Gunyama Park Aquatic and Recreation Centre Transport Assessment

Client //	City of Sydney
Office //	NSW
Reference //	15S1006100
Date //	09/06/16

Gunyama Park Aquatic and Recreation Centre

Transport Assessment

Issue: B 09/06/16

Client: City of Sydney
Reference: 15S1006100
GTA Consultants Office: NSW

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
A	07/06/16	Final	Darnell Cordova, Rhys Hazell	Rhys Hazell	Brett Maynard	Brett Maynard
B	09/06/16	Final – Modified area schedules	Darnell Cordova, Rhys Hazell	Rhys Hazell	Brett Maynard	

GTAconsultants
Melbourne | Sydney | Brisbane
Canberra | Adelaide | Perth
Gold Coast | Townsville

Table of Contents

Appendices

Figures

Tables

1. Introduction

1.1 Background

City of Sydney is finalising the design for a proposal to redevelop land located at 132-140 Joynton Avenue, Zetland in to a new aquatic leisure centre and park (Project Number – C16113). The site, to be known as Gunyama Park Aquatic and Recreation Centre (GPARC) is located within the Epsom Park Precinct in Zetland which forms part of the broader Green Square development area.

This Transport Assessment has been completed for Andrew Burges Architects (ABA) and Grimshaw Architects, on behalf of City of Sydney.

The key GPARC facilities include the following:

- 50m heated outdoor pool and leisure pool
- 25m indoor program pool
- indoor leisure pool
- hydrotherapy pool
- crèche
- café
- health and fitness centre and outdoor fitness station
- outdoor synthetic multipurpose sports field
- outdoor playground with skate facilities
- park boardwalk, terraces and seating
- native planting and landscaping.

1.2 Purpose of this Report

This report sets out an assessment of the anticipated transport implications of the facility, including consideration of the following:

i existing pedestrian and bicycle facilities within the vicinity of the subject site
ii existing public transport facilities and services within the vicinity of the subject site
iii existing on-street parking conditions
iv existing traffic conditions surrounding the site (referencing previous traffic modelling studies)
v pedestrian and bicycle requirements
vi suitability of pedestrian and cyclist facilities
vii suitability of the proposed site access arrangements
viii suitability of the proposed parking arrangements
ix service vehicle requirements
x the transport impact of the proposal on the surrounding road network (referencing previous studies).

1.3 References

In preparing this report, reference has been made to the following:

- inspections of the site and its surrounds
- City of Sydney Development Control Plan (DCP) 2012
- City of Sydney Local Environmental Plan (LEP) 2012
- Green Square Urban Renewal Area Transport Management and Accessibility Plan (TMAP), 2012 Update Volume 2: Main Report, Parsons Brinckerhoff
- Green Square Town Centre – Essential Infrastructure and Public Doman, 2031 Traffic Modelling Synopsis, AECOM, July 2014
- Green Square Town Centre Parking and Traffic Study, Bitzios Consulting, January 2012
- Gunyama Park and Green Square Aquatic Centre Access Assessment Report Preliminary Design, BCA Logic, June 2015
- GPARC Population Study Input, @leisure, July 2015
- Transport Report for Green Square Town Centre Essential Infrastructure, Colston Budd Hunt & Kafes, July 2012
- Traffic and Car Parking Advice prepared by GTA Consultants, dated 20 December 2012
- Newcastle Regional Aquatic & Leisure Centre (Lambton) Site Feasibility & Masterplan
- Warringah Aquatic Centre – Site Development Strategy prepared by Strategic Leisure Group, March 2013
- Australian Standard/ New Zealand Standard, Parking Facilities, Part 1: Off-Street Car Parking AS/NZS 2890.1:2004
- Australian Standard, Parking Facilities, Part 2: Off-Street Commercial Vehicle Facilities AS 2890.2:2002
- Australian Standard / New Zealand Standard, Parking Facilities, Part 6: Off-Street Parking for People with Disabilities AS/NZS 2890.6:2009
- 100% Design Development drawings prepared by ABA+G.
- other documents and data as referenced in this report.

2. Traffic and Transport Context

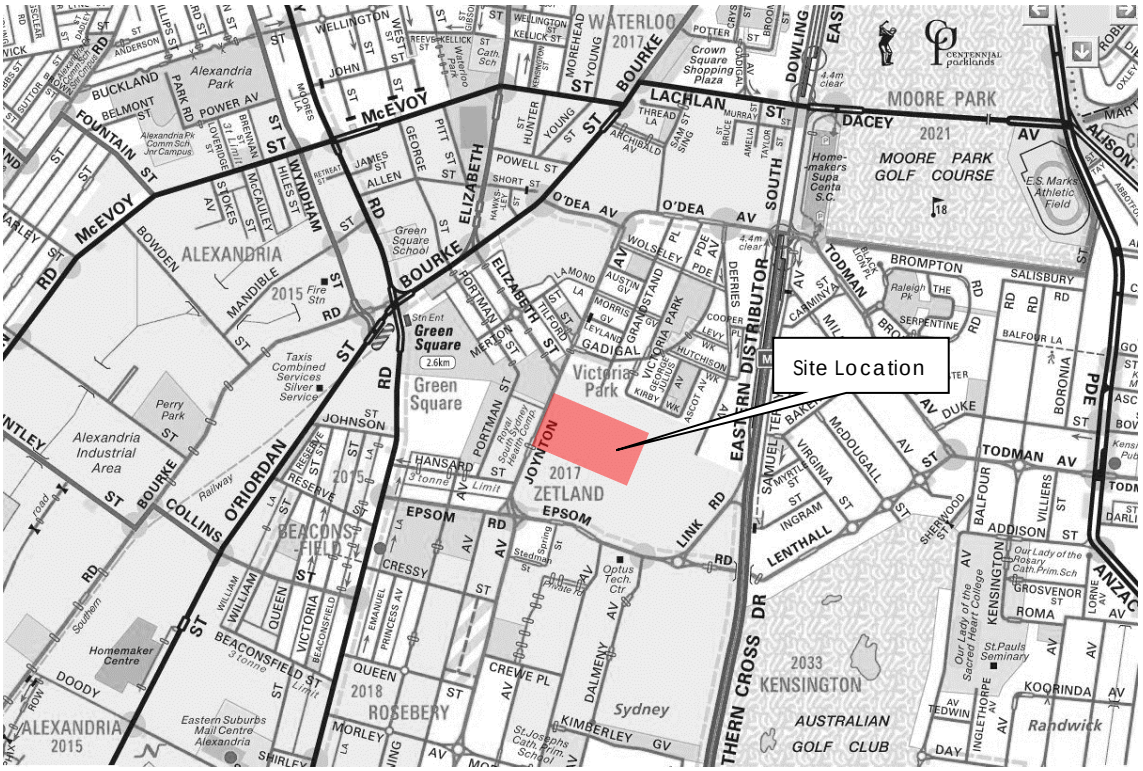
2.1 Existing Conditions

The site is located at 132-140 Joynton Avenue, Zetland and currently has a single street frontage of 155m to Joynton Avenue along its western boundary. The site currently has a land use classification of B4 Mixed Use and has largely been cleared of permanent structure. Temporary buildings and worker parking associated with the Green Square Stormwater Drain Project is currently occupying the majority of the site area.

The surrounding properties currently include a mix of industrial and commercial land uses with an increasing amount of medium and high density residential properties. The area is subject to several precinct studies with the onset of residential and mixed use developments being implemented in accordance with the Green Square development area.

The location of the site and its surrounding environs is shown in Figure 2.1 with the Epsom Park Precinct illustrated in Figure 2.2.

Figure 2.1: Subject Site and Its Environs



Basemap source: Sydway

Figure 2.2: Epsom Park Precinct Public Domain

Source: Epsom Park Precinct Public Domain Concept Design, City of Sydney, Rev. A, 23.10.15

2.2 Precedent and Benchmarking Study

Several transport related studies have been completed for the immediate area and several surrounding precincts, as detailed in Table 2.1. Select studies are particularly relevant to the transport related objectives of Gunyama Park Aquatic and Recreation Centre (GPARC), specifically those that assess future traffic implications, regional and local level road upgrade needs together with provision for future public transport services.

Table 2.1: Transport Related Studies

Document	Author	Date/Year	Traffic Surveys	Traffic Generation	Purpose
Green Square Town Centre (GSTC) Parking and Traffic Study	Bitzios Consulting	January 2012	Yes	Yes	Parking and traffic study of the GSTC and appropriate measures to address increase in traffic volumes.
Epsom Park Precinct Traffic Generation Study	City of Sydney	2014	No	Yes	Compare existing and future traffic generation of the site and determine future traffic impacts.
Population Study Input	@leisure Planners	July 2015	No	No	Estimate and model the population of activity areas within the GPARC precinct.
Green Square Town Centre – Essential Infrastructure and Public Domain – 2031 Traffic Modelling Synopsis	AECOM	July 2014	No	Yes	Determine the future traffic impacts of the GSTC development in surrounding road networks
Gunyama Park and Green Square Aquatic Centre Access Assessment Report – Preliminary Design	BCA Logic	May 2016	No	No	Assess and comment on the relevant access requirements for persons with a disability and identify any issues relating to non-compliance.
Transport Report for Green Square Town Centre Essential Infrastructure	Colston Budd Hunt & Kafes	July 2012	No	Yes	Traffic and parking implications of the essential road infrastructure works for the Green Square Town Centre to support the development application

2.3 Transport Context

GPARC is located within the Epsom Park Precinct in Zetland which forms part of the broader Green Square development area. The site is planned to be highly accessible by walking, cycling and public transport services with limited car parking, which is generally in accordance with the City of Sydney's Green Square development objectives. Future surrounding land uses will predominantly consist of high density residential with ground floor retail/ commercial uses, with Green Square Town Centre (GSTC) located to the west, which will further support reduced reliance on private vehicle transport.

The site is located approximately 950m (or 12 minute) walk from Green Square Railway Station with high frequency bus services currently provided along Joynton Avenue that link the local area with the CBD and beyond. Planned sustainable transportation in the area includes the Eastern Transit Corridor (ETC), a high capacity transport corridor which will initially be serviced by buses and eventually light rail, to connect Green Square with Sydney CBD. This corridor is planned to make use of Zetland Avenue along the site's northern boundary.

A network of dedicated pedestrian routes are proposed, which will in-turn connect with the broader area and recognises the site's importance as a pedestrian destination and asset for local residents. The proposed cycling routes will also link the site with the surrounding established network and those planned as part of the broader Green Square development area. These facilities address the objectives of City of Sydney's Cycling Strategy and Action Plan.

Sustainable Sydney 2030

When planning for the future transport requirements of key public facilities, it is appropriate to reference the transport objectives of Sustainable Sydney 2030.

The development of bold and decisive transport options is key to building on Sydney's global city status and facilitating the anticipated significant growth in population and employment between 2006 and 2036, while also realising the negative impacts of bus, traffic and pedestrian congestion on the City. Providing people with faster and more efficient transport options has proven to be the most effective way to combat congestion, whether it be via heavy rail expansion, provision of light rail, expanded dedicated bus lanes, safe cycleways and walking routes.

Green Square is one of two key development areas (the other being Barangaroo), with the need to ensure a high level of connectivity by a range of transport modes considered of prime importance. The City has been working with both State and Federal Governments to protect a corridor to ensure the medium-term delivery of light rail to better link the area with the City, in combination with improved cycling and cross-regional bus networks. The light rail corridor would use Zetland Avenue along the GPARC northern boundary, noting that implementation would remove on-street parking currently accommodated within the central median.

The key transport related actions relevant to Green Square include the following:

- encouraging active transport
- integrating transport and land use
- managing street, parking and vehicles
- enhancing public transport.

2.4 Existing Travel Modes

The Census *Journey to Work* (JTW) data 2011 is regarded as the most robust picture of existing travel patterns to/ from Green Square. The smallest geographical area for which JTW data is available is a Travel Zone (TZ). JTW data was analysed for the broader Green Square catchment, to better understand the current travel patterns for people who live in the area.

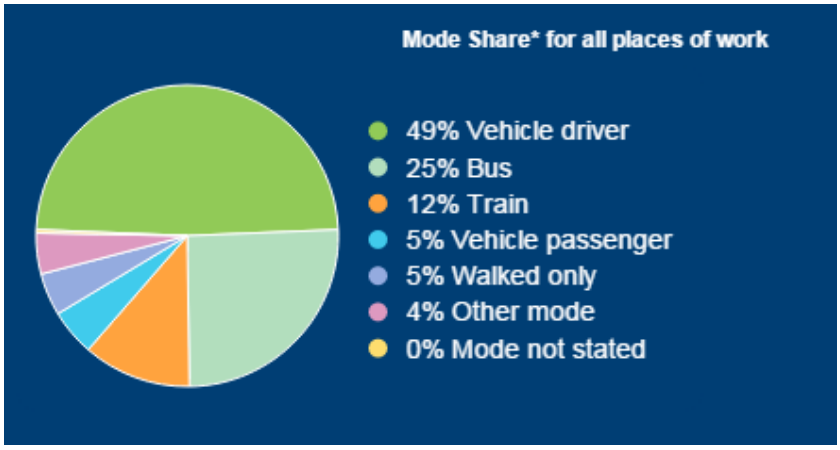
The analysed Green Square catchment is shown in Figure 2.3.

Figure 2.3: 2011 Census Data Journey to Work Data (TZ 280 and TZ 278)

Basemap Source: Bureau of Transport Statistics

The 2011 JTW data indicates that 1,832 people lived in the Green Square region located immediately north of the site. Of those travelling to work on a daily basis, 54% (906) commuted by car (as driver or passenger) and 37% (625) commuted via bus or train. These statistics are summarised in Figure 2.4.

Figure 2.4: 2011 JTW – Employed Residents Commuting from TZ 280 and TZ 278



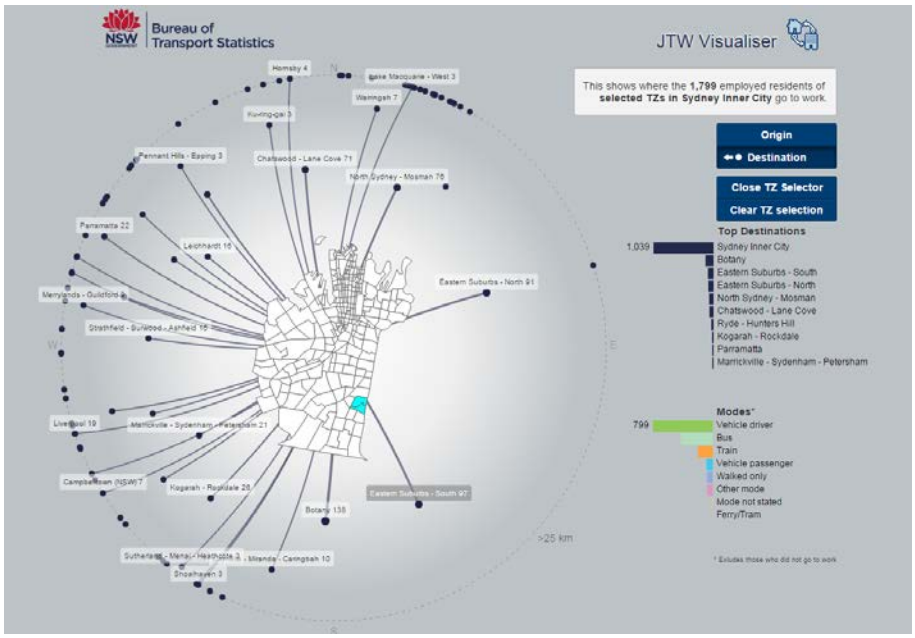
Basemap Source: Bureau of Transport Statistics

The JTW data also states the most common places of work for the 1,799 employed Green Square residents, with the primary destinations including:

- Sydney Inner City (57%)
- Botany (8%)
- Eastern Suburbs - South (5%)
- Eastern Suburbs - North (5%)
- Northern Sydney - Mosman (4%).

Figure 2.5 shows where the employed residents in the selected Travel Zones (see Figure 2.3) work. In total, 49% travel to work by car (as driver or passenger) with 35% using public transport (bus, train).

Figure 2.5: Place of Work for Employed Residents in selected Travel Zones, 2011



Basemap source: Bureau of Transport Statistics

It is also worth noting that of the 220 people who work in the selected Travel Zones, 79% either drive a car or are a passenger in a car, with 13% travelling by bus or train.

Given the age of the most recent census data (last census being 2011) it is anticipated that the mode shift to active travel modes (walking and cycling) and public transport would have increased and now be higher than the census data indicates. The subject site is well placed to support future growth of active and public transport modes, particularly with the anticipated high density residential growth and public transport improvements anticipated in the area over the next few years.

2.5 Existing Road Network

Joynton Avenue

Joynton Avenue is a collector road which has historically functioned as the main north-south link through the area. It is a two-way road which is predominantly configured with one traffic lane and one parking lane in each direction. Kerbside parking is generally permitted on both sides of the road with specific areas of no stopping.

Joynton Avenue carries approximately 24,000 vehicles per day in the vicinity of the site and currently serves as the primary north-south route through the local and regional areas.

Epsom Road

Epsom Road is a collector road aligned in a west-east direction and located south of the site. It is a two-way road with one traffic lane and one parking lane in each direction. Wide traffic lanes (approximately 4m) readily allow for heavy vehicle movements. Epsom Road links Botany Road

to the west with Lenthall Street to the east (under the M1) and further convenient connections with Todman Avenue and Anzac Parade further to the east.

Epsom Road carries approximately 12,000 vehicles per day in the vicinity of the site.

Hansard Street

Hansard Street is a local road that travels west from Joynton Avenue south of the site and connects with Botany Road further to the west. It is a two-way road with a mix of parallel and angled kerbside parking along both sides.

All the roads in the vicinity are subject to a 50km/h speed zone, except Hansard Street and Elizabeth Street (to the north-west) which are subject to 40km/h limits. The site is well located with respect to the surrounding local and arterial roads providing convenient local and regional access. Traffic distribution would be direct and uncomplicated with minimal incentive for use of lower order roads.

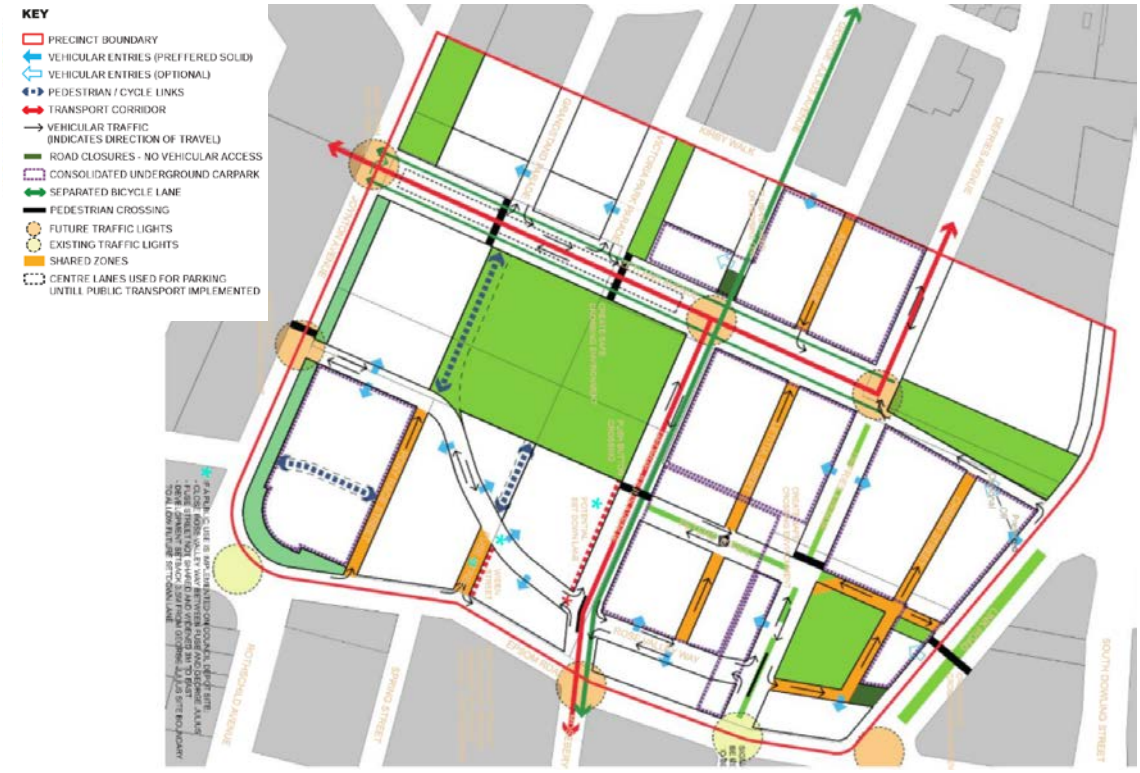
2.5.1 Surrounding Intersections

The following intersections currently exist in the vicinity of the site:

- Joynton Avenue/ Epsom Road/ Rothschild Avenue (signalised)
- Joynton Avenue/ Hansard Street (priority controlled)
- Joynton Avenue/ Elizabeth Street (priority controlled).

Given the planned modifications to the road network associated with the Green Square development area, the existing road network is somewhat unrepresentative of future conditions. With this in mind, Figure 2.6 intends to illustrate the key roads in the immediate vicinity of GPARC with the key traffic routes, future intersections and turning locations evident.

Figure 2.6: Epsom Park Precinct Access and Circulation



Source: City of Sydney, Public Domain Urban Framework, Epsom Precinct – Access and Circulation, 08.04.15, Rev. D

Based on the above, the future key precinct intersections will include:

- Joynton Avenue/ Zetland Avenue (signalised)
- Zetland Avenue/ George Julius Avenue(signalised)
- Joynton Avenue/ Rose Valley Way (priority controlled)
- George Julius Avenue/ Rose Valley Way (priority controlled).
- Epsom Road/ George Julius Avenue (signalised)
- Epsom Road/ Joynton Avenue.

2.6 Traffic Volumes

Existing traffic volumes for the adjacent Green Square Town Centre development area are contained in the *Green Square Town Centre Parking and Traffic Study* prepared by Bitzios (2013).

City of Sydney also completed turning movement counts at all site access locations along Joynton Avenue, Epsom Road and Link Road in June 2014 as part of the *Epsom Park Precinct Traffic Generation Study*.

The results concluded that the site (Epsom Park Precinct) generated a total of 585 vehicle movements during the weekday AM peak hour, 452 during the weekday PM and 276 on a Saturday.

2.7 Future Road Network

Zetland Avenue

Zetland Avenue is planned to provide the main west-east link through the Epsom Park Precinct and along the northern boundary of GPARC. It is also proposed to serve as the key public transport corridor with future light rail also planned over the medium term. A light rail stop is also proposed east of GPARC and east of the intersection with George Julius Avenue. It will also serve as a bus corridor and links well with GSTC further to the west (and Green Square Railway Station).

Parallel parking is proposed along both sides of the road and within the central median until a time when the light rail will occupy the central median.

It is understood that full construction of Zetland Avenue will not be complete at the time of GPARC opening with planning for this to include turnaround facilities.

George Julius Avenue

George Julius Avenue will provide a key north-south link along the eastern boundary of Gunyama Park. It will be a key future traffic route through Epsom Park Precinct linking Epsom Road with Zetland Avenue and Defries Avenue further to the north.

90-degree parking is proposed along the western side and parallel parking along the eastern side adjacent to Gunyama Park. The key intersections along the length of George Julius Avenue will be signalised on account of the anticipated future traffic volumes.

Rose Valley Way

Rose Valley Way travels along the southern boundary of the Aquatic Centre and deviates further south around future mixed use development along the southern alignment of Gunyama Park. When complete, it will link Joynton Avenue in the west with George Julius Avenue in the east at priority controlled intersections. It will also serve as a key access road to surrounding residential developments.

Full construction of Rose Valley Way will not be completed prior to the opening of GPARC. In the interim, the Rose Valley Way footpath south of GPARC will be used as a shared zone, with dedicated service vehicles access also permitted.

2.8 Traffic Assessment

A series of modelling assessments have been completed as part of the planning for GSTC and the Epsom Park Precinct. With this in mind, the following assessment highlights the outcomes of the base Paramics modelling as it relates to specific locations key to GPARC and other assessments/ assumptions etc:

- The Bitzios report determined that the intersection of Joynton Avenue/ Epsom Road operates at Level of Service (LoS) A/B in the weekday AM peak and LoS F in the weekday PM peak.
- The AECOM report completed future 2031 modelling with the intersection of Zetland Avenue/ Joynton Avenue expected to operate at LoS D in the weekday AM peak and LoS C in the PM peak. Overall, the report concluded that the GSTC road network will likely be at capacity in future years due to the development of the GSTC, Epsom Park Precinct and other precincts. However, revised model inputs and amendments to traffic signal phasing as a result of RMS consultation resulted in agreed and acceptable intersection operation.
- The City of Sydney report included turning movement counts in June 2014 for all site accesses along the site frontage streets. The existing peak period was found to be between 6.30am and 9.30am and 3:00pm and 6:00pm weekdays and 12:00pm to 1:00pm on Saturdays. The existing site generates 585 vehicles in the AM peak, 452 vehicles in the PM peak and 276 vehicles on Saturdays.
- The City of Sydney report also concluded that GPARC would generate low traffic volumes; 15 vehicle trips in the AM peak and 30 vehicle trips in the PM peak.

2.9 Existing Parking Review

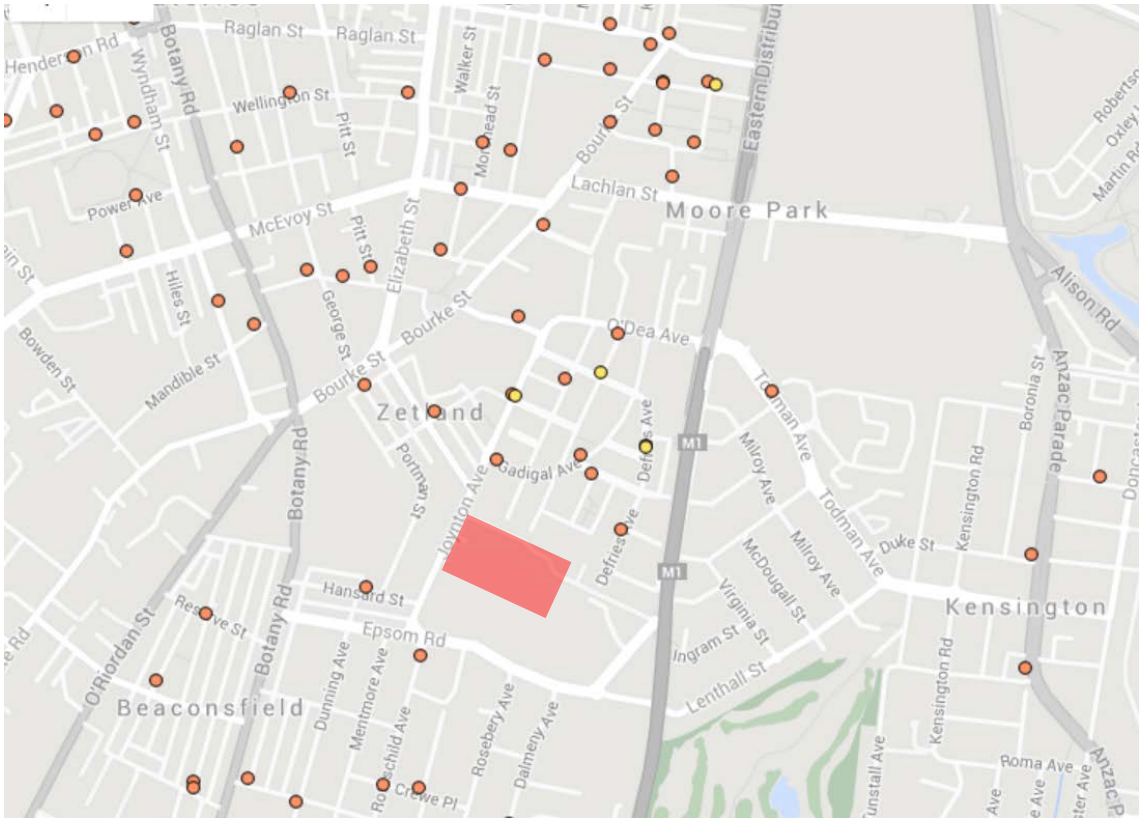
An existing signage plan has been prepared for Joynton Avenue, Hansard Street, Chester Lane, Elizabeth Street and Grandstand Parade and is included as Appendix B. The total existing on-street car parking supply for this study area is 138 spaces with a real mix of restricted parking (1P through to 4P) and unrestricted parking.

2.10 Local Car Sharing Initiatives

The site is already well located to car share facilities with several GoGet spaces located within a short walking distance. Those within the vicinity of the area are illustrated in Figure 2.7.

The redevelopment of the Green Square area will obviously bring about significant change to the level of car share spaces available both on-street and, increasingly likely, within the various residential developments surrounding GPARC.

Figure 2.7: Car Share Locations



Source: http://www.cityofsydney.nsw.gov.au/live/residents/car-sharing (accessed May 2016)

The above shows that the site is readily accessible with several currently available car share spaces located within the vicinity.

3. Development Proposal

3.1 Project Overview

The key facilities of the GPARC project will incorporate the following:

- 50m heated outdoor pool and leisure pool
- 25m indoor program pool
- indoor leisure pool
- hydrotherapy pool
- crèche
- café
- health and fitness centre and outdoor fitness station
- outdoor synthetic multipurpose sports field
- outdoor playground with skate facilities
- park boardwalk, terraces and seating
- native planting and landscaping.

The GPARC site will not incorporate off-street parking given the level of existing and planned future accessibility via public transport, walking and cycling, as well as its proximity to future high density residential living. This approach will be supported by a Green Travel Plan and an ongoing monitoring program and is in accordance with City of Sydney's Green Square development objectives.

Parking demand will also be facilitated by provision of on-street parking and associated management (e.g. 'park and swim') in the vicinity, including 30 angled spaces along the western alignment of George Julius Avenue fronting Gunyama Park.

Aquatic Centre

The Accommodation Schedule indicates the aquatic centre will have a total floor area of 7,107 sq.m internal area and 2,409 sq.m external area, comprised of the following facilities:

- Front of House – 978 sq.m (internal), 158 sq.m (external)
- Administration – 175 sq.m (internal), 6 sq.m (external)
- Aquatic Centre – 3,691 sq.m (internal), 2,285 sq.m (external)
- Health and Fitness Centre – 1,479 sq.m (internal)
- Back of House – 667 sq.m (internal).

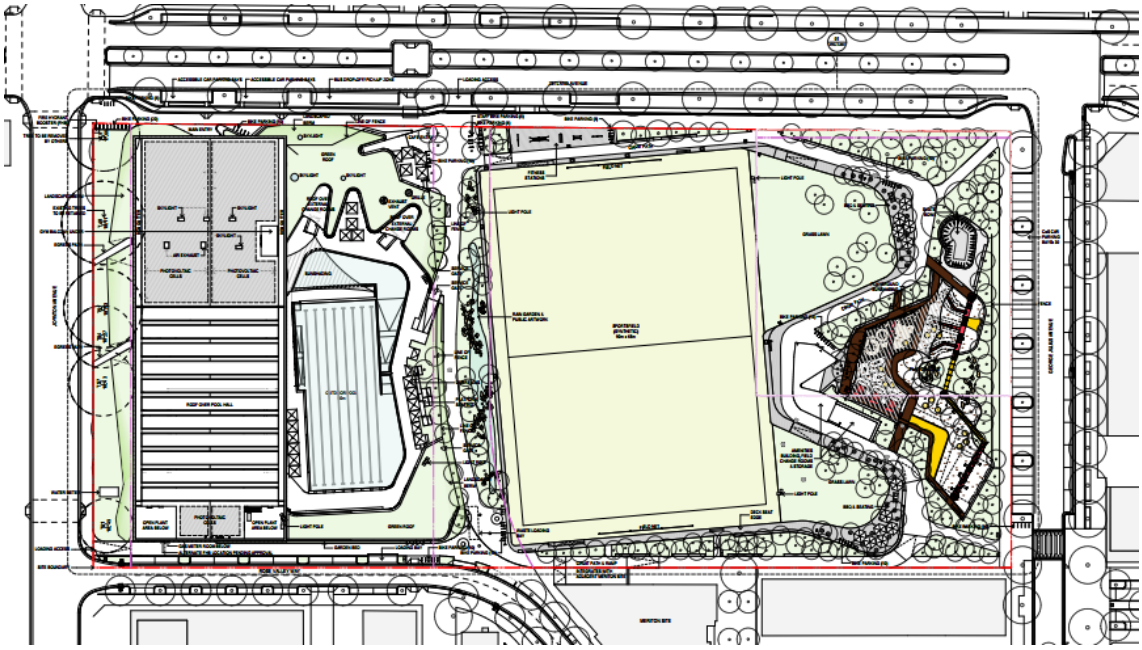
Park/ Sports Field

The Park and Public Domain Accommodation Schedule indicates the park and sports field area will have total floor areas as follows:

- Multi-purpose Field – 5,850-7,400 (external)
- Playspace – 1,500 sq.m (external)
- Park Amenities – 112 sq.m.

An extract of the site layout plan is shown in Figure 3.1.

Figure 3.1: Site Plan



Source: Site Plan, ABA Grimshaw, ARC-DA-011, Rev. A, 25/05/16

3.2 Schedule of Areas

Table 3.1 summarises the subject site facilities and sizes.

Table 3.1: GPARC Schedule of Areas

Facility	Use	Size
Aquatic Centre		
Entry/ Reception	Office	44sq.m plus part of foyer
Cafe/ Kiosk	Food and Drink premises	306sq.m [1]
Crèche	Child care centre	128sq.m
Management Offices/ Meeting Rooms	Office	174sq.m
Leisure Water Area	Pool	510sq.m (indoor)
25m Program Pool	Pool	540sq.m (8 lanes)
50m Outdoor Pool	Pool	1,150sq.m (8 lanes)
Stadium seating	Place of Assembly	110sq.m (allow 100-200 seats)
Hydrotherapy (pool)	Health consulting rooms and medical centre	366sq.m (1 program room)
Weights, Cardio, Spin Room	Gym	1,478sq.m
Back of House Plant Rooms, Garbage Room	Ancillary Uses	667sq.m
Gunyama Park		
Multi-purpose sports facility and park area	Recreation	5,850 sq.m (65m x 90m field) + park area

[1] Number of seats not specified

[2] Floor area based on ABA + Grimshaw plan (Rev D, 31/05/16)

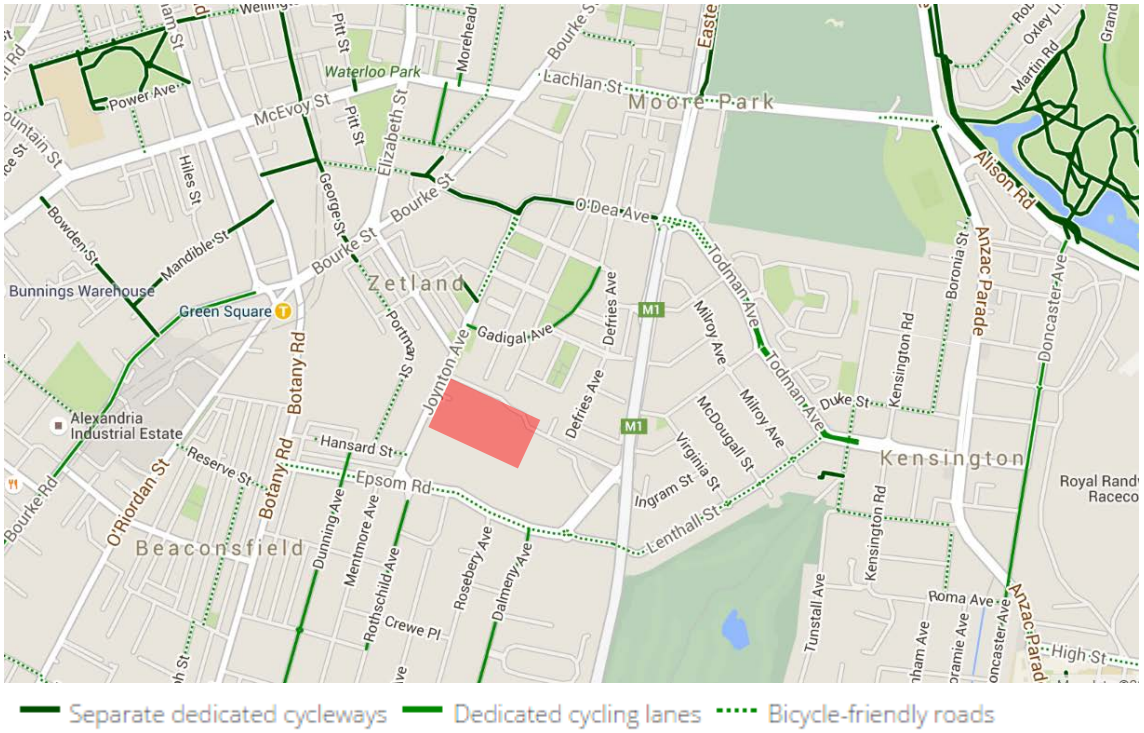
4. Sustainable Transport Infrastructure

4.1 Existing Walking and Cycling Facilities

The streets surrounding the subject site all have some footpath provision, generally with sealed footpaths provided on both sides of the carriageway. These footpaths provide a relatively connected pedestrian network within the local area surrounding the subject site. Signalised intersections in the vicinity of the subject site provide pedestrian crossing facilities. With future development near the subject site it is understood walking routes and crossing opportunities will be improved and strengthened as part of the surrounding development.

No on street bicycle facilities currently exist on the roads immediately adjacent the subject site, although there are several on street bicycle lanes providing some connectivity to the south, including Dunning Avenue and Dalmeny Avenue. Figure 4.1 shows the existing cycling infrastructure within the vicinity of the subject site. With future development in the surrounding area it is anticipated cycling facilities will be upgraded with connectivity strengthened to support reduced car use in the area.

Figure 4.1: Existing Cycling Infrastructure



Source: http://www.sydneycycleways.net/map/ (accessed May 2016)

Furthermore children under the age of 12 (and accompanying adult) can cycle on the footpath (unless otherwise signed) in NSW. The existing footpaths within the vicinity of the site are currently able to be used by children cycling to/ from GPARC and within the local area.

4.2 Bicycle End of Trip Facilities

Bicycle end of trip facilities will include the following:

- bicycle parking for general public and for private (staff) users
- bicycle repair stations
- end-of-trip facilities including showers and lockers for both public and private (staff) users
- convenient, well-lit pedestrian links.

When planning sustainable transport options careful consideration needs to be given to factors that may affect the level of use. For example, the implicit provision for walkers and cyclists include:

- security and safety
- visibility
- shelter
- convenience
- signage.

The site plans show extensive bicycle parking within and around GPARC as part of the development. The facilities are understood to be inverted U-loops which are appropriate for short term use consistent with recreational land uses. Of the total 130 bicycle racks, 64 (49%) are located in good proximity to the Aquatic Centre front entrance. The remainder are evenly spread around Gunyama Park. In addition, 8 dedicated staff bicycle racks are conveniently located close to the front entrance to ensure their needs are also catered for.

Future provision has also been made for an additional 70 bicycle racks, with 40 (57%) of these located along the Joynton Avenue frontage and the remainder in the north-west corner, close to George Julius Avenue.

The provision will ensure viable sustainable transport modes are not only accommodated but able to be easily promoted, with convenience to play a significant role in ensuring new residents to the precinct move away from private vehicles as their primary mode of transport.

4.3 Future Walking and Cycling Network

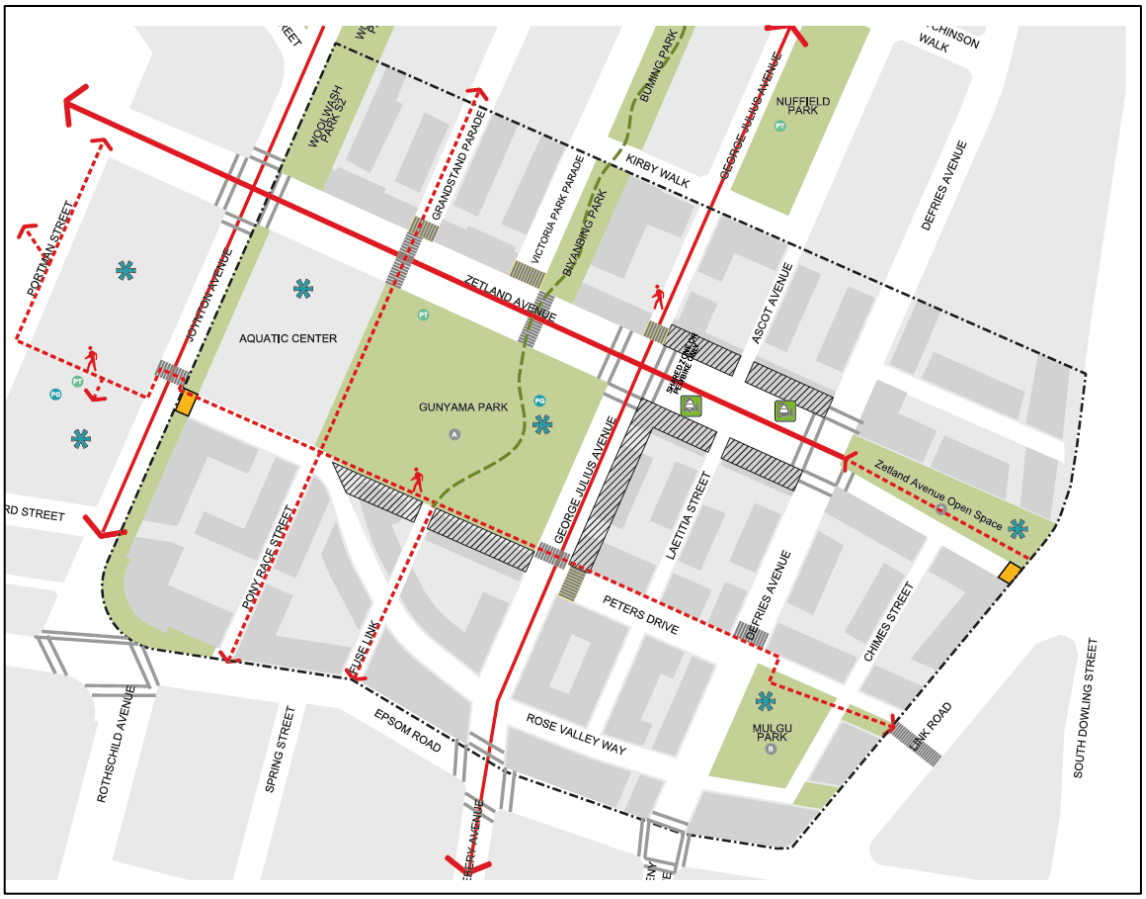
GPARC and the broader precinct is a brownfield site with the whole area currently undergoing extensive redevelopment. As part of that redevelopment pedestrian and cyclist facilities will be strengthened, which is essential to achieving the desired change in mode shift from private vehicle to more active modes of transport. This should support the localised high density residential catchment that will be developed over the next 10 to 15 years that should generally not need to drive within the local area to access a wide range of facilities.

Pedestrian paths will generally be provided along both sides of the road in the surrounding streets, connecting GPARC users with the broader Green Square development area. Primary pedestrian paths along Joynton Avenue and George Julius Avenue will connect to the Zetland Avenue main entrance. A dedicated path will also travel in a north-south direction between Aquatic Centre and Gunyama Park to ensure permeability throughout and to allow for overland flow requirements.

Pedestrian facilities, including marked pedestrian crossings will improve pedestrian safety in the area and allow pedestrians to easily move between and around the precinct, as illustrated by Figure 4.2.

The proposed shared paths discussed further below will also improve pedestrian access to the subject site and surrounding areas.

Figure 4.2: Public Spaces and Pedestrian Desire Lines



Source: City of Sydney Epsom Park Urban Framework Plans Rev D (April 2015)

Surrounding streets which facilitate recreational and leisure cycling include Dalmeny Avenue, Dunning Avenue, Bourke Road and Bourke Street. It is also understood that a cycle lane infrastructure is currently in the design stage for a high quality link between Green Square and Randwick which may be attractive to GPARC users. As the precinct continues to develop, appropriate cycling infrastructure should be accommodated.

Part of City of Sydney's Cycle Strategy and Action Plan 2007-2017 (2007) is to develop the Green Square area in to a fully permeable, safe environment for the residents, workers and visitors to move safely.

More recent new cycleways planned for Green Square Town Centre include:

- Zetland Avenue between Paul Street and Victoria Park Parade: 420m long separated one-way cycleway on each side of the road to connect GPARC with GSTC and community facilities.
- Geddes Avenue between Botany Road and Portman Street: 275m long separated bidirectional cycleway (construction to commence June 2016).
- Portman Street between Portman Lane and Hansard Street: 350m separated bidirectional cycleway.

Providing these cycling links will substantially improve bicycle access to the site from the existing routes and support the vision for increased cycling activity to the site while ensuring a high level of cyclist amenity.

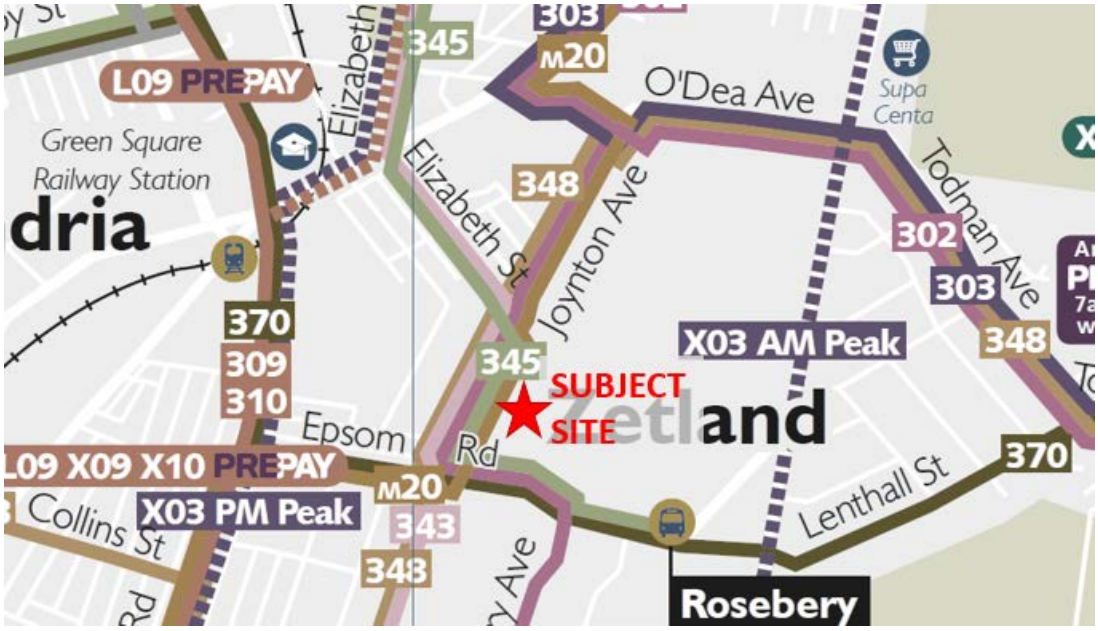
4.4 Public Transport

4.4.1 Buses

Existing Services

As illustrated in Figure 4.3, it is evident that there are several existing bus routes in close vicinity to the site, mostly travelling along Joynton Avenue immediately to the west, as well as Epsom Road to the south.

Figure 4.3: Existing Bus Services



Source: Sydney Buses region guide for eastern region (SMBSC 9), www.transportnsw.info

A bus stop for northbound buses is located opposite the site on Joynton Avenue with the southbound bus stop located approximately 120 metres to the south. These bus stops are serviced by the following bus routes:

- 301 Eastgardens - Sydney
- 343 Daceyville - Chatswood
- M20 Botany – Gore Hill
- 348 Wolli Creek - Bondi Junction.

The above routes combine to provide high frequency services at the Joynton Avenue bus stop, with the wait time between buses generally up to 5 minutes during the day and less during the peak hours.

The two Epsom Road bus stops are also each within approximately 300m of the site. Bus route 370 Coogee – Leichhardt is the key east-west route through the area and in combination, these stops generally have a 5 to 20-minute wait between buses throughout the day.

The frequency of each route is summarised Table 4.1.

Table 4.1: Existing Bus Routes

Bus Route	Headway Weekday	Operating Hours
301	<10 minutes (peak) 20-30 minutes (off peak)	06:13 – 23:28
343	5-10 minutes (peak) 10-20 minutes (off peak)	04:24 – 00:09
348	30 minute	06:18 – 19:42
M20	10 minutes (peak) 15 minutes (off peak)	06:38 – 20:21
370	10 minutes (peak) 20 minutes (off peak)	05:42 – 20:54

Source: Transport NSW

The services these bus routes provide and their regularity will allow for easy bus access to the site from initial opening and able to support the objectives of limited private vehicle travel.

To support the existing public transport routes, the walking routes to and from public transport services (i.e. bus stops and train stations) should be of good quality and provide for passive security through design, particularly on walking routes to public transport that would be in use at night (e.g. lighting).

Future Provision

In addition to the existing bus routes along Joynton Avenue and Epsom Road, there are proposed bus routes which will also service the GPARC site. It is understood from City of Sydney's Epsom Park Urban Framework Plan (Rev D) that short term potential bus routes will operate along Zetland Avenue as part of the Eastern Transit Corridor (ETC) initiatives. The bus services will provide links to the Green Square Town Centre, Transport Place and other key locations in the Green Square development area within the local context. From a broader perspective, the bus services will provide links to several key generators including Sydney CBD, Mascot and Bondi Junction.

Transport for NSW has outlined its intentions to provide two alternative bus routes travelling through the GSTC site. These bus services will provide links to areas including the CBD, Gore Hill, Mascot, Coogee, Leichhardt, Bondi Junction, Wolli Creek and the University of New South Wales (UNSW). Bus services will operate at a frequency of about one bus every 6 minutes during peak periods. With relation to the site, these buses will travel in a north-south direction along Joynton Avenue, directly west of the site.

4.4.2 Heavy Rail

The GPARC site is currently an approximate 950m (or 12 minute) walk from Green Square Railway Station. The T2 Airport Line provides a convenient link to Central Station and other CBD stations, as well as to the domestic and international airport terminals. Ongoing connections to all Sydney Trains and NSW TrainLink rail networks are achievable via Central station.

The Green Square Railway Station provides trains at a frequency of every 2 to 5 minutes across peak periods and during the day. Weekend services are also reasonably frequent, although there is some irregularity in service patterns with wait times varying between 2 and 15 minutes. The two directions of service operate at 5 to 10 minute headways and span 04:45am to 00:15am (following day). The regularity of train services at the Green Square Station will assist with convenient train access to the site and wider precinct, to support the objectives of limited private vehicle transport.

Notwithstanding, the current walking route to/ from Green Square Railway Station represents a detour which will be resolved as part of the ongoing Green Square/ Epsom Park development. When the Green Square Town Centre is developed, the direct pedestrian link will represent a travel distance saving of approximately 300m, and well within the broadly recognised 800m walking distance (approximate 10-minute walk) for access to a railway station.

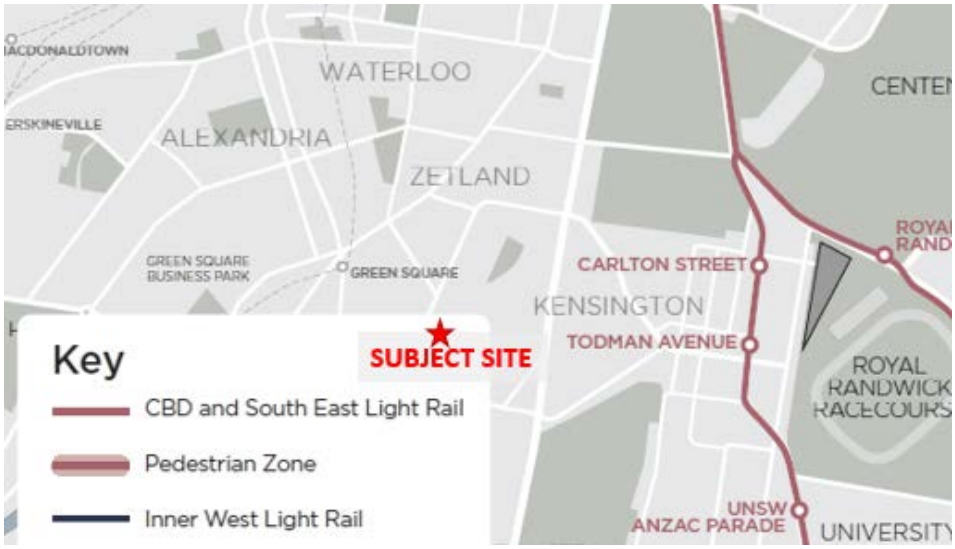
4.4.3 Light Rail

CBD and South East Light Rail

The proposed CBD South East light rail line (shown in Figure 4.4) will provide additional public transport options within the vicinity of the site. The proposed route and stop locations are shown in Figure 4.5.

The Todman Avenue stop is expected to provide the closest stop to the site, although it will be further from the site than the existing Green Square Railway Station.

Figure 4.4: CBD and South East Light Rail



Source: Transport for NSW CBD and South East Light Rail Route Map (December 2015)

Zetland Avenue

The ETC was previously proposed as a bus rapid transit system to operate along Zetland Avenue and connect the surrounding area to the Sydney CBD. Within the site's neighbourhood, the ETC was to connect GPARC to key destinations in the area such as Transport Place, Green Square Town Centre and various plazas. This has now been superseded by light rail proposals.

In Infrastructure Australia's latest plan, the light rail project to Green Square has been designated a high priority initiative with a probable timescale of 5-10 years. The City of Sydney is proposing an indicative Green Square Light Rail alignment as shown in Figure 4.5.

A future light rail stop is also being considered along Zetland Avenue in close proximity to the GPARC site.

Figure 4.5: Green Square Light Rail

Source: Infrastructure Australia

4.5 Green Travel Plan

A Green Travel Plan (GTP) and Transport Access Guide (TAG) is a package of measures aimed at promoting and encouraging sustainable travel and reducing reliance on the private car. The GTP is designed to support and promote active and sustainable alternatives instead of typical private car usage, that is, single occupancy or short distance trips. The GTP seeks to support mode shift to healthier, more active and sustainable travel.

A separate GPARC GTP has been prepared and indicates:

- measures which encourage reduced car use (disincentives or 'sticks')
- measures which encourage or support sustainable travel (also known as Active Transport), reduce the need to travel or make travelling more efficient (incentives or 'carrots').

The GTP promotes the use of transport, other than the private car, for choice of travel to and from GPARC, which is more sustainable and environmentally friendly. Ultimately however, visitors shall determine their most suitable means of transport.

The GTP will benefit from the walkable and bikeable precinct that is envisaged and the high level of public transport accessibility intended to be readily available to and from the precinct. The GTP will:

- advise the wider travel choices to staff and visitors
- help staff/ visitors identify transport means which will result in them being healthier, fitter and more productive
- aim to reduce congestion and provide easily identifiable transport means, improving relations with neighbours and enabling deliveries and essential journeys to move more freely.

Encouraging staff to use public transport could also incorporate elements such as transit pass subsidy to discourage staff from driving to and from the centre.

5. Car Parking

5.1 Proposed Development

The GPARC site will not be providing any dedicated on-site parking for general visitor use.

While the excessive costs of basement car parking located beneath a complex pool structure contributed to this decision, there is a prevailing desire to remain consistent with the broader precinct planning intent and limit the use of private vehicles by provision of both active and sustainable transport modes, together with implementation of a range of incentive programs.

The provision of no parking is generally intended to reduce the incentive to travel by car, and the future growth of the local area will increase the local population catchment significantly, allowing more patrons to walk or cycle to GPARC.

As such, any patrons who chose to drive to the centre will be required to park on-street in the surrounding local street network, which will largely be time restricted parking (e.g. 2P). Parking demand will be addressed through a parking management scheme, including appropriate priced meter/ ticket parking and discounts/ reimbursement for aquatic centre users, and a Green Travel Plan. An additional 30 parking spaces would also be provided along George Julius Avenue.

5.2 Other Facilities

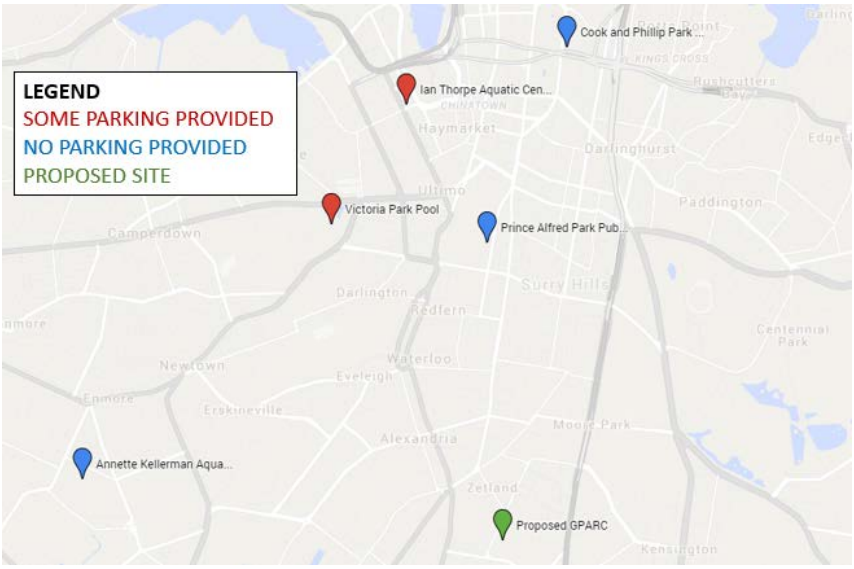
GTA has considered similar facilities for their empirical car parking impact to consider the potential impact of parking on street, and the appropriateness of providing no on-site parking.

There are several aquatic facilities located within Sydney that do not include off street vehicle parking provision, including:

- Annette Kellerman Aquatic Centre
- Prince Alfred Park Pool
- Cook and Philip Park Aquatic and Fitness Centre (Domain car park opposite).

The above facilities are shown on Figure 5.1, along with other nearby pool facilities for which some information on parking is available. This map shows that the Annette Kellerman Aquatic Centre is of comparative location (proximity to the CBD and other nearby pools) to the subject site.

Figure 5.1: Existing Pools within Vicinity of the Site



It is understood Victoria Park Pool provides 'limited' free 2-hour parking, although the exact quantity is not known. Ian Thorpe Aquatic Centre is understood to provide 99 on-site car parking spaces.

Discussions with Belgravia Leisure provided GTA with a general understanding of pool patronage numbers and operation. In regard to the existing Annette Kellerman Aquatic Centre, the following was noted:

- The Aquatic Centre is permitted to have 650 patrons on the premises at any one time.
- Patronage limits are determined from the volume capacity of the pools, with the Royal Life Saving Society providing standards/ guidance.
- During school aged children swimming lessons there could be up to 10 instructors in charge of 5 pupils each.
- Peak periods generally occur in the early weekday evenings (after school) and on weekends.
- No on-site car parking is provided.

5.3 Empirical Car Parking Assessment

Outputs from the GPARC Population Study commissioned by City of Sydney were used to develop parking estimates for the proposed development. As inputs and assumptions for this assessment, the following is noted:

- Existing journey-to-work mode split (ABS, 2011) for Victoria Park (immediately to the north of Epsom Park Precinct) is approximately 55% car driver and passenger, with more than 50% of local residents working within the City of Sydney LGA.
- The Green Square Transport Management and Accessibility Plan (TMAP) sets car-based mode share targets (work trips) for the broader Green Square area at 39% for residents and 58% for workers (combined target of 50%). This rises to 54% when accounting for both work and non-work trips, implying that greater car use is expected for non-work trips, which would include trips to GPARC (either as specific trips or linked trips).

- The TMAP targets represent a relatively significant mode shift from existing travel patterns, noting that additional public transport and active travel initiatives would support such a mode shift.
- Residents within 400-500m of GPARC could be expected to walk to the facility (when not visiting as part of a broader car-based linked trip). However, given that the above mode share percentages are an average for the local population, the likely mode share for patrons outside this immediate catchment would need to be recalculated should the overall catchment be broken up in this manner. There is insufficient data to estimate this with any reliability.
- Given that the GPARC resident catchment is approximately 138,000 people and the worker catchment is approximately 13,500 people, it is appropriate to adopt a residential mode split for assessing travel to the facility.
- GPARC patrons during the AM and PM peak periods would have a significant proportion of professionals travelling alone. As such a vehicle occupancy of 1.5 persons per car has been assumed.

On the above basis, a 39% car driver and passenger mode split has been adopted for assessing potential parking demand, noting that initial parking demand could be higher but offset by lower short-term patronage and alternative transport mode access prior to full occupation of surrounding developments and future development and enhancement of public transport, cycling and walking networks.

Table 5.1 has been prepared on the basis of PM peak time user numbers sourced from GPARC Population Study supplementary data and the assumptions of a 39% car-based mode share and an average vehicle occupancy of 1.5 persons. Two scenarios have been presented; direct use of the PM peak population estimates and a scaled estimate that is considered to be more reflective of typical weekday PM peak activity (particularly acknowledging that gym facilities would typically not operate at maximum capacity). The resultant estimate of a demand for 105 parking spaces is comparable with the weekday PM peak period estimate of 104 parking spaces in Table 5.1.

Table 5.1: PM Peak Period Parking Demand Estimates based on Population

Activity Area	Peak Time (1700-1900) Estimated Total Capacity*	GTA Typical PM Peak Patronage Estimate	PM Peak Maximum Parking Requirement	GTA Typical PM Peak Parking Requirement Estimate
Indoor Leisure Water	50	40	13	10
Outdoor Leisure Water	30	25	8	7
Indoor 25m Pool	64	64	17	17
Outdoor 50m Pool	120	120	31	31
Hydrotherapy Pool	24	15	6	4
Gym, cardio room, dry fitness studio	160	100	42	26
Spin room	30	20	8	5
Weights room	30	20	8	5
TOTAL	**508 pax***	**404 pax****	**132 spaces**	**105 spaces**

* Assumed to represent the likely maximum number of patrons using the facility at any one time (Source: @ Leisure Population Study Input, Supporting Document, 28/07/15).
** GTA typical PM peak period patronage estimate total of 404 patrons is comparable with 402 patrons identified for the 5-7pm period (based on @ Leisure Year 1 estimates) in the Green Square Aquatic Centre – User Projections (City Aquatics, 30/07/15).

The above indicates some 100-130 vehicles could attempt to park near the subject site based on this analysis. It is anticipated that this level of demand could be reflective of the operation of the site following initial opening.

With longer term local high density residential development and the wider public transport, walking and cycling network improvements the local catchment of the aquatic centre will increase and the parking demand would be expected to reduce.

5.4 Precinct Wide Parking Assessment

To consider the impacts of the potential car parking demand a precinct wide parking assessment has been conducted.

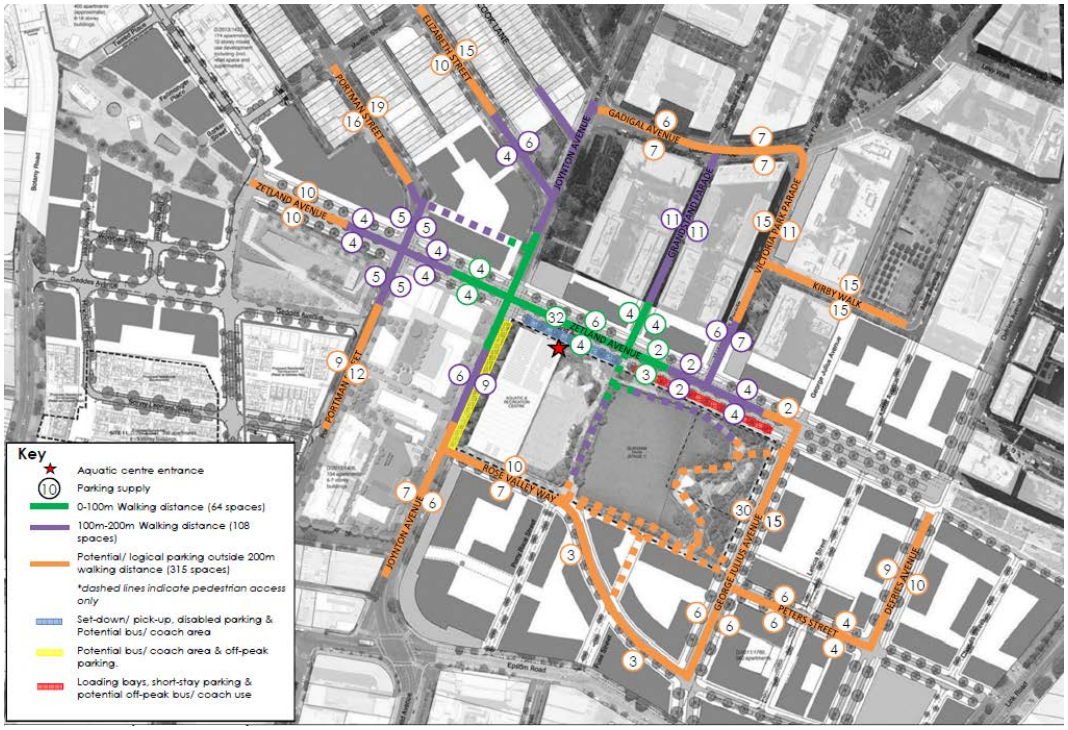
The future roads adjacent to GPARC, including Zetland Avenue, George Julius Avenue and Rose Valley Way would be able to support approximately 36 on-street non-dedicated car spaces along the site frontages as part of the Epsom Park Precinct public domain.

Following a detailed options assessment and analysis throughout, agreement has been reached to provide expanded on-street parking provision along the frontage streets. The assessment confirmed that the parking supply would be increased to approximately 50 spaces, mostly through the use of 90-degree parking along George Julius Avenue (noting the traffic and road safety impacts of such 90-degree parking, including setback requirements).

While it is recognised that the entire Epsom Park Precinct will include approximately 215 time restricted on-street non-dedicated parking spaces, demand and competition for such parking is anticipated to be high. This considers several factors though is mostly attributable to the surrounding likely future land uses (including anticipated ground floor retail and other parking demand generators) and proximity of available parking for the Aquatic Centre.

With this in mind, Figure 5.2 has been prepared to assess the theoretical supply of on-street parking that would be within a logical walking distance of the Aquatic Centre entrance. A larger version of this figure is included as Appendix C. The area of influence includes the Epsom Park Precinct, Green Square Town Centre and other local areas and assumes that there would be no other land uses generating parking demand in competition with GPARC.

Figure 5.2: Potential Future Parking Catchment Map



The following is a summary of key information from the potential future parking catchment map:

- There will be approximately 60 parking spaces available within 100m walking distance from the Aquatic Centre entrance.
- There will be approximately 105 parking spaces available between 100m-200m walking distance from the Aquatic Centre entrance.
- There is potential for approximately 315 spaces outside a 200m walk from the Aquatic Centre entrance for visitors to park.
- A set-down/ pick-up area and 4 accessible parking spaces will be provided along Zetland Avenue close to the Aquatic Centre entrance.

5.5 Adequacy of On Street Parking Supply

Based on the above, there would be between 150 and 175 on-street spaces within a 200m walk of the Aquatic Centre entrance that would theoretically be available for visitors to park. This increases to between 215 and 240 spaces within a 225m walk, and is variable depending on the time of day, extent of future planned Joynton Avenue clearways, bus/ coach areas and provision of set-down/ pick-up areas.

With the decision made to ultimately provide no on-site parking and thereby rely on the on-street parking within the surrounding precinct, a range of incentive programs and detailed implementation strategy will be key to the functionality of GPARC and the precinct generally.

Future land uses (including residential, retail, commercial and other parking demand generators) will likely create some competition for on-street parking, and will also increase the local catchment that can walk or cycle to GPARC and the potential for linked trips (e.g. parents dropping kids at lessons and then doing the shopping). The future development of the area will also strengthen existing walking and cycling connections, as well as public transport links.

Similar to the Annette Kellerman Aquatic Centre the proposed GPARC will advertise the train, bus, bicycle and walking routes to the site and facilities to the site instead of advertising parking. In the short term there will be some impact on nearby on street parking, but as the area develops into a higher density region the reliance on vehicular transport will shift to adopt more sustainable transport methods and the impact on the surrounding streets car parking due to the GPARC will reduce.

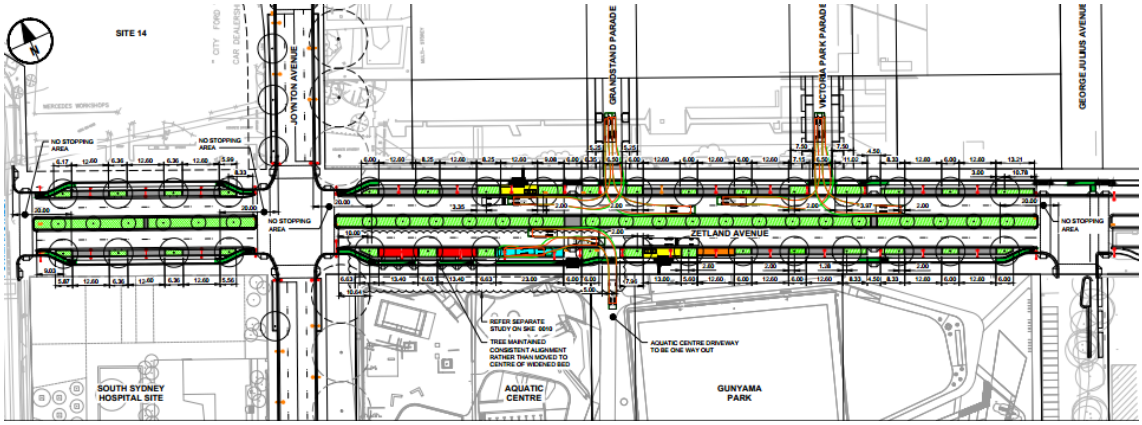
5.6 Other Considerations

The role of Zetland Avenue as the primary frontage street will be key to the way the site is accessed. With this in mind, the following provision will be made in close vicinity to the Aquatic Centre entrance:

- separated cycle path
- set-down/ pick-up area/ coach set-down
- in-lane bus stop
- accessible parking
- loading zone.

The Zetland Avenue layout is illustrated in Figure 5.3.

Figure 5.3: Zetland Avenue Proposed Layout



Source: Zetland Avenue East Ultimate Layout, AECOM, 60300384-SKE-02-04-G-0006, Rev. 1, 07.03.16

Rose Valley Way also plays an important role in terms of broader precinct accessibility and will provide a loading bay, indented parking bays for the general public and loading/ service vehicle access.

The number of accessible spaces may be influenced by the extent of hydrotherapy pool activity, and will likely require monitoring and potentially additional detailed investigation.

These areas connect well with the surrounding expansive public domain and formalised pedestrian facilities along Zetland Avenue, and adjacent to the primary Aquatic Centre entrance.

The 90-degree on-street parking along George Julius Avenue provides additional on-street parking spaces, though creates a long walking distance for visitors to access the Aquatic Centre entrance and is therefore most likely to be used for access to Gunyama Park. This option will also impact the safety of surrounding roads as it creates more vehicular activity on-street as cars pull in and out of parking spots. The final design and setback from the adjacent traffic lanes will also

require detailed design analysis and consideration by City of Sydney to ensure a safe environment for all future users, based on anticipated future traffic volumes.

A parking management system including a metered 'Park and Swim' scheme will also be adopted in order to allow effective use of specific parking spots in the vicinity by visitors to GPARC. The concept is modelled off North Sydney Council's Olympic Pool in Milsons Point, an area that also experiences high demand for on-street parking. The parking fees are in the order of $8.00 per hour with a full refund available for pool users via an automated facility internal to the site, for a two-hour stay. It will be important for such a scheme to be implemented with an appropriate pricing strategy and to be monitored to ensure use by Aquatic Centre visitors and not the general public.

Appropriate signage indicating parking restrictions, accessible parking, loading zones and set-down/ pick-up zones should be incorporated and clearly delineated.

6. Service Vehicles

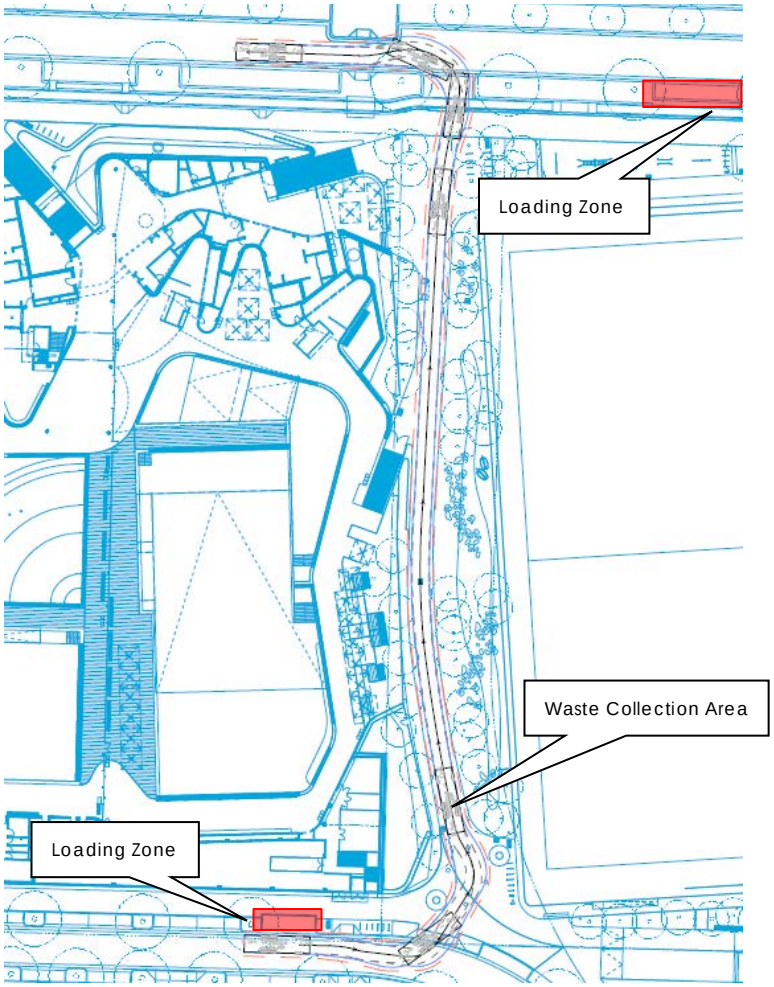
The detailed design includes provision for service vehicles and garbage trucks to access a drive-thru area for the purposes of servicing the site. This design will ensure that all service vehicles are able to have dedicated access at all times of the day and is both efficient and non-intrusive to visitors.

Dedicated driveway crossovers have been provided along Zetland Avenue and Rose Valley Way to ensure a high level of accessibility and links with the logical approach and departure routes. On-street loading bays to the north (close to the main entrance and café) and south (close to pool plant areas) will also ensure that servicing the aquatic centre is easily achievable.

This reduces the design related impact of the site servicing needs while being able to maintain appropriate access. Garbage collection and specific GPARC loading needs (if required) would all be achievable along this corridor. Swept paths of the standard City of Sydney garbage truck and Australian Standard 6.4m small rigid trucks have been completed in various key locations to ensure appropriate design and confirm access.

The service and maintenance vehicle, together with garbage truck access and facilities are broadly highlighted in Figure 6.1.

Figure 6.1: Anticipated Service Vehicle Access and Loading Areas



7. Traffic Impact Assessment

7.1 Traffic Impact

AECOM (2014) completed future traffic modelling for GSTC taking into account future surrounding developments that included the Epsom Park Precinct. With respect to traffic generation, AECOM assessed the GPARC site as 'community' land uses and adopted a commercial development traffic generation rate. The adopted traffic generation rate had a reduction factor applied (to account for GSTC location and proposed reduced parking provisions) and when considering the indicative site floor area quoted, represents approximately 65 vehicle trips during the road network PM peak hour.

City of Sydney (2014) estimated the traffic generation of the GPARC site based on a series of mode split assumptions and traffic generated by the Ian Thorpe Aquatic Centre and the Cook + Phillip Park Aquatic and Leisure Centre, summarised as follows:

- 50% of visitors would be locals residing in the immediate surrounding precincts and 50% from the outer Green Square area
- all local visitors to travel by non-car modes
- 60% of visitors from the outer area to be by non-car modes (based on the Parsons Brinckerhoff Green Square TMAP (2012)
- average of 2 people per car
- less than 20% of daily visits occurring in any peak hour.

The City of Sydney report concluded that GPARC would generate low traffic volumes; 15 vehicle trips in the AM peak and 30 vehicle trips in the PM peak.

Assessment by GTA (2014 and 2015) identified a PM peak parking demand of just over 100 spaces. A turnover of 1-2 vehicle movements per parking space during the PM peak hour would result in a traffic generation of 100-200 vehicle trips, noting that this did not specifically account for any set-down/ pick-up activity. This could be considered reflective of opening conditions in which the catchment will be large and prior to firmly establishing the associated transport improvements.

While it is also recognised that close to 5,000 new dwellings are currently planned to be occupied by the time GPARC opens in 2019, the longer term scenario will see the surrounding residential areas develop much further and result in a significant proportion of users arriving from the local area. Given this, the percentage of corresponding vehicle trips will decrease.

Given the site will not provide off-street parking, all site specific traffic will be associated with the on-street car parking spaces. The AECOM report has detailed the impact of some 65 trips during the PM peak hour and would be more aligned with future travel modes, where increased use of active/ sustainable travel would lessen traffic associated with the site.

The AECOM report indicates that in 2031 the future Joynton Avenue/ Zetland Avenue intersection will operate close to capacity in peak periods. A staged intersection upgrade may be undertaken in the future. GTA notes this is with the realisation of other traffic generating uses within the Epsom Park Precinct, and will not be solely due to the contribution of the GPARC site, which will in fact lessen in traffic impact by 2031 due to anticipated travel mode shift.