbspace is fully utilised by buses laying over or for loading / unloading passengers.

2.8 Traffic signals

Traffic signal control is provided at all intersections on approach and departure from the station, i.e.:

- Eddy Ave at Elizabeth Street and at Pitt Street;
- George Street at Broadway , Pitt and Lee Streets and at Rawson Place;
- Pitt Street at Hay Street, and
- Lee Street at Regent Street and Regent Street at Cleveland Street.

2.9 Existing road network

Figure 2.8 shows the existing road hierarchy in the vicinity of Central.

Major intersections at Broadway, (Pitt Street, George Street, Lee Street); and Eddy Avenue (Pitt Street, Elizabeth Street and Foveaux Street) are typically congested. Harris Street (southbound only) functions as a major arterial corridor linking Pyrmont to Central / Railway Square interchanges. The sub-arterial roads (north to south) include Pitt Street, Castlereagh Street and Wentworth Avenue. The sub arterial roads feed traffic into and out of Elizabeth Street. The most extensive local road networks are located within the suburb of Surry Hills to the east and feed onto Elizabeth Street.

The north-south routes of Broadway, George Street, Lee Street and Chalmers Street / Elizabeth Street carry traffic volumes of up to 30,000 vehicles per day. The arterial corridors of Broadway, Lee Street and Chalmers Street / Elizabeth Street to the south have the highest demand and provide the key vehicular routes into and out of the CBD from the south. Hay Street intersecting with Pitt Street and George Street accommodates light rail movements and through signalised intersections.

2.9.1 Traffic volumes and turning movements

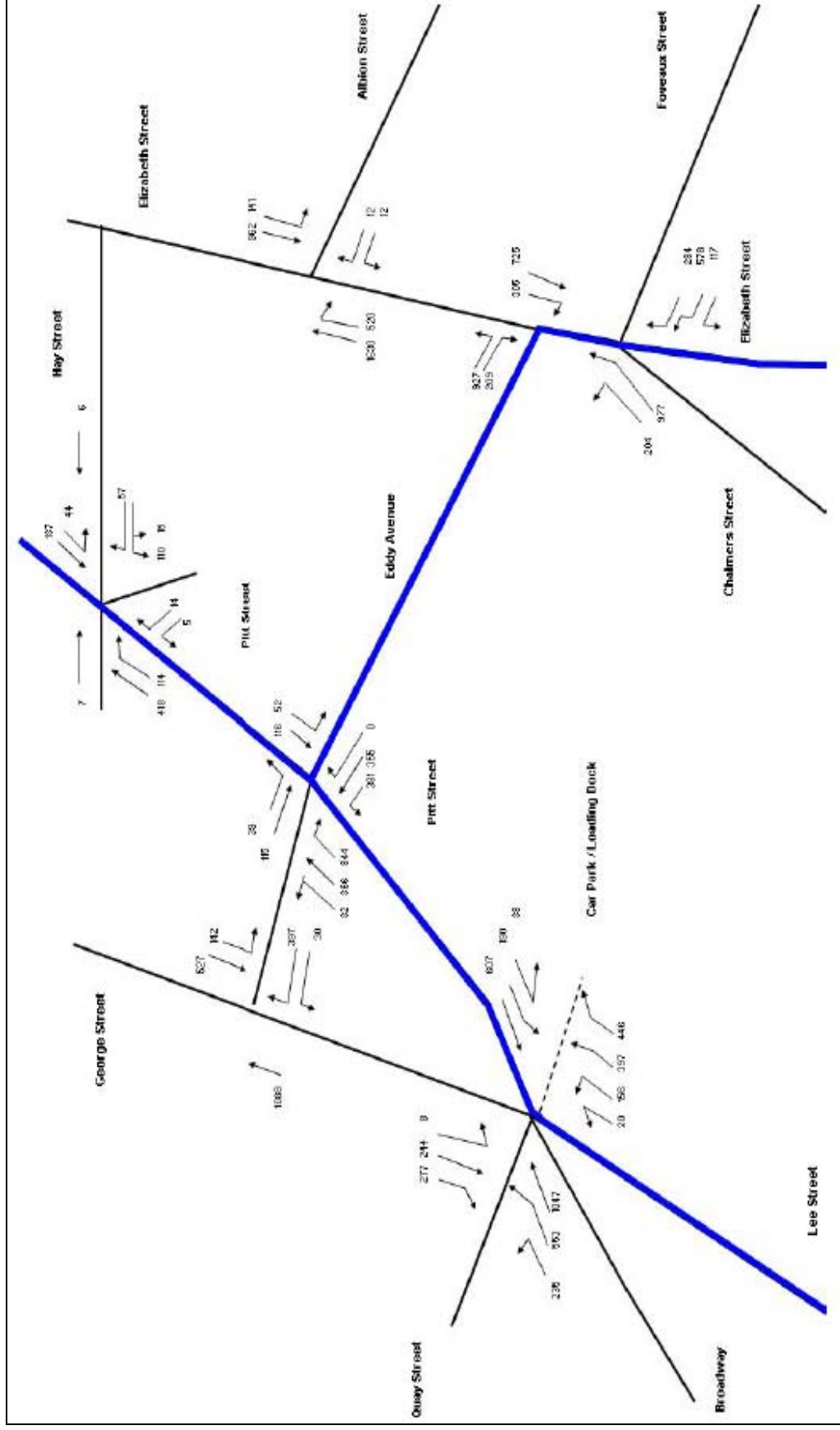
The limited number and indirect nature of east-west traffic routes around Central station results in congestion at key signalised intersections. Traffic travelling between the eastern and western sides of the station and vice versa is funnelled via Pitt Street, Eddy Avenue, Elizabeth/Chalmers St and Foveaux/Albion Streets. These traffic flows conflict with high pedestrian flows between Central Station, buses and surrounding attractors. Cleveland Street, the next east-west route to the south, is also very congested in peak periods.

The AM and PM peak hour flows, as adopted for the RTA PARAMICs model (2007), are illustrated in **Figure 2.9**. **Figure 2.10** shows the surveyed pedestrian counts.

Figure 2.8: Existing Road Hierarchy at Central Station

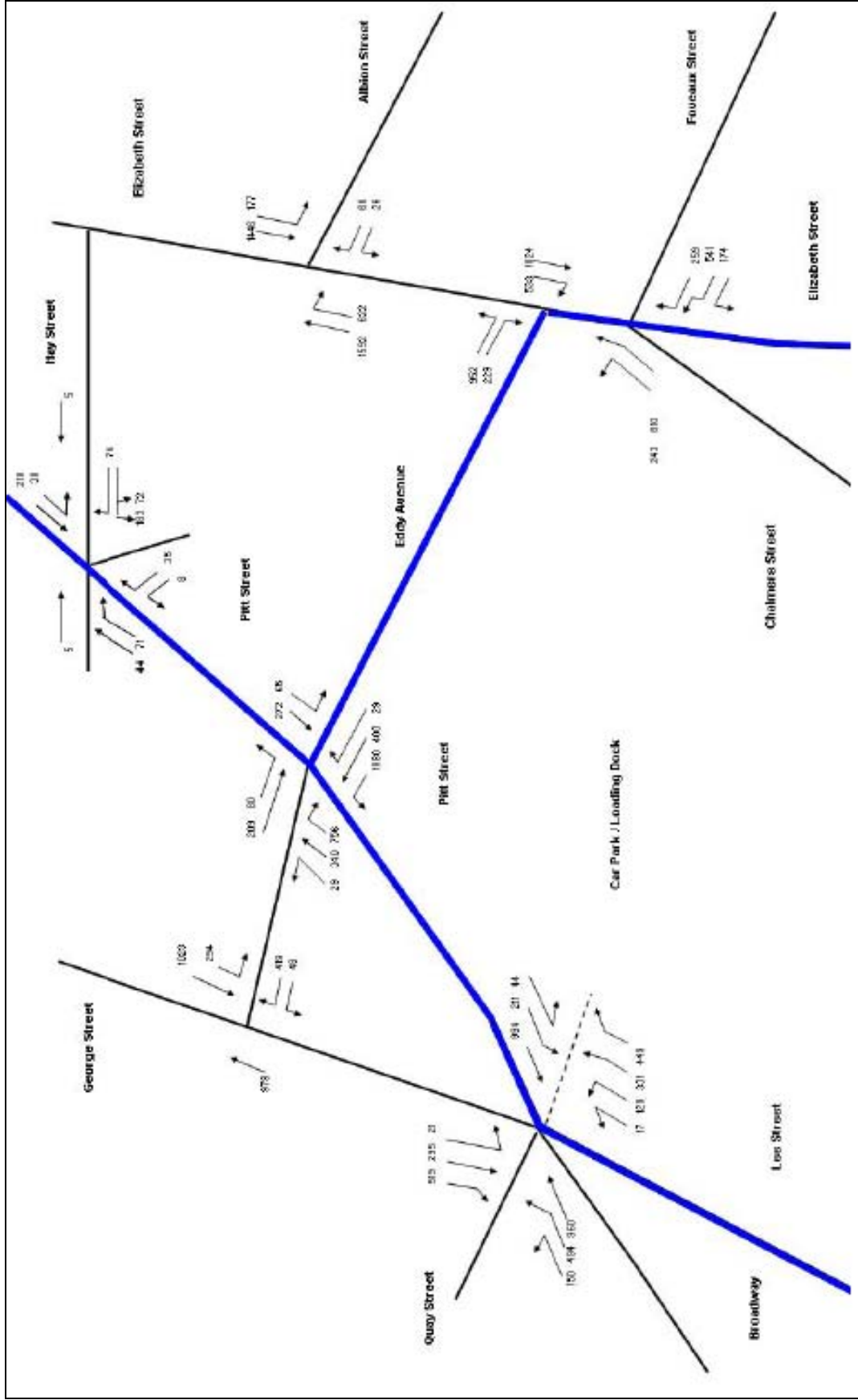


Figure 2.9: AM Peak Hour Traffic Flows at Central Station, 2007



Source: RTA Traffic Surveys (December 2007) for PARAMICS CBD Model

Figure 2.10: PM Peak Hour Traffic Flows at Central Station, 2007



Source: RTA Traffic Surveys (December 2007) for PARAMICS CBD Model

2.10 Adjacent developments

The Central sub-precinct is dominated by Central Station, UTS campus and Sydney Technical College and the Carlton United Breweries (CUB) site, which is currently subject to redevelopment proposals.

Central Station is a major heritage listed building bounded by Eddy Avenue and Belmore Park to the north, Lee Street / George Street to the west and Chalmers Street to the east. Areas around Central Station in the southern CBD have the highest residential component of land use when compared with other parts of the CBD. In addition, there are a number of backpackers, hostels and hotels in close proximity to Central, reflecting its attractiveness to travellers as a major transport hub. The CUB site has recently received approval for a major mixed use development, incorporating offices and apartments.

2.10.1 Vehicular access

Access to the existing western forecourt at Central is via a dedicated left turn slip lane from Pitt Street and left turn exit to Lee Street. These movements are unsignalised; with drivers giving way to pedestrians on the entry and exit lanes and once inside the parking area.

The light rail approaches the northern concourse via the Hay Street and Pitt Street signals and ramps over Eddy Ave to the colonnade light rail stop on the main concourse level, before ramping back down to Hay Street, near the Castlereagh Street junction. A vehicle / pedestrian ramp parallels the light rail ramp from Hay Street and provides a second point of access to the western forecourt.

The adjacent Medina Hotel site on Lee Street, State Rail food preparation areas, minor retail outlets and backpacker hostel are accessed from Ambulance Lane off Lee Street and the access road adjoining the proposed Central Station worksite.

2.11 Bus arrangements during CityRail Construction affecting Central Station or track possessions

RailCorp utilises various street frontages around Central to accommodate bus bays dislocated by construction impacting on Central Station or during times of track possessions. The preferred locations are:

- 1) Eddy Avenue;
- 2) Western forecourt;
- 3) Chalmers Street, south of Devonshire Street;
- 4) Chalmers Street, north of Devonshire Street; and
- 5) Pitt Street corner of Eddy Avenue

There are some RailCorp 15 configurations of bus stop locations, with the majority involving Eddy Ave (1) and/or the western forecourt (2). RailCorp officers advise that over the past two years there have been a number of occasions when buses have relocated to allow construction work at Central to take place.

3.0 Proposed Work Method

3.1 Work method

The underground stations along the proposed CBD Metro route will be cavern stations with the exception of White Bay station, which will be constructed using cut and cover techniques

Cavern stations are planned at locations where there are depth or land use restrictions for construction of cut and cover stations. Caverns are required to be in competent ground conditions to ensure the large spans required for the stations can be supported.

Cavern stations will primarily be mined with surface structure elements such as entrance, emergency egress and ventilation shafts constructed using cut and cover techniques similar to typical building basement methods.

A primary worksite will be established at the surface to support all stages of cavern station construction and secondary worksites will be required to support shaft construction activities. The site constraints at the surface are considerable with impacts on pedestrian and vehicular traffic for four or more years at each station primary worksite and to a lesser extent at secondary worksites.

Station shafts will be excavated using conventional excavation methods and the caverns will be excavated using roadheaders and rock breakers. It is envisaged that cavern excavation would be completed prior to the arrival of the Tunnel Boring Machines (TBMs) constructing the running tunnels. TBMs will be pulled through the station and prepared for the tunnel drive to the next station. A range of activities will be required at the primary worksite to support this process.

The main truck generating activity will be associated with spoil removal from the excavation of cavern stations, entrance, emergency egress and ventilation shafts, as discussed in Section 4. Other activities that will be supported by truck movements include:

- Enabling works will include building demolition works for property at primary worksites; temporary construction power supply installation; utilities/services relocation or diversion clear of the works and site establishment of station worksites;
- Ground support and lining works for station caverns with plant and material delivered to the underground cavern from the surface;
- Structural concrete works for station entrances, emergency egress and ventilation shafts, followed by internal building works and station architectural fit-out/finishes;
- Specialised installation works associated with station platforms, concourses, accommodation and circulation areas, services and other amenities, station entry/exit gates, platform screen doors and barrier installation.
- Mechanical and electrical fitout of station services and communication systems (including local power supply, lighting, public address, plant room cooling/humidity control; building management systems, smoke exhaust, gas purging, water and waste water, mechanical ventilation, etc.);
- Underground pedestrian concourse areas are to be constructed by combination of mining methods (to minimise disturbance of the road surfaces); and
- Testing and commissioning station systems.

The indicative station construction staging and indicative construction timeframe for the construction activities are summarised in the following table.

3.2 Indicative construction timeframe

An indicative construction program timeframe is shown in **Table 3.1** following.

Table 3.1: Indicative Construction Timeframe

Construction Staging Activities	Indicative Station Construction Timeframe												
	2010	2011	2012	2013	2014	2015							
Enabling & Site Establishment Works	█	█	█										
Shaft & Cavern Excavation		█	█	█	█	█	█						
Ground Support and Cavern Lining					█	█	█						
Structural Concrete Works						█	█	█	█				
Specialised Installation Works									█	█	█	█	█
Mechanical and Electrical Services									█	█	█	█	
Underground Pedestrian Link Works				█	█	█	█	█	█				
Systems Testing and Commissioning												█	█

Source: CBD Metro TA2100, 9 July 2009.

4.0 Worksite Operation and Management

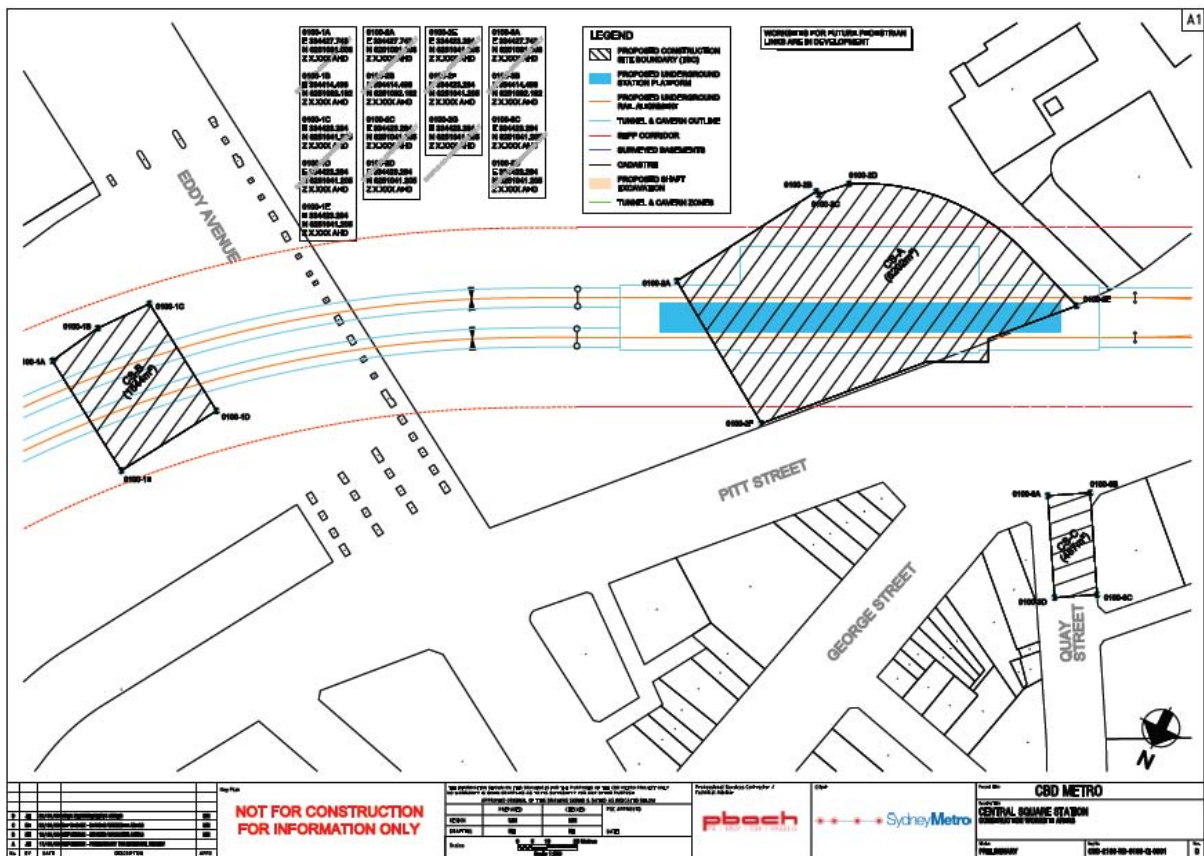
4.1 Worksite locations

The southern shaft would be located in the south-western portion for the Central Station western forecourt (Western Forecourt site) bounded by Pitt St and Ambulance Av. This area currently includes a small car park, 159 parking spaces for commuter and staff and vehicular access to the Country Trains platforms for private vehicles and CityRail replacement buses.

The northern shaft would be constructed within the south western corner of Belmore Park and across Eddy Ave. The worksite in Belmore Park is required to construct the north-eastern portion of the station cavern.

Worksite locations for Central Station are proposed, as shown in **Figure 4.1**.

Figure 4.1: Central Station – Worksite Locations



Source: Extract from Central Construction Worksite Areas, CBD Metro, PBACH 23/06/09.

4.2 Site access and egress

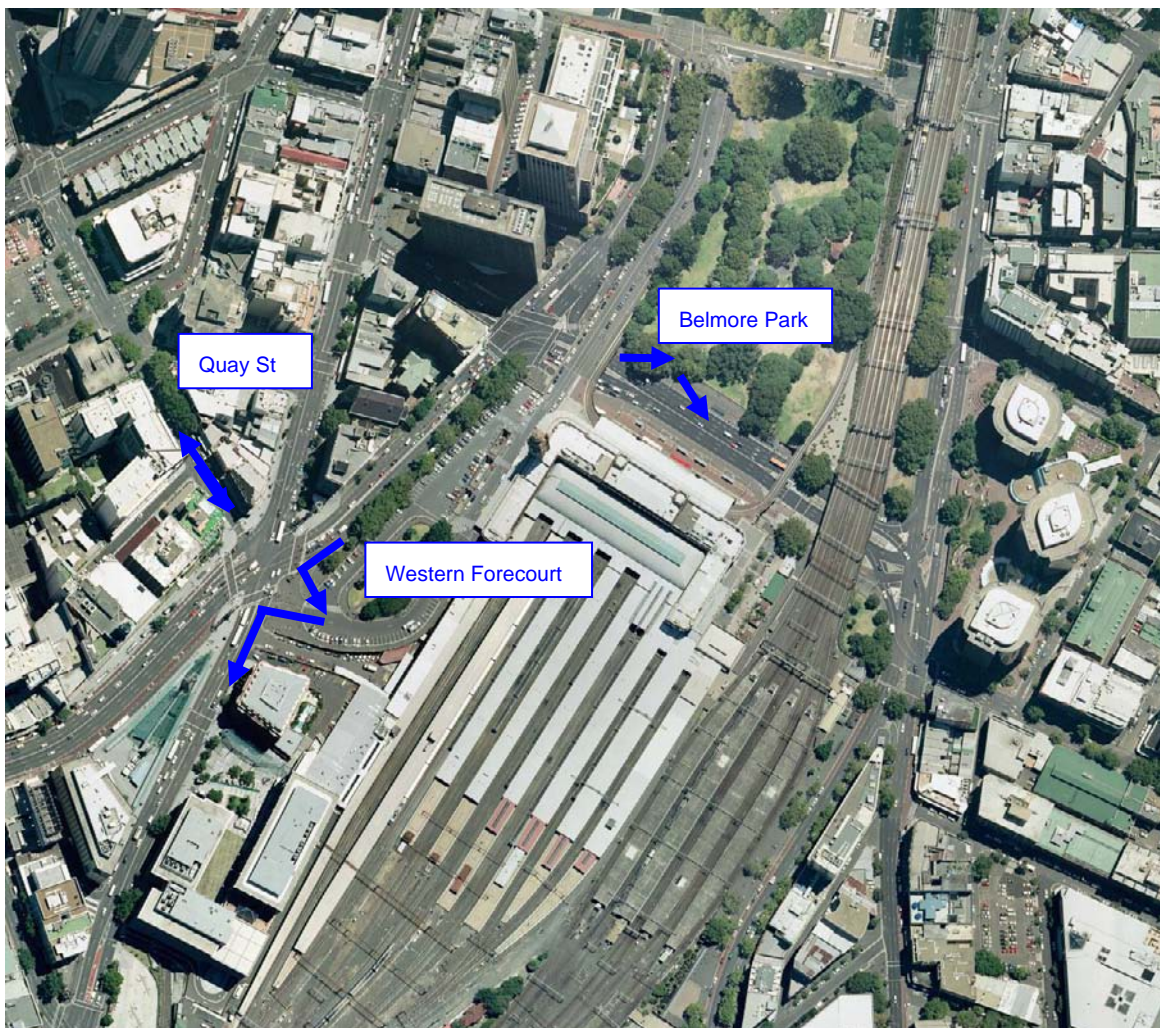
4.2.1 Truck access locations

Access to the main worksites at Central is proposed as follows:

- a) Western forecourt
Truck access to the main worksite is proposed via the existing left turn slip lane on entry from Pitt Street, and exit via left turn to Lee Street southbound.
- b) Belmore Park / Eddy Avenue north side, east of the access ramp overbridge.
Truck access is proposed via a left turn entry and exit from Eddy Avenue.
- c) Quay Street is a minor worksite for the construction of pedestrian access to the underpass of George Street. Truck access is proposed from Quay Street.

The site locations and access are diagrammatically illustrated on the attached **Figure 4.2**.

Figure 4.2: Worksite Locations and Access at Central Station



Source: CBD Base Map, City of Sydney, March 2009, annotated by TA2108, July 2009.

4.2.2 Truck manoeuvring requirements

It is assumed that concertina gates to control pedestrians crossing the site access driveways would operate in parallel with the outside edge of site boundary hoardings. The wider the driveway (and separation of the concertinas), the less the lane width required on the street from which the truck is either entering or departing in order to allow it to turn to or from the kerbside lane.

In order to assess this requirement, and AUTOTRACK turning path simulation has been undertaken for a 10.5m truck. The worksite boundaries have been established having regard to this truck size.

4.2.3 Access for workers

Access for workers will be via the existing pedestrian footpath network or via a shuttle bus to the site. Provision of a shuttle bus service will be a matter for the PRI and IMO contractors to consider. The most likely sites for worker parking and an associated shuttle bus service is White Bay and possibly Barangaroo.

It is assumed that workers who do not use the shuttle bus, or if a shuttle bus is not provided, will arrive at the various sites by public transport. Given the high levels and accessibility of public transport to the CBD and that construction hours not coinciding with peak periods for office workers, the use of public transport is not anticipated to be an issue.

4.2.4 On site parking

The limited areas available for on site parking will generally preclude the provision of on site parking for the general workforce. However there may be limited parking required for operational purposes at each of the sites for the project engineer / foreman / inspectors etc which may account for one or two vehicle spaces.

Access to worksites for material and equipment required by tradespersons during IMO / fit out stage may be limited either by size constraints or other concurrent activities. Consideration will be given to storing materials and equipment remotely at either White Bay or possible Barangaroo and transferring them when needed.

4.2.5 Approach and departure routes for trucks

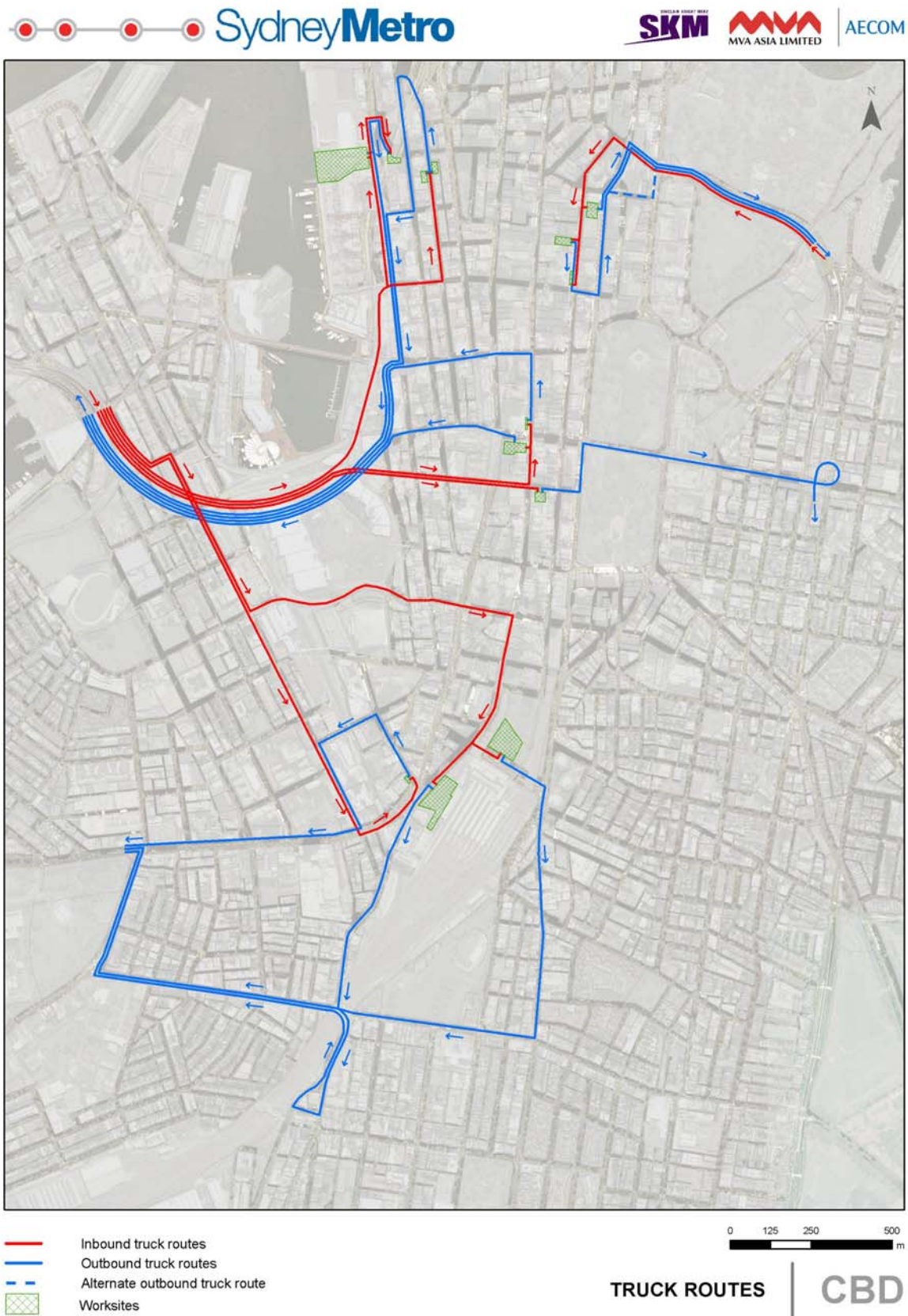
The approach route for all sites is proposed via the Anzac Bridge, off-loading to Harris Street and using the Pier Street Bridge to approach via Goulburn Street eastbound and turning right to Pitt Street (southbound). Trucks entering the main worksite on the western forecourt site at Central Station would use the existing left turn slip lane from Pitt Street.

Similarly for the Eddy Avenue worksite(s), trucks approaching southbound on Pitt Street would turn left into Eddy Avenue and enter the site via a left turn. The limited site area for the Belmore Park site will mean trucks remain parallel to Eddy Avenue and exit via a left turn to Eddy Avenue. The removal of the TBM will require will require a separate approval to the proposed route and times of travel.

Trucks departing the main worksite will exit via a left turn to Lee Street, (as per existing exit arrangements) continue on Regent Street, turn right to Lawson Square and Gibbons Street and return to Cleveland Street, exiting via City Road to Parramatta Road. Trucks departing the Eddy Avenue worksite would follow a similar route, although exiting via Elizabeth Street will permit a right turn directly to Cleveland St without the need to proceed to Lawson Square.

Figure 4.3 following shows the truck approach and departure routes for the CBD worksites.

Figure 4.3: Truck Routes for CBD Metro Worksites



Source: CBD Metro TA 2108, July 2009

4.2.6 Truck manoeuvring requirements

The existing access roadways for the western forecourt area are adequate for the larger single unit trucks likely to use the site.

The Belmore Park worksite is constrained, due to the site limitations and the location, a smaller 8.8m single unit dump truck or possibly a 10.5m truck is likely to be the maximum size truck to use this site for ongoing spoil removal operations. The Quay St is further constrained in area and the smaller 8.8m truck is the likely maximum size truck to use this site for spoil removal.

4.3 Management of worksite access

4.3.1 Site security

The Central worksite(s) will be hoarded off to provide public safety and site security. Pedestrian walkways will be maintained on the southern edge of the western forecourt site to maintain pedestrian access to the main concourse at Central Station.

For the western forecourt site, the hoarding will extend from the property boundary and encircle the proposed pedestrian path around the southern worksite boundary between Pitt Street and the station entry and Ambulance Avenue.

The Belmore Park site will require truck access at Eddy Avenue with concertina traffic control gates for the truck arrivals and departures at times of peak pedestrian movements, between 7.00am and 7.00pm Mon-Fri, with an ongoing operational review to determine the need for pedestrian traffic control at other times such as Thursday late night retail trading or Friday and Saturday night entertainment, or other special event periods.

In order to mitigate impacts on pedestrians waiting for shuttle bus transfers on Eddy Avenue, the potential for relocation of the UNSW shuttle bus stops to Pitt St, south of Hay St or to Chalmers St, adjacent to the station, have been identified.

The minor site on Quay Street for construction of the pedestrian underpass connection will be enclosed and occupy part of the existing footpath and roadway on the southern George Street. The existing single traffic lane entering Quay Street from George Street will need to be diverted around the worksite, requiring the removal of the kerb extension on the northern side of Quay Street.

4.3.2 Truck access

The worksite locations will require trucks to cross busy CBD footpaths. At all times between 7.00am and 7.00pm Mon-Fri management of the driveway accesses to reduce potential conflicts between pedestrians and trucks is proposed.

At the western forecourt site, this would take the form of traffic controllers to monitor the entry / exit driveway and stop pedestrian movement across the driveways, when necessary and deter pedestrians from using the roadway.

At other times, outside peak periods, truck drivers may be able to enter and exit observing normal requirements to give way to pedestrians when crossing footpaths. This arrangement currently occurs for vehicles accessing the forecourt and give way signage and line marking for exiting drivers would be provided to reinforce this requirement. Traffic controllers would be available to monitor the need for traffic control.

Trucks will enter, load spoil / deliver materials etc and exit all worksites in a forward direction.

At the Eddy Avenue frontage left turn on entry and exit is proposed. Due to the limited site area, trucks are anticipated to drive within the site parallel to the street frontage between driveways, i.e. without executing a three-point turn or other manoeuvre to turn around.

For the Quay Street site, trucks are anticipated to approach and depart from Quay Street, using traffic control and existing driveways to turn around.

4.4 Management of pedestrians

4.4.1 Western forecourt Central Station

Pedestrians currently walk through the western forecourt to access Railway Square from Central Station. During construction these movements will be confined to the perimeter walkway. The capacity for pedestrian movement has been assessed and a minimum pedestrian walkway width of 3.5m between the face of hoarding and property line, has been identified as sufficient to accommodate the peak pedestrian movement.

The pedestrian walkway will be maintained without obstruction e.g. hoarding footings, posts, other street furniture and trip hazards. In addition, lighting of the walkways for night-time security will be provided

4.4.2 Eddy Ave at Belmore Park

At the Eddy Ave frontage to the Belmore Park worksite it is likely that the site access will impact on the existing holding area for UNSW shuttle bus ranks, which are busiest in the AM peak between 7.30am and 9.00am. In addition, existing STA bus stops (2 stands) are located to the east of the shuttle bus stops. Entry and exit movements to the Eddy Avenue site will be required to enter cross the footpath, with potential conflict between waiting bus passengers or stationary buses at the STA stands.

The shuttle bus stop currently permits up to three buses to stand, with concurrent boarding of the leading two buses. At peak times, buses are queued on Pitt Street southbound approaching Eddy Avenue, while waiting to turn onto the shuttle bus stops. **Photograph 4.1** shows the maximum queue of buses on Pitt Street during the AM peak. Lesser queues were observed for the majority of the morning peak.

Photograph 4.1: Pitt St southbound prior to Eddy Ave- AM Peak, April 2009



Source AECOM, April 2009

The relocation of the UNSW shuttle bus stops to Pitt St/ Chalmers Street will reduce potential vehicle / truck conflict, as discussed in **Section 5**.

4.5 Hours for truck movements

Standard NSW construction hours are 7.00am to 6.00pm on weekdays and 8.00am to 1.00pm on Saturdays. While some of the construction work would be undertaken within these standard construction hours, the majority of the works would need to be undertaken on a 24 hour, seven day week basis. Some adjustment to these standard project work hours may be considered by CBD Metro for the Pyrmont worksites.

The proposed construction hours for the below-ground and above-ground activities are outlined below in **Table 4.1**. In exceptional cases of urgency it may be necessary to depart from these assumed hours. This would not take place without prior discussion with and/or notification of local residents and the Department of Environment and Climate Change.

Table 4.1: Expected hours of work

Activity	Construction Hours	Comment/expectations
Below-ground construction activities		
Tunnelling	24 hours per day, six days per week	<ul style="list-style-type: none"> Some activities that support tunnelling and fitout works may need to occur 24 hours per day, seven days per week Rock hammering in the tunnel between 10.00pm and 7.00am is likely to be precluded where it may impact on residential receivers
Construction of station caverns	As above	
Above-ground construction activities		
Construction Sites	Standard DECC construction hours	<p>The following activities would be undertaken 24 hours per day, six days per week where noise impact management measures have been established:</p> <ul style="list-style-type: none"> Surface works supporting underground construction (e.g. concrete pumping, truck loading) Excavation in hard ground <p>Non-disruptive preparatory work, repairs or maintenance may be carried out on Saturday afternoons or Sundays between 8am and 5pm.</p> <p>Activities requiring temporary possession of roads may need to be undertaken outside the assumed hours to minimise safety impacts and inconvenience to commuters. Similarly, works involving utilities would need to be undertaken during periods of low demand likely to be outside of standard hours.</p>
Construction Traffic	24hours per day, 7 days per week	<ul style="list-style-type: none"> Spoil trucking operations are likely to occur between 7am to 10pm, seven days per week. Spoil trucking from the White Bay worksite will take place 24hours per day, 7 days per week. At locations where sensitive noise receptors are close to construction sites, significant construction vehicle movements are likely to be restricted during evening and night-time periods. Extended periods of localised lane and road closures would likely be required for safety purposes for the demolition of multi-storey buildings.

Source: CBD Metro July 2009

4.6 Truck movements associated with spoil excavation

For the ongoing worst case period of spoil excavation, **Table 4.2** summarises the maximum number of truck movements per day, based on the average spoil production per day and removal by single unit dump trucks.

These figures have been estimated based on the maximum daily production rates advised from TA2100 on 27/07/09, and may be subject to revision once a more detailed construction methodology and program is developed. It should be noted that maximum daily production rates refer to the ability of equipment to produce spoil. The maximum daily production rates may not be achieved if shift times are shortened due to the program of this station not being on the critical path for TBM arrival. Not all worksites will be operating concurrently.

Table 4.2: Summary of Excavated Spoil Quantities and Associated Number of Trucks per day

Location/ Activity	Excavation (m ³)	Average Production (m ³ per day)	Truck movements per day ^{1/2} (trips per day)	Average Truck Movements per hour ³ (trips per hour)	Maximum Truck Movements ⁴ (trips per hour)
Eddy Ave Northern Entrance Shaft-Cut & cover	Soft: 24,634 Rock: 35,121	180 136	72 56	5 4	24
Pitt St Southern Entrance Shaft- Cut & cover	Soft: 26,694 Rock: 53,656	579 272	232 110	16 8	24
Pitt St Cavern & mined tunnels	Rock: 33,830	334	134	9	24
Pitt St Central Cross-over/ Turnback cavern	Rock: 26,906	164	66	5	24
Quay St Shaft	Soft: 9,883 Rock: 4,150	25 23	12 10	1 1	<10
Sub-total- Soft		784	316	22	
Sub-total- Rock		929	376	27	
Total	214,874	N/A	N/A	N/A	N/A

Source: Preliminary estimates of excavation, CBD Metro TA 2100, 27/07/09, based on spoil quantities as of 17/06/09.

Preliminary estimates of truck movements per day and hourly truck movements, CBD Metro TA 2108 28/ 07/09, based on assumed average production rates (CBD Metro TA 210, 27/07/09) and daily truck movements

Note:

- 1 Number of trucks per day estimated on the basis of 5m³ per single unit dump truck
- 2 Daily trucks movements assume each truck generates one inbound and one outbound trip., or two trips per truck
- 3 Average truck trips per hour, based on 15 hours per day for truck movements for northern and southern shaft entrance.
- 4 Maximum truck trips per hour, based on the maximum throughput of one truck per 5 minutes and two trips per truck.

4.6.1 Other activities generating truck movements

The estimated truck generation shown in Table 4.2 is expected to be the period of maximum truck movements. However truck access will also be required for demolition and IMO stages. Structural concrete and steel, plant and equipment, fittings and fixtures, escalators, and other engineering material will be required to be delivered to the site(s) for construction and fit out of the site.

It is not possible to accurately determine the volume of truck movements that will access the site for the purpose of making deliveries, and it is likely that this will change over the course of the various stages of construction activity. However, the deliveries are anticipated to generate lower numbers of truck movements than the peak movements associated with spoil removal.

4.7 Provision for over-dimensional vehicles

Procedures for over dimensional vehicles to access the site may be required. This may include low loaders transporting construction plant and equipment. The haulage contractor will be responsible for complying with RTA restrictions on access routes and travel times, together with obtaining any prior approvals.

4.8 Spoil disposal locations and proposed haulage routes

Disposal locations for the excavated spoil have been identified, as outlined in the Environmental Assessment. Generally the potential spoil disposal locations are in Western Sydney, however the exact locations will be dependent on the type of excavated material and specific sites at the time of construction. This aspect would be detailed in the Construction TMPs for individual sites.

4.9 Other temporary worksites

In addition to the main construction sites identified, other temporary worksites would be required from time to time, as part of the enabling works, PRI works, IMO works and/or other minor works packages.

The temporary worksites would be short in duration in comparison with the main CBD Metro construction sites. Duration for these worksites would range from less than 24 hours (for overnight delivery of oversized loads to site), to longer durations of up to 12 months (for worksites required for utility diversions, initial stages of building demolition works, and other staged areas to facilitate infrastructure construction).

The size, location and extent of temporary worksites have not been determined at this stage of the project, however the activities would likely be for work items such as:

- Delivery and lifting of large construction equipment, materials, and components of the works (e.g. escalators, lifts, steel or concrete beams/columns, etc) from within the road reserve, that can not be undertaken from within the main construction sites due to space limitations;
- Removal and lifting of large construction equipment and material (e.g. TBM components at Belmore Park (Central Station), materials from demolition of existing building, etc) that can not be undertaken from within the main construction sites due to space limitations;
- Pit and duct systems for 11kV construction power supply for all station sites, and 33kV supply at Pymont and Rozelle/Lilyfield;
- Other utility/services connections for construction purposes (e.g. water supply points, connections for telecommunications, etc);
- Construction and permanent depot access connections onto City West Link Road at Lilyfield;
- Pit and duct systems for bulk power supply routes at Central/Surry Hills and Rozelle/Lilyfield;
- Relocation or diversion of existing services/utilities clear of the main CBD Metro construction sites;
- Initial stages of building demolition works where there is no suitable vehicular access within the property boundary;
- Utility/services connections for the CBD Metro infrastructure in the vicinity of stations, and the stabling and maintenance depot (e.g., water supply, sewer, stormwater, power supply, telecommunications, data, etc);

- Other staged temporary areas to facilitate infrastructure construction works;
- Station precinct and stabling and maintenance depot urban domain and finalisation works external to the main worksite locations including minor adjustment/interface with roads; provision of bicycle ways, pedestrian areas and footpaths; hard and soft landscaping; relocation or adjustment to bus stops and taxi ranks; provision of bicycle storage facilities; wayfinding and signage; line marking; exterior lighting; and other urban domain treatment works.

Measures and management processes that would be implemented to minimise impact associated with temporary worksites would include items such as the following:

- Coordination of works to ensure concurrent worksites at any one location do not coincide (for example a water main diversion on one side of the road would not be undertaken at the same time as installing a telecommunications cable pathway on the opposite side of the road);
- Staging of the works to ensure extent of impact is minimised. For example 'rolling' worksites would be used for linear worksites required for utilities. Trenches for utilities within roads would be excavated, pipework/ducts installed, and backfilled in short (easier to manage) sections along the length of the utility works wherever practicable;
- Alternative 'trenchless' construction methods including pipe jacking, auger boring, micro-tunnelling, pipe ramming, pilot tube, and horizontal directional drilling could be used where space and methods permitted reduces disturbance on the surface;
- Where works in roadways are required to cross through or are in proximity of intersections, or other constrained areas, night works and the use of road plates would be employed to ensure day-time traffic is not impacted;
- The construction contractors would be required to prepare Traffic Control Plans (TCPs) and road occupancy permits for each worksite for approval by the relevant authorities (e.g. RTA and/or Council) prior to the works commencing on site;
- Provision of suitable traffic control and warning devices as detailed in the TCPs such as traffic control personnel, signage, etc;
- Provision of suitable worksite fencing/barricades to ensure safety of the public and the workers. Where works are proposed in or adjacent to the road reserve, vehicular barricades would be used, otherwise chain wire/mesh type fencing would be used around worksites within footpath areas;
- Access and security of temporary worksites would be carefully managed at all times including when no activity is being undertaken within the sites;
- Minimising storage of materials and equipment within temporary worksites;
- Selection of noisy construction equipment and methods (such as jack picks, jack hammers, rockbreakers, concrete cutting, cranes, etc) would include consideration of proposed working hours, duration of works, and proximity of residential and other sensitive receivers;
- Use and management of suitable environmental controls such as cleaning of truck wheels, sweeping or pavements, control of excavated material to prevent mud tracking and dust, silt socks around stormwater inlets, etc;
- Maintaining and coordinating access to adjacent properties, and access for emergency services at all times;
- Undertaking appropriate community notification and liaison prior to and during the works.

4.9.1 Trenchless construction methods

Trenchless construction methods are an alternative to open trenching. There are different methods depending on the sites specific requirements. Trenchless methods use either steerable or non-steerable equipment. The steerable equipment can provide pipelines at accurate lines and grades, which is essential for certain applications such as gravity flow sewers. Each different method has its advantages and limitations and the selection of the appropriate method is crucial. The various trenchless methods available are pipe jacking, auger boring, microtunnelling, pipe ramming, pilot tube, and horizontal directional drilling. The particular trenchless techniques also vary depending on whether pressure conduits, gravity flow conduits, where and under what facility they are being installed, length of the installation, and the diameter.

5.0 Management of Impacts and Mitigation Measures

5.1 Primary construction impacts

Primary impacts of construction are envisaged to relate to:

- Less direct path for pedestrians currently using the western forecourt to access Central Station with pedestrians diverted to the footpath around the worksite;
- Worksite traffic movements crossing pedestrian movements on Pitt Street and Lee Street frontage during the cut and cover construction;
- Loss of Central Station main entrance and managing the change with RailCorp, along with other transport services;
- Impacts on Central Station during construction, particularly taxi access, passenger access and flow and way-finding. Disruptions to taxi, coach and other vehicular access to the western forecourt areas of Central and diversion to the Hay Street ramp for access to the main concourse;
- Maintenance of access to the Medina Hotel car parking, State Rail food preparation area and small retail outlets, during works affecting Ambulance Lane;
- Truck movements occurring primarily during the cavern excavation with lesser numbers of truck movements during demolition and IMO / station fit out;
- Truck movements crossing the northern footpath of Eddy Avenue to access to the Belmore Park worksite;
- Potential need to relocate shuttle bus UNSW stops on Eddy Avenue, at the Belmore Park worksite frontage to Pitt St/ Chalmers Street. Provision of new facilities and the associated legibility and capacity of pedestrian access route to the relocated stops;
- Potential noise, vibration and pedestrian impacts on Central Station during cut and cover below the lower concourse within the main hall;
- Potential need for road crossing of Elizabeth Street and footpath works associated with the establishment of power supply to worksites;
- Oversized loads may be necessary for deliveries and/or removal of equipment/ materials. Hours of operation may be restricted to night-time hours, subject to EPA requirements. Any oversized loads would be limited one-off events and be subject to RTA and/or Council restrictions on access routes and times and approval; and
- Adjacent businesses, retail, schools, accommodation and residences, e.g. Medina Hotel, Railway Square YHA adjacent to the western forecourt site, Country Comfort Hotel, University of Technology and Sydney TAFE College on George Street, mean that managing pedestrian movements near the worksites will be a key issue.

5.2 Incidents and events

5.2.1 Incidents

Incident response and relevant responsibilities for managing incidents are outlined in the FTMP.

5.2.2 Emergency vehicle access

Access to Central Station for emergency services vehicles will be largely unchanged with access available via the upper level northern concourse (Light Rail Station entry), ramp from Hay Street and the Eddy Avenue frontage.

The construction area occupying the western concourse will mean there is reduced area available for evacuation or assembly of large numbers of pedestrians from the upper level of the main hall and platforms. This would need to be taken into account in any incident response plan for Central Station, which relies on use of this area. Access down the ramp to Hay Street from the main hall access will still be available.

5.2.3 Size of emergency vehicles

The Fire Brigade has the largest vehicle size e.g. appliances with aerial ladders. These vehicles conform to the general truck width of 2.5m, (11.7m length, max 12.4m, 3.8m height), although the maximum turning circle of up to some 29m (wall to wall) for the largest appliance is relatively large. The existing ramp from Hay Street provides for two traffic lanes with kerbside parking, which will provide adequate width to accommodate the minimum access widths for general appliances of 4.0m (between kerbs) increasing to 6.0m min for aerial appliances.

Access to the remainder of the existing road network for emergency service vehicles will not be affected.

5.3 Events

The CBD is impacted by several significant events, which affect visitor numbers on city streets, but are generally of limited duration. Central Station functions as a key interchange point for rail passengers, together with special bus and coach services to transfer passenger to hotels/sporting and recreation venues. Potential issues associated with construction activities affecting pedestrian footway capacity and rail access, together with noise and vibration sensitivities may occur for occasions such as Australia Day, Anzac Day services, Royal Easter Show, Chinese New Year, and sporting fixtures at Moore Park. These potential impacts will need to be managed by the CBD Metro contractor (s) to avoid or mitigate impacts and in accordance with any RTA / Council approval conditions.

5.3.1 Christmas retail

Pedestrian activity in the CBD increases significantly in the lead-up to Christmas and through to the post-Christmas sales. This period coincides with an increase in tourist activity, e.g. with summer cruise ship arrivals and generally increased visitor numbers. City of Sydney has a policy of not permitting disruptive works within the retail core during the period from the first week to the end of December. While Central is on the southern gateway to the CBD and hence not within the retail core, increased activity may require consideration, where feasible, of minimising works affecting pedestrian paths and station access, and/or increased site supervision by traffic controllers.

5.3.2 Other scheduled events

Increased visitor movements occur within the CBD on Australia Day, around the Mardi Gras, Chinese New Year and other scheduled marches / parades, which may involve temporary closures on CBD streets, restricted access for private vehicles and altered public transport schedules, and bus layover requirements. Major sporting events on the periphery of the CBD, generate increased pedestrian and public transport activity at Central. Ideally construction activities involving truck movements and impacts on CBD streets would be avoided or minimised during these times.

5.4 Pedestrian management

The western forecourt worksite will require trucks to cross relatively busy footpaths with pedestrian moving between the signalised crossing of Lee Street to the rail concourse. Pedestrian flows moving north south on Pitt Street / Lee Street footpaths are minor. At peak times in the morning, lunchtime and afternoon peak periods, management of the driveway crossovers may be necessary to reduce potential conflicts between pedestrians and trucks. This would take the form of traffic controllers to stop pedestrian movement on the footpath and deter pedestrians from using the roadway.

The potential need to relocate existing UNSW shuttle bus stops on Eddy Avenue will require significant diversion of pedestrian travel paths, with associated consideration of advance notification, signage and relocation of ticketing machines. The intersection of Eddy Avenue at Pitt Street currently experiences heavy pedestrian flows and queue congestion on the south-eastern corner. Any diversion of bus passengers should ideally avoid directing pedestrians to cross at this intersection and in particular at the south-eastern corner. The bus stop relocation is discussed in Section 5.8.

5.4.1 Western forecourt worksite

For the worksite on the western forecourt, a minimum pedestrian walkway width of 3.5m has been identified to maintain adequate footpath capacities, past the worksites. The width of the walkway has been based on an assessment of the required capacity to accommodate the combined number of pedestrians crossing Lee Street to the western forecourt to access the main station concourse.

In the absence of an origin and destination survey, the pedestrian movements summarised below assume an accumulation from the survey locations.

5.4.2 Pedestrian walkway capacity

Pedestrian capacity has been estimated based on Highway Capacity Manual 2000 (HCM) methodology for walkways of total width between face of building and hoarding of 3.0m to 4.0m. The following assumptions were adopted:

- Effective walkway width = Total width less shy line effect for walls (Ref: HCM 0.5m for wall without window display). This would yield effective widths of 2.0m and 3.0m. Note this assumes a clear width without obstructions, such as footings, support posts etc; and
- Level of Service C is a desirable objective, based on hourly pedestrian flows. Higher flows (as illustrated under Level of service D to E) may be achieved in individual, short term peaks within the hour.

The resultant capacities, expressed in pedestrians per minute per metre, at Level of Service C to E are shown in **Table 5.1**. An allowance has been included for platooning of pedestrians due to the signalised pedestrian crossing of Lee Street. The resultant capacities for effective walkway widths of 2.0m to 3.0m are shown in **Table 5.2**.

Table 5.1: Pedestrian Flows for Level of Service C to E

Level of Service for walkways	Flow Rate ¹ p/min/m	Flow Rate ² p/min/m (Incl platooning)	Flow Rate ³ p/hour/m (Incl platooning)
C	23-33	10-20	600-1,200
D	33-49	26-36	1,560-2,160
E	49-75	36-49	2,160-2,940

Source: HCM, Chapter 18.

1. Flow rate is measured in pedestrians per minute per metre.
2. Flow rate including platooning, provides an allowance for platooning of pedestrians due to signal operation/ bus stops
3. Flow rate (incl platooning) converted to hourly flow per metre.

Table 5.2: Pedestrian Flows for Design Level of Service C

Level of Service for walkways	Flow Rate ¹ (p/hr/m) For Effective Walkway Width ² (m)	
	2.0m	3.0m
C (incl platooning)	1,200- 2,400	1,800-3,600
D (incl platooning)	3,120- 4,320	4,680-6,480

Source: HCM, Chapter 18.

1. Flow rate is measured in pedestrians per hour at the nominated walkway width.

2. Effective walkway width allows for total width less 500mm to vertical obstruction such as walls/ hoarding.

5.4.3 Existing pedestrian movements

Pedestrian surveys for AM and PM peak hours and at midday, were surveyed in April 2009. In the vicinity of the proposed work zone, available count data provides details of pedestrians crossing at the signalised crossing of Lee Street, and using the western forecourt.

In order to estimate the potential numbers of pedestrian movements past the worksite, the following assumptions were adopted. It is acknowledged that the estimated flows are indicative only because the origin and destination of pedestrian movements is not discernable from the counts alone.

Assumptions adopted for estimating existing pedestrian flows were:

- Pedestrians currently crossing the western forecourt will continue to use this path. In practice some change in pedestrian movement, both to and from footways and the Devonshire Street Tunnel may occur i.e. this assumes pedestrians will not change their travel patterns to avoid restricted areas around the work zone; and;
- Pedestrians currently walking north-south in this section of Pitt Street / Lee Street will continue to walk past the work zone once implemented.

Hourly flows on the walkway around the construction site are shown in **Table 5.3**.

Table 5.3: Pedestrian Flows Crossing Western Forecourt for Design

Source-Survey location	Pedestrian Flow (Pedestrians per hour)		
	AM Peak	Midday Peak	PM Peak
Pedestrians crossing western forecourt at grade to/ from rail station.	2631	1580	2213

Source: Pedestrian surveys for AM, midday and PM peak hours, April 2009.

5.4.4 Resultant footway widths

The proposed walkway width of 3.0m (effective walkway width of 2.0m) would accommodate a flow of up to some 2,400 p/hr/m at Level of Service C to 4,300 p/hr/m at Level of Service D maximum flow.

In order to accommodate the maximum flow of some 2,600 pedestrians per hour at a desirable Level of Service C, a 3.5m wide walkway would be required.

5.4.5 Provision for vulnerable users (school children, elderly and mobility impaired)

Existing footpath conditions will be maintained on Pitt Street / Lee Street and Eddy Avenue site frontages with traffic control available at times of truck entry and exit movements. The pedestrian walkway from Lee Street will be maintained without obstruction e.g. due to hoarding footings, posts and trip hazards. In addition, lighting of the walkways for night-time security is proposed. Pedestrian signage and reflective tape at entries/ hoardings for the path around the western forecourt to alert pedestrians to the appropriate path will be provided. Consideration should also be given to tactile pavement marking to guide visually impaired pedestrians around potential obstructions or conflict points.

In addition, advance direction signage to advise pedestrians of the new arrangements in the main concourse area at Central Station will be desirable; subject to consultation and agreement from CityRail.

5.5 Servicing

The western forecourt currently provides for access to passenger drop-off, pick-up facilities at the station entry and for limited car parking. The access arrangements will be displaced during construction with taxis and other vehicles requiring short term set-down and pick-up at the western concourse re-routed via the ramp up from Hay Street. This is not envisaged to cause major increase in travel times. However approach routes will be diverted to Hay Street and with exit back down the ramp to Hay St/ Pitt Street.

5.6 Provision for adjacent development

A review of City of Sydney's development control maps show that the CUB site redevelopment is the major redevelopment proposal in the vicinity of Central. The self contained nature of the construction site and minimised on street running of trucks will reduce any potential cumulative impacts of concurrent development activity.

The self contained nature of the worksite(s) also serves to not prohibit the redevelopment of adjacent sites. However, the Medina Hotel and YHA will be impacted by the proximity to the proposed the western forecourt worksite. In addition, businesses, hotel and the TAFE on George Street at Railway Square are located in proximity to the worksite.

No alteration to existing adjacent premises is proposed. Pedestrian movement will be affected by the proposed worksite within the main hall at Central Station.

5.7 Cash in transit

The western forecourt currently provides by access cash transit vehicles to facilities at the station entry. This access arrangement will be displaced during construction with vehicles re-routed via the ramp up from Hay Street. This is not considered likely to cause major increases in travel times, However, approach routes will be diverted to Hay Street with exit back down the ramp to Pitt Street.

5.8 Cycle route and access

City of Sydney Council has a strong commitment to increasing cycling mode share. Regional cycle routes (generally segregated on-road) are proposed by City of Sydney on Elizabeth, Regent, Lee, and Devonshire Streets.

These cycle routes are due for implementation in the next 3 years (by 2012). In addition to those routes, a new regional cycle link is proposed by City of Sydney over the CityRail lines connecting Prince Alfred Park to the CUB site and local cycle routes are proposed through Belmore Park. Implementation of these routes may need to be coordinated with the CBD Metro worksite activities.

5.9 Bus routes and stops

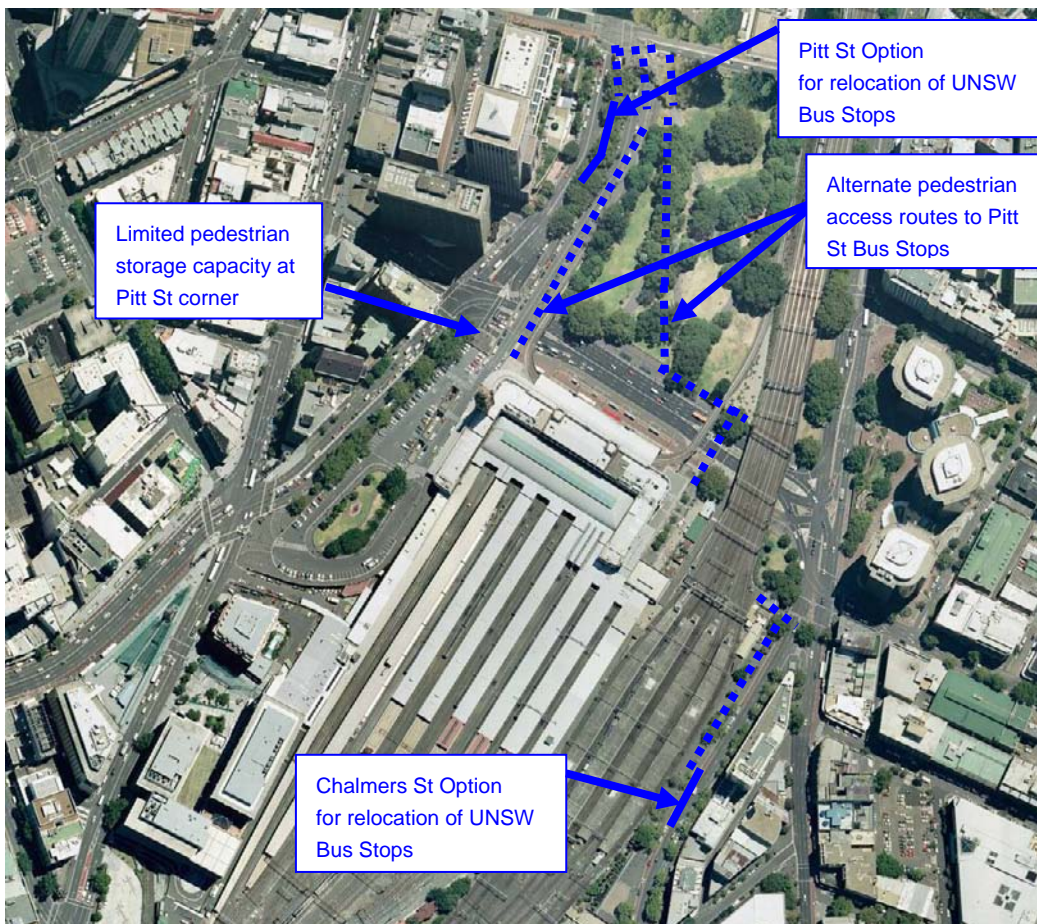
The Belmore Park site will require truck access at Eddy Ave with traffic control / gates for the truck arrivals and departures at times of peak pedestrian movements, generally in the AM peak period 7.30am – 9.00am on weekdays. In order to mitigate impacts on pedestrians waiting for shuttle bus transfers on Eddy Avenue, the potential for relocation of the UNSW shuttle bus stops has been identified.

The relocation of the UNSW shuttle bus stops to the eastern side of Pitt Street, between Hay Street and Eddy Avenue or to Chalmers St, adjacent to the station, would reduce potential vehicle / truck conflict. In order to avoid pedestrian storage constraints at the Pitt Street / Eddy Avenue signalised intersection, alternate routes for UNSW bus passengers would need to be developed,

For bus stops on Pitt St, pedestrians could use the overbridge to Hay Street and approach the bus stops southbound on Pitt Street. Existing escalators near the Eddy Avenue corner with Pitt Street connect the ground level and northern concourse of the main hall, which will provide a convenient access route to the overbridge. While this route would have the advantage of reducing the concentration of pedestrian movement at the Pitt Street intersection, walking distances between station and bus stops would increase by a minimum of some 200m.

Alternatively, the shuttle bus stops could be transferred to Chalmers St, which may be closer to the station western exits. Chalmers St is intensively utilised by existing scheduled bus services particularly in the AM peak and as a result introducing the shuttle bus stops is envisaged to displace existing stopping or layover spaces for taxis or buses. **Figure 5.1** illustrates the alternate locations for relocation of the UNSW shuttle bus stops, together with the associated diversion of pedestrians from Central Station.

Figure 5.1: Alternate Locations for Relocation of UNSW Bus stop on Eddy Ave



Source: CBD Metro, TA2108, July 2009.

The disadvantage of the Pitt St location is in the distance students and teachers would be required to walk, either through Belmore Park to Hay St, or via the Hay St overbridge. The route(s) would require directional and advisory signage to be legible to unfamiliar students.

The Chalmers St bus stop location provides a shorter, more legible direct access route, however the kerbspace is intensively utilised by existing bus services. The additional pedestrian movement generated by UNSW students and teachers on the Chalmers St western footpath would contribute to congestion. Particularly as passengers alighting buses in the AM peak predominantly proceed northbound and UNSW students would be walking southbound to their shuttle buses

Consultation and advance notification of any changes would need to be provided to the university, together with signage and relocation of ticketing machines. No other change to existing bus stop locations or routes is proposed for the majority of construction.

5.9.1 Alternative locations for buses / coaches during construction and track possessions

Alternative locations for bus stops and coach parking bays during construction or track possession have been identified, as follows:

- Rawson Place, between Pitt Street and George Street for coach parking bays displaced from the Sydney Coach Terminal frontage on Eddy Avenue. Existing loading and no parking zones on the south side (3 coaches) could be utilised for coaches actively engaged in setting-down, picking-up passengers. Existing meter parking on the northern side would be replaced with bus / coach bays (4 coach/bus lengths);
- Existing bus stands in Pitt St, east side, north of Eddy Ave (2 spaces) could be utilised for bus/coach bays.
- Negotiations with the Sydney Coach Terminal and bus operators regarding alternative locations for the terminal (offices and coach parking bays) have been initiated. These may result in the relocation of the terminal away from the vicinity of Central Station; and
- Barlow Street, south side between Pitt Street and George Street for bus and coach layover / holding areas, in lieu of the existing metered parking spaces. Buses would then travel to George Street and turn left into Rawson Place to pick-up passengers on the northern side of Rawson Square and proceed eastbound on Eddy Avenue or north or south on Pitt St.

The relocation of bus and coach bays will require altered approach routes on Pitt Street southbound to relocated stops on Rawson Place, Pitt Street or via a right turn to Barlow Street.

5.10 Coaches

As discussed in **Section 4**, relocation of buses and coaches may be required during construction or in the event of track possessions. No other significant impact on existing conditions for coaches is envisaged.

5.11 Taxis

Taxis currently using the western forecourt to access the station entry will need to be diverted to the ramp to the upper level concourse from Hay Street. Drivers would alter their approach route to accommodate this change, i.e. approaching via Elizabeth St and Hay St. Drivers approaching from the south would be the most disadvantage in the need to circulate round the block, e.g. via Eddy Ave, Elizabeth St and Hay St.

Advance warning of the proposed changes in access and directional signage of the alternate routes would be required. Consultation and advance notification of the Taxi Council, which could include a pamphlet of the alternate routes, would enable advance warning to drivers and minimise the impacts of the proposed traffic arrangements.

Minor residual impacts are envisaged to be related to an increase in travel time due to diverted approach routes, the need to u-turn back down the ramp to exit and increased delays due to the increases in traffic on the ramp overall.

Beyond these immediate site frontages, southbound trucks exiting from the site down Lee Street (maximum of 15 trucks per hour) and travelling via Lawson Square / Gibbons Street to Cleveland Street to City Road and Parramatta Road may increase taxi travel times. Changes in overall network travel times will be following detailed traffic modelling.

5.12 Kiss and Ride

In addition to taxis, other vehicles requiring access to the main entrance to the main concourse at Central Station will be diverted to the ramp via the upper level concourse from Hay Street. Drivers would alter their approach route to accommodate this change, i.e. approaching via Elizabeth St and Hay St. Minor residual impacts are envisaged to be related to an increase in travel time due to diverted approach routes, the need to u-turn back down the ramp to exit and increased traffic on the ramp.

No other impacts on existing conditions for kiss and ride are proposed.

5.13 Parking

The western forecourt site will displace existing RailCorp staff parking. Negotiations are being undertaken regarding alternate arrangements.

Potential relocation of shuttle bus operations to the eastern side of Pitt Street south of Hay Street will displace existing meter parking (some 6-10 spaces), depending on the number of bus stops and queuing capacity required.

5.14 Traffic

5.14.1 Vehicle speeds

No change to existing speed limits is proposed. The need for changes to the existing speed zoning may occur with development of the detailed traffic control plans as part of the CTMP. Any change would be subject to the Road Occupancy Licence and Speed Zoning Authorisation approval procedures and conditions.

5.14.2 Road network changes

There are generally no network changes proposed in order to manage traffic at the Central Metro Station worksites for the majority of the work.

New driveway entrances and egress points may be created at the Eddy Ave site, with potential relocation of shuttle bus stops to Pitt St or Chalmers St may impact on existing parking control.

Assessment of the network performance has been based on the cumulative impacts of the CBD sites, as discussed in the following **Section 5.13**,

The minor site on Quay Street for construction of the pedestrian underpass connection will be enclosed and occupy part of the existing footpath and roadway on the southern George Street corner. The existing single traffic lane entering Quay Street from George Street will need to be diverted around the worksite, requiring a kerb extension on the northern side of Quay Street to be removed and reinstated on completion of the entrance.

5.14.3 Intersection operation

No changes to the existing intersection operation are proposed.

5.14.4 Freight and commercial vehicles

The western forecourt site encompasses the adjacent Ambulance Lane, where the RailCorp food preparation area is located, in addition to small retail outlets and the car park access to the Medina Hotel. Arrangements for servicing these premises will be agreed and managed by the contractor.

No other impacts on freight and commercial vehicles is envisaged.

5.14.5 Impact of construction traffic on frontage roads

The additional volume of vehicles using Lee Street / Regent Street (average of eight entering and exiting trucks per hour) is minor, relative to existing traffic flows, the exact impacts are being quantified through network modelling.

The forecast truck movements relative to the existing flows on frontage roads are presented in the following **Table 5.4**.

Table 5.4: Summary of Increased Traffic on Frontage Roads due to Construction- Central Station

Site/ Frontage Road	Existing Vehicle Movements			Truck movements		
	Average Daily Flow	AM Peak Hour	PM Peak Hour	Average Daily Flow ¹	AM Peak Hour	PM Peak Hour
Western Forecourt Site						
- Pitt St SB entry	11,000	633	835	216	30	30
Increase (%)				2.0%	4.7%	3.6%
- Lee St SB exit	6,000	323	454	216	30	30
Increase (%)				2.0%	9.3%	6.6%
Belmore Park Site, Entry- Eddy Ave EB Exit- Eddy Ave EB Total	7,000	888	1011	36 <u>36</u> 72	3 <u>2</u> 5	3 <u>2</u> 5
Increase (%)				10.1%	0.6%	0.5%
Quay St	1,800	238	150			
Entry				6	1	1
Exit				<u>6</u>	<u>1</u>	<u>1</u>
Total				12	2	2
Increase (%)				0.6%	0.3%	0.3%

Source: CBD Metro TA2108, Estimate of truck movements, July 2009.

Note:

- 1 Daily truck movements assume each truck generates one inbound and one outbound trip. Average daily flow is the sum of the maximum number of truck movements by construction phase at the worksite, eg cut and cover, cavern excavation, entrance shaft mined tunnel, derived from Table 4.2
- 2 Average truck trips per hour, based on 15 hours per day for truck movements. Number of truck trips in peak hours estimated on the basis of average trucks per hour. In practice this rate may not be achieved in peak hours, due to pedestrian flows;

5.15 Wester Forecourt Impacts and Responses

The forecourt construction site will result in the following:

- A loss of 57 public spaces (2 hour limit weekdays 0800 – 1800; 4 hour parking 1800 – 2000),
- 1 – 2 bus bay for country link coaches and
- 2 employee parking bays. It will also remove the coach and primary exit routes for parking, taxi and commercial vehicles.

To balance these changes the following arrangements are proposed:

- Conversion of the 42 upper level rail employee parking bays to a coach layover and public parking replacement. The coach layover will require reversing into a right angle bay, however it is

a pedestrian free area and the traffic flows are sufficiently low and slow speed to allow this manoeuvre to be conducted safely

- Removal of the small central northern parking of 8 rail employee spaces, and relocating 4 of these spaces to the “median” to become public parking.
- Relocation of the loading zone to utilise 4 existing kiss and ride / 15 minute parking.

Please refer to Appendix B

5.16 Network modelling

The assessment of construction traffic impacts and likely future mitigation responses is being undertaken with the assistance of the RTA’s Paramics SCATSIM models of the CBD and Rozelle-Pyrmont corridor (PUR model). The full modelled area extends from Victoria Road at Iron Cove Bridge in the west, to college Street / Macquarie Street in the east, Hickson Road and the Sydney Harbour Bridge Toll Plazas in the north, to Railway Square and Foveaux Street in the south. Preliminary model results suggest that the impacts associated with cumulative construction at each of the proposed worksites can be mitigated through the measures documented in the TMP. Further analysis with the assistance of the Paramics models will be undertaken to define impacts and preferred mitigation measures.

5.16.1 Cumulative impacts

Cumulative construction traffic impacts may occur where multiple construction projects utilise the same construction traffic routes at the same time. Cumulative impacts could include traffic congestion, particularly if truck movements occur during peak hour and if truck queuing occurs.

At a local level, the following traffic routes may experience cumulative impacts as a result of multiple construction activities within their vicinity:

- Broadway and Pitt Street are likely to be common local construction traffic routes for the CBD Metro Central Station, the Carlton United Breweries development, the UTS development and the CityGrid project (Belmore Park substation).
- Pitt, Bathurst and Park streets are likely to be common local construction traffic routes for the CBD Metro Town Hall Square Station and services building, the Sydney Water Board site redevelopment and the Boyd development;
- Castlereagh Street is likely to be a common local construction traffic route for the CBD Metro Martin Place Station and the CityGrid project (City East substation likely to be in the vicinity of Philip, Bent, Bligh and O’Connell streets);
- Margaret, Sussex, Hickson, Napoleon, Erskine and King streets are likely to be common local construction traffic routes for the CBD Metro Barangaroo-Wynyard Station, the CityOne development and the Barangaroo development;
- Union and Pyrmont streets are likely to be common local construction traffic routes for the CBD Metro Pyrmont Station, the Star City development and the Global Switch site development (Pyrmont Street only);
- Victoria Road and The Crescent/City West Link are likely to be common local construction traffic routes for the White Bay construction site and CBD Metro Rozelle Station, the Balmain Tigers development, the Inner West Bus Project, the Terry Street development, the Baileys Marine project and the White Bay Cruise Passenger Terminal.

6.0 TMP Compliance and Approvals

The TMP has considered the requirements of the Director General and Department of Planning for information to support the Environmental Assessment for the project.

The plan considers the management of traffic at worksites as well as the effects on pedestrians and traffic movements resulting from construction or changed conditions at worksites. Further, the plan considers in depth the legislated requirements for the provision of a safe and effective local road network management throughout all stages of construction.

6.1 Compliance with Director General's Requirements

Details of the specific construction related tasks from the Directors General's requirements to support the environmental assessment are further outlined in **Table 6.1** following

Table 6.1: Director General's Environmental Assessment Requirements

Requirement	Condition Requirements	Reference
Key issues	<p>General Construction Impacts – Consider the potential impacts associated with the construction of the project, and present a management framework for construction works to ensure that impacts are mitigated, monitored and managed. The EA must include consideration of, and a management framework for:</p> <ul style="list-style-type: none"> • construction noise and vibration, including a considered approach to scheduling construction activities including transport, blasting and tonal or impulse noise generating works). • construction traffic including a considered approach to route identification and scheduling of transport movements, having regard to <ul style="list-style-type: none"> - Alternatives to road transport; - The number, frequency and size of construction related vehicles (both passenger, commercial and heavy vehicles); - The nature of existing traffic on construction access routes (with consideration of peak traffic times and sensitive road users, including emergency vehicles and buses) - The need to close, divert or otherwise reconfigure elements of the road network associated with construction of the project; and - How construction traffic impacts will be managed to minimise the potential for cumulative traffic impacts with other major construction activities in the region (whether this is to be managed as part of the subject project, or through a separate overarching mechanism beyond the direct scope of the project) 	<p>Framework Traffic Management Plan.</p> <p>Noise Assessment (by others) Construction Plan (by others)</p> <p>This Station-Traffic Management Plan.</p> <p>Construction Plan (by others)</p>

Requirement	Condition Requirements	Reference
	<p>The EA must also present a strategy for monitoring and mitigating traffic impacts, with a particular focus placed on those activities identified as having the greatest potential for adverse traffic flow, capacity or safety implications, and a broader, more generic approach developed for day-to-day traffic management.</p> <ul style="list-style-type: none"> • Spoil management • Water Impacts 	<p>Framework Traffic Management Plan. This Station-Traffic Management Plan.</p> <p>Construction Plan (by others) Framework Traffic Management Plan. Construction TMP (by others)</p>
Consultation	<p>The EA must reflect an appropriate and justified level of consultation with relevant parties during the preparation of the EA, including:</p> <ul style="list-style-type: none"> • local, State or Commonwealth government authorities and service providers such as the Roads and Traffic Authority, RailCorp, State Transit Authority, the Ministry of Transport, the Department of Environment and Climate Change, the Department of Water and Energy, NSW Maritime, Sydney Ports, Barangaroo Delivery Authority, Sydney Harbour Foreshore Authority, Leichhardt Council, and City of Sydney Council; • the public, including specialist interest groups and affected landowners. • The EA must describe the consultation process, document all community consultation undertaken to date and identify the issues raised (including where these have been addressed in the EA). 	<p>Framework Traffic Management Plan</p> <p>This Station-Traffic Management Plan.</p> <p>Environmental Assessment</p>

Appendix A - Kerbside Changes

Table 1: Central Station

Station Worksite	Location	Existing Kerb Use	Proposed Changes to Kerbside Parking restrictions	Loss of Loading / Parking ¹ and duration		Mitigation Strategy
Site No	Map Reference			Enabling	Construction	
Central Western Forecourt	Western Forecourt	Staff parking for State Rail and short term parking associated with Central Station 2hr/4hr parking (55 spaces) No parking (2 spaces) State Rail Authorised parking (30 spaces). Emergency Vehicles (4 spaces) ¼ hr parking (3 spaces) Disabled (5 spaces) Bus Zone (3 spaces) (Total 102 spaces all purposes) [excludes parking on Hay St ramp- unchanged State Rail Authorised parking	Existing parking for staff and short term visitor parking will be removed by worksite. Access to the station entry for taxis, mini-buses, emergency vehicles, disabled parking will be maintained via the Hay St ramp	87 spaces State Rail staff parking and short term parking Duration of the works	87spaces State Rail staff parking and short term parking Duration of the works	To be determined in consultation with City Rail
CS-A	C1					

Station Worksite	Location	Existing Kerb Use	Proposed Changes to Kerbside Parking restrictions	Loss of Loading / Parking ¹ and duration		Mitigation Strategy
				Enabling	Construction	
Site No	Map Reference					
		(30 spaces). 2/4hr hr parking (15 spaces)]				
	Ambulance Ave, south side, east of Lee St C1.1	Loading zone (4 paces) 2hr/4hr parking (4 spaces) Loading area unsigned (2 spaces) No parking (7 spaces) State Rail Authorised parking (14 spaces). (Garages-4- No parking)	Existing loading and parking spaces on Ambulance Ave may be affected	30spaces Subject to confirmation Duration of the works	30 spaces Subject to confirmation Duration of the works	Nil Demand for these spaces will be diminished if existing premises on Ambulance Ave do not operate during the works.
Central Belmore Park	Eddy Ave, north side, east of Pitt St C2	UNSW Shuttle bus stop (2 bus lengths loading, 1 storage = 3 bus lengths)	Shuttle bus stop at worksite frontage may require relocation to permit construction zone at site frontage.	3 bus lengths Existing shuttle bus stop Duration of the works	3 bus lengths Existing shuttle bus stop Duration of the works	Relocation of bus stop to Chalmers St west side south of Foveaux St. See location C2.1
	C2.1 Chalmers St west side south of Foveaux St	Alternate locations for relocated bus stop Bus Zone Taxis Zone	Potential relocation of bus stops to the Chalmers St frontage to Central may result in the loss of taxi parking and/or bus layover (some 45m or 3 bus lengths)	3 bus lengths Relocated shuttle bus stop Duration of the works	3 bus lengths Relocated shuttle bus stop Duration of the works	Refer Item C.2

Station Worksite	Location	Existing Kerb Use	Proposed Changes to Kerbside Parking restrictions	Loss of Loading / Parking ¹ and duration		Mitigation Strategy
				Enabling	Construction	
Site No Central Quay St CS-C	Quay St, west side North of George St C3	No Stopping/ 1 Hour Parking	No Stopping/Parking occupied by construction zone	Duration of the Quay St works	Duration of the Quay St works	

Note: 1. Length of loading and parking zones based on estimation only and 6m vehicle length; except where spaces stated as bus length or other measurement

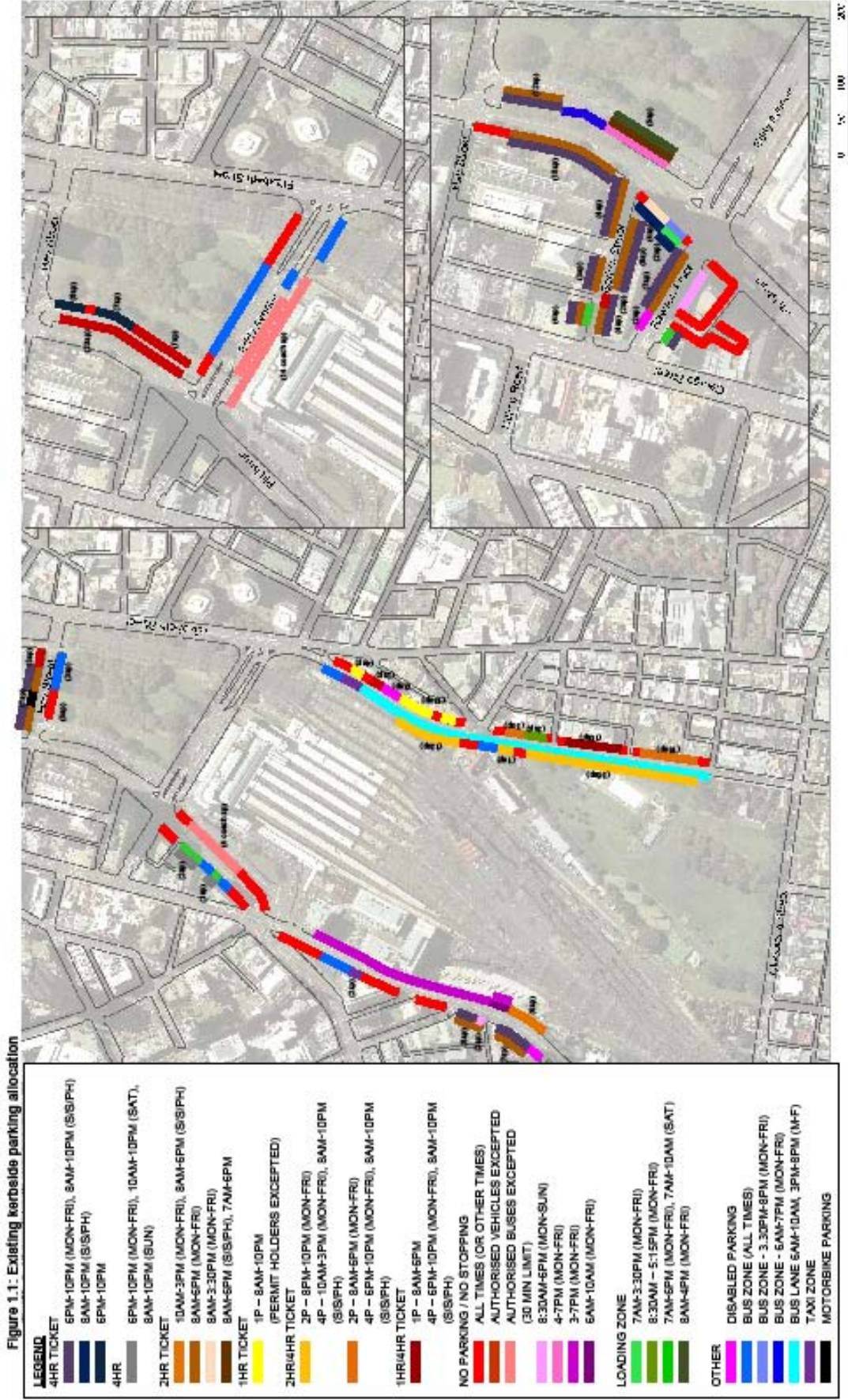


Figure 1.2: Proposed workareas and changes to kerbside parking allocation



Appendix B - Central Station Forecourt Parking

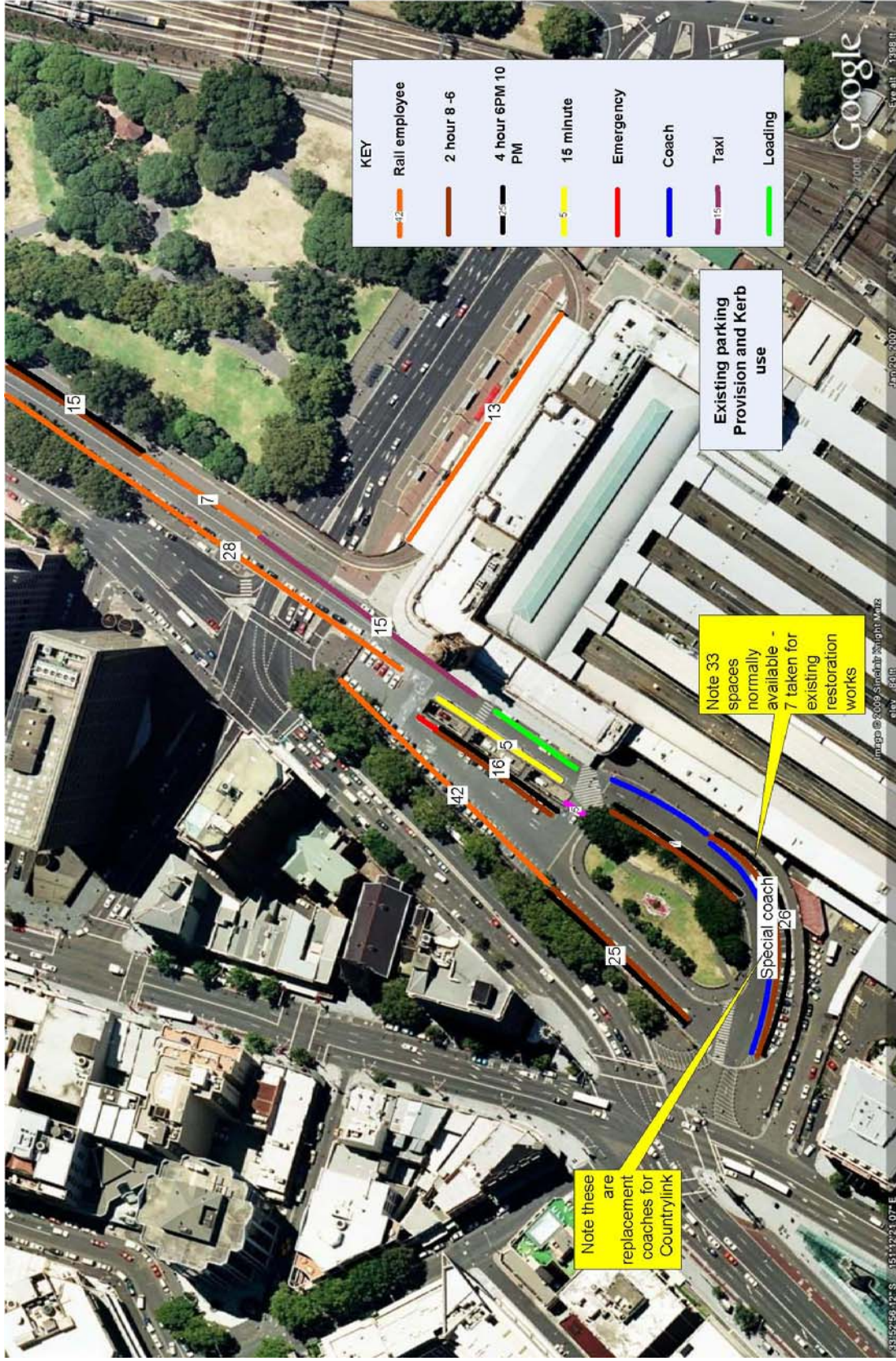
During the construction of the CBD Metro station at Central there are several operational needs of Railcorp and other users / stakeholders at Central Station which will need to be accommodated, including pedestrian access, traffic access and parking at the western forecourt.

The existing arrangement of parking within Central Station western forecourt is shown in **Figure B 1**.

Features of this parking provision are:

- Public parking 2 hour 0800 – 1800 / 4 hr 1800 – 2000)
- 57 Short stay (15 minute)
- taxis
- Coach 1 bay
- Rail staff

Figure B 1: Existing Parking at Central Western Forecourt



Source Google / AECOM SKM MVA August 2009

The issues that are relevant to traffic management during construction in the western forecourt area summarised in **Table B 1**:

Table B 1: Western Forecourt Functional Requirements

Western Forecourt Parking Requirements
Raicorp parking for essential operations (e.g) emergency response, crew parking, etc)
Railcorp parking for non essential activity non essential activity (e.g. senior staff)
Countrylink parking for essential operational services (e.g.) cre parking
NSW police, Transit police
Disabled parking
Public parking (metered)

Source GHD 31 July 2009

In terms of priority of parking supply the following hierarchy and quantity of provision is proposed:

1. Emergency response vehicles (1- 2)
2. Country rail workers (say three per overnight parked train 9)
3. Coaches (1 with 1 layover)
4. Taxis (15)
5. Commercial (2)
6. Public parking
7. NSW and Transit police
8. Other rail staff

Proposals to minimise the impacts of construction in the forecourt upon pedestrians and traffic have been developed for both stages of construction of PRI and IMO as follows.

The main difference between PRI and IMO are:

- At PRI stage (2.5 years duration approx) the southern end of the western forecourt is being excavated and bulk earthworks being undertaken within part of the southern end. A pedestrian route will still be maintained to the main station building from Lee Street / Broadway via a 3.5m walkway around the southern boundary of the site. The worksite will be defined by hoardings.
- At IMO stage (2.5 years duration approx) the walkway area available at PRI stage will be required for construction. Although pedestrians could walk along the western and northern edges of the site, these would need to be constructed on ramps, and there may be insufficient vertical transport capacity to access the station. This route would also bring pedestrians into conflict with vehicles through the northern forecourt and is therefore not favoured. It is intended to route pedestrians around the outside of the site adjacent to Pitt Street and Eddy Avenue, and access via main station building via the existing escalators.
 - These escalators have a capacity of approximately 120 persons per minute (7,200 per hour peak capacity). However to account for the peaking demand determined by the various train arrivals a planning capacity of ~ 4,000 pedestrians per hour is a suggested basis for impact assessment.
 - This route is approximately 50m longer than the existing route from Pitt / Lee / George Streets intersection through the western forecourt to the concourse level for country trains.
 - Pedestrians could also use the southern access underpasses to the station.

The forecourt construction site will result in the following:

- A loss of 57 public spaces (2 hour limit weekdays 0800 – 1800; 4 hour parking 1800 – 2000),
- 1 – 2 bus bay for country link coaches at the front of the station and
- 2 employee parking bays. It will also remove the coach and primary exit routes for parking, taxi and commercial vehicles to Lee Street and require this traffic to exit onto Hay Street.

To balance these changes the following potential arrangements are proposed:

- Relocation of the loading zone to utilise 4 existing 15 minute parking
- Relocation of the Countrylink coach stop to the existing loading zone
- Conversion of the 42 upper level rail employee parking bays to a coach layover and public parking replacement. The coach layover will require reversing into a right angle bay, however this corner is a pedestrian free area and the traffic flows are sufficiently low and slow speed to allow this manoeuvre to be conducted safely.
- Removal of the small central northern parking of 8 rail employee spaces, and relocating 4 of these spaces to the “median” or light shaft to become public parking.
- Circulation of all vehicles in a one way movement around the forecourt.

A summary of these changes are shown in Table B 2.

Table B 2 Summary of Potential Western Forecourt Parking Adjustments

Parking Loss	Remedial measure
17 public spaces	No action
1- 2 coach stops	Relocate to existing service vehicles
Service vehicle	Replace with 1 space at existing kiss and ride
Early start rail staff.	Reallocate to Hay Street ramp
Staff spaces 50 off	Negotiate with leasing from private parking stations: Thomas Street parking ~ 300m Quay Street parking ~ 350m Goulburn Street parking structure ~ 550m
Coach layover	North-west corner (coaches to reverse into bay, loss of 3 parking bays)

These proposed parking changes and arrangements are shown in **Figure B 2** whilst the proposed pedestrian routes are shown in **Figure B 3**. The swept path / turning circles are shown for a coach departing the coach stop kerbline with the minimum desirable radius is shown in **Figure B 4** whilst the absolute minimum radius for a truck or coach passing a coach at the coach stop is shown in **Figure B 5**.

Both of these diagrams show that there is sufficient clearance for turning coaches or trucks even at the minimum radii and that the available space provides for greater than these minimum.

The locations of potential rail staff off site replacement parking in existing commercial facilities together with the approximate walking distance to the station entry are shown in **Figure B 6**.

Further discussion will be undertaken with RailCorp and other stakeholders to resolve pedestrian access, traffic access and parking at the western forecourt during the second half on 2009.

Figure B 2 Potential parking changes in Western Forecourt during construction

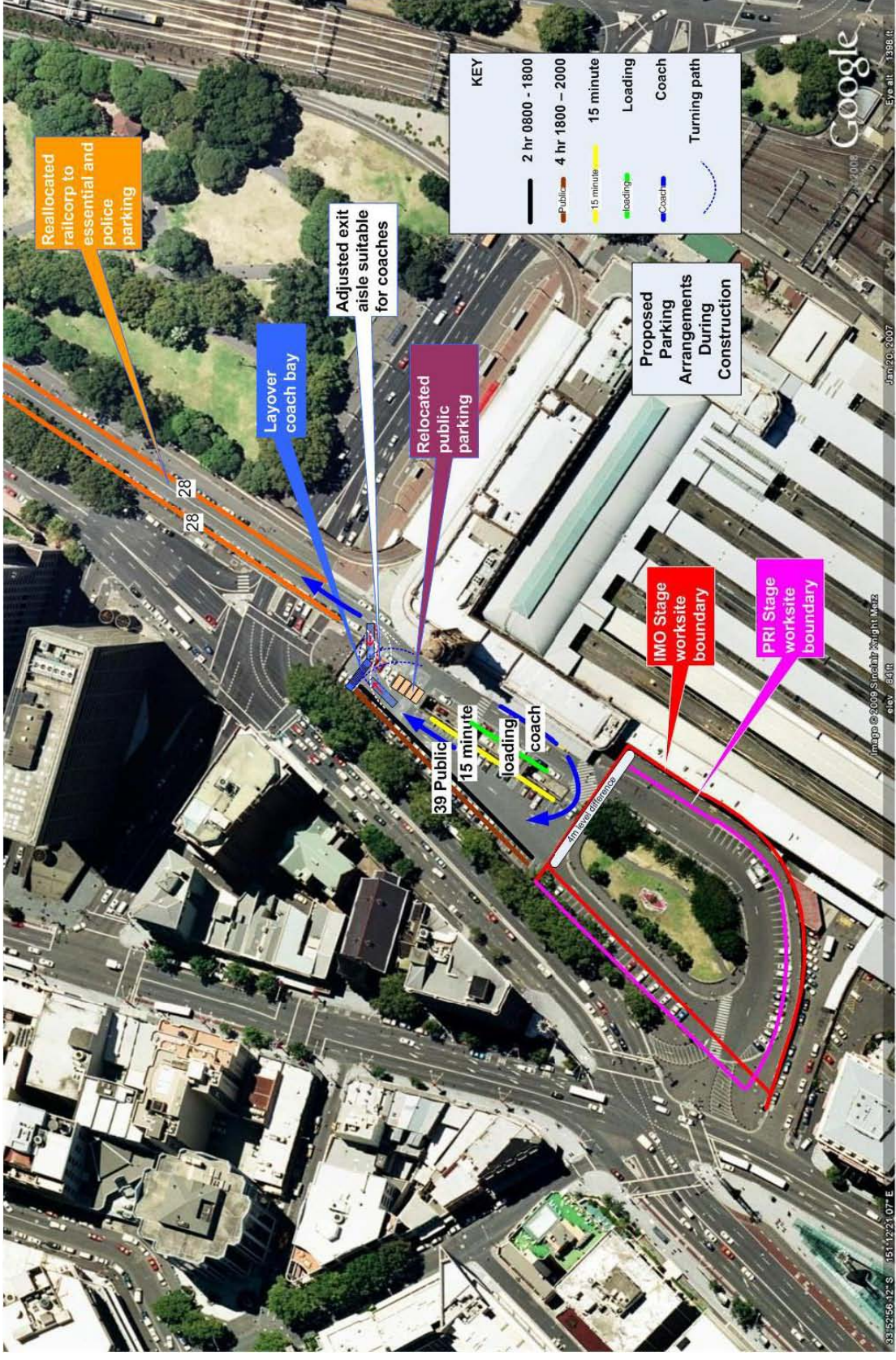


Figure B 3 Pedestrian access routes

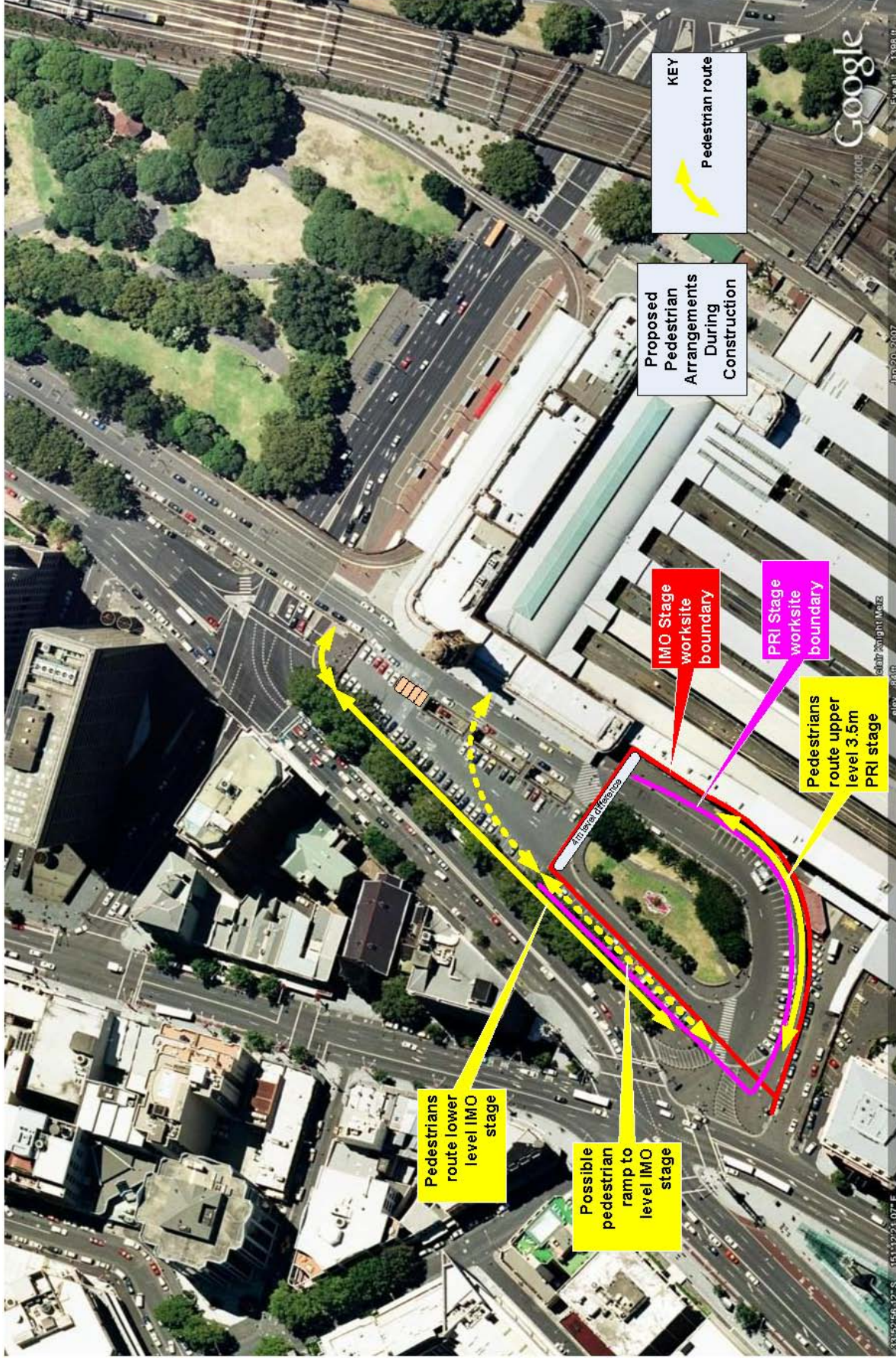


Figure B 4 Bus swept path from bus stop – minimum desirable radius

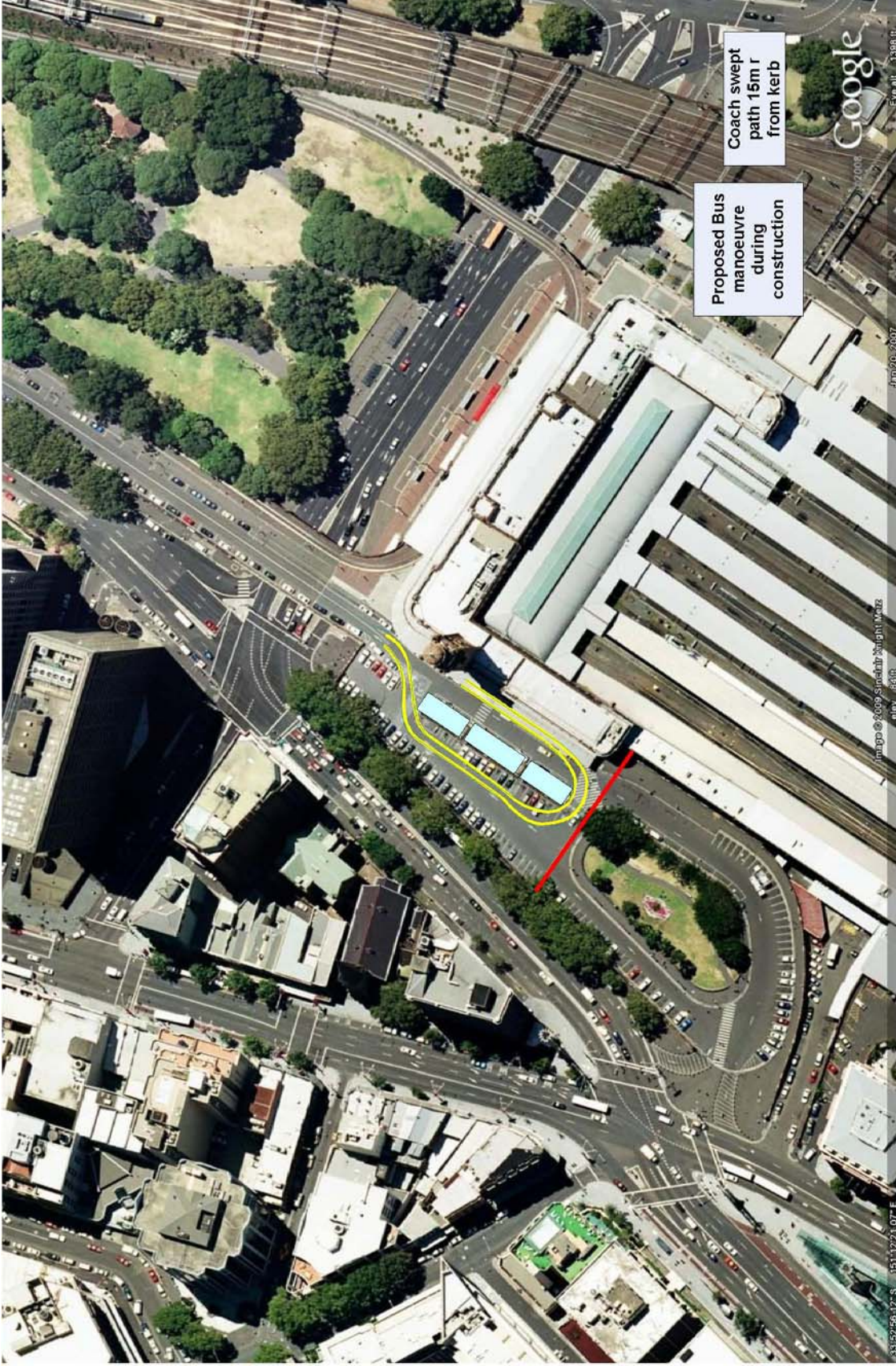


Figure B 5 Truck / Bus Minimum radius turn from beside stopped Coach

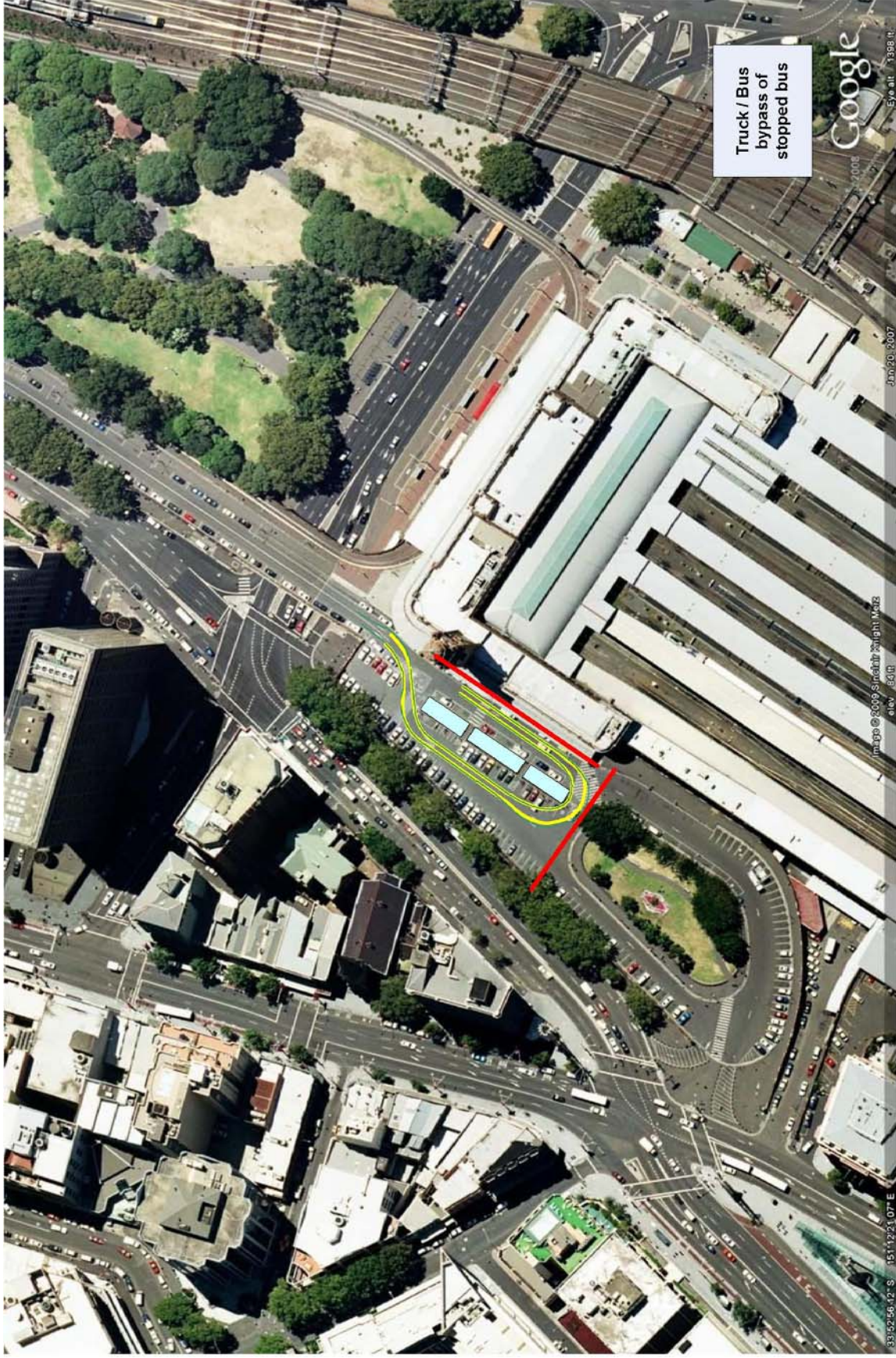


Figure B 6: Location of possible commercial facilities for rail staff replacement parking and walking distance

