6.5 Traffic and transport

This section describes the traffic and transport impacts associated with the proposal and is based on the supporting *Traffic and Transport Report – Great Western Highway Upgrade Program Medlow Bath* (Mott MacDonald, 2021c) included at Appendix H.

6.5.1 Methodology

Construction assessment

The traffic and transport assessment considers how the proposed activities, work methods, program, expected vehicle movements and required management controls would temporarily impact the following within the study area:

- traffic network performance on the Great Western Highway between the intersections Bellevue Crescent and Station Street
- all modes of public, private and active transport
- public road and private property access.

Operation assessment

Potential traffic impacts of the proposal were assessed by comparing the performance of the road network with and without the proposal. Future traffic on the Great Western Highway was derived from the Strategic Traffic Forecast Model. Future traffic volumes were then put into the intersection modelling software 'SIDRA' (Signalised Intersection Design Research Aid) to evaluate the performance of the road network.

The key intersection performance indicators extracted from the SIDRA Network analysis for this study include:

- Level of Service (LOS) – this is the standard measure used to assess the operational performance of an intersection. It is a measure of the delay at an intersection. There are six levels of service from 'A' (excellent with delays of less than 15 seconds) to 'F' (unacceptable with delays of more than 70 seconds)
- Degree of Saturation (DOS) – this is the ratio of traffic using an intersection to its capacity. A DOS value greater than 1.0 indicates that the intersection is over capacity.

6.5.2 Existing environment

Road corridor

The Medlow Bath road corridor for the proposal extends 1.2 kilometres east-west between the existing rail overbridge at Railway Parade and a location around 330 metres south of the intersection with Bellevue Crescent. It is a state highway managed by TfNSW and is situated in the Blue Mountains LGA.

This section of the Great Western Highway is currently a two-lane single carriageway with a posted speed limit of 60 kilometres per hour for most of its length. The posted speed limit on the eastbound carriageway changes from 60 to 70 kilometres per hour around 75 metres south of the intersection with Bellevue Crescent. The corridor is accessed via an intersection at Bellevue Crescent and another at Railway Parade. Westbound, the Great Western Highway splits into Railway Parade and Station Street. The corridor provides access to a service station, Hydro Majestic Hotel, a Mazda dealership and Medlow Bath Station.

Freight and heavy vehicles

The Medlow Bath corridor forms part of the freight and heavy vehicles network connecting adjacent suburbs along the Great Western Highway. It accommodates freight and heavy vehicles up to 19 metre B-Doubles over 50 tonnes.

Observed traffic volumes

Traffic volumes were identified in December 2020 through a combination of link counts (seven day count and a 10 day count) and video turning movement surveys during AM and PM peak periods at various locations along the Great Western Highway. It is noted that these traffic volumes may have been affected by COVID-19, yielding lower volumes than expected in a normal year.

Below is a summary of observations from daily traffic volumes travelling westbound and eastbound on the Great Western Highway at a location just south of the intersection at Bellevue Crescent.

- Average weekday traffic volumes are around 20,000 vehicles in total with daily westbound flows slightly higher than daily eastbound flows.
- Average weekend traffic volumes are around 21,000 vehicles in total with daily eastbound flows slightly higher than daily westbound flows.
- Heavy vehicles make up around 20 per cent of total traffic on an average weekday. On a weekend, they make up around 10 per cent of total traffic.

Further, observed average weekday and weekend traffic volumes showed that:

- on an average weekday, eastbound flows are higher than westbound flows during the AM period (6-9am) while westbound flows are higher than eastbound flows during the PM period (4-7pm)
- on an average weekday, two-way traffic volumes are highest in the afternoon between 3-4pm. During this time, 793 vehicles were observed travelling westbound and 789 vehicles eastbound
- on an average weekend, westbound flows are higher than eastbound flows during the AM (6-9am) while eastbound flows are higher than westbound flows during the PM period (4-7pm)
- on an average weekend, two-way traffic volumes are highest in the afternoon between 12-1pm. During this time, 878 vehicles were observed travelling westbound and 942 vehicles eastbound.

Existing road network performance

Existing intersection performances were assessed following the calibration and verification of SIDRA models. Analysis results are summarised in Table 6-13 and indicates a LOS A for the Railway Parade intersection, and LOS B/C at Bellevue Crescent.

Table 6-13: Existing 2020 intersection performance (SIDRA 2020)

Intersection	Existing control	Peak hour	Traffic volume (veh/h)	Average vehicle delay (seconds)	Level of Service (LoS)	Degree of Saturation (DoS)	95 percentile queue lengths (m)
Great Western Highway and Railway Parade	Signalised	AM	1441	6	A	0.3	54 (west approach)
		PM	1482	6	A	0.3	54 (west approach)
Great Western Highway and Bellevue Crescent	Stop (unsignalised)	AM	1434	26	B	0.49	2 (north approach)
		PM	1476	31	C	0.48	2 (north approach)

Crash data

The results of crash data analysis associated with the Medlow Bath section of the highway over a five-year period ending in 2019 revealed nine crashes recorded along the Medlow Bath corridor, comprising:

- nil fatality crashes
- one serious injury crash at the dividing road westbound
- five moderate injury crashes
- three non-casualty towaway crashes.

The spatial grouping of crashes suggests that there exists a safety concern at the Bellevue Crescent intersection as 44 per cent of the total crashes occurred at this location. Despite the lack of formal footpaths and cycling routes, no pedestrian or cyclist crashes occurred during the five-year survey period. However, one pedestrian crash was recorded near the Hydro Majestic Hotel entrance at Medlow Bath Station during the 2009-13 period. The pedestrian refuge is highly susceptible to near miss incidents involving pedestrians and highway traffic due to its geometry and placement.

Parking provisions

Various parking arrangements are available within the proposal area as shown in Figure 6-9. Perpendicular parking for around 40 vehicles is available along the western side of the highway for around 300 metres adjacent to the Hydro Majestic Hotel. Parking bays in this area are unmarked and untimed. This on-road parking area has been identified for relocation into the 90-space car park to the south as part of the separate Hydro Majestic Hotel redevelopment approval.

There are currently no kiss and ride spaces available within the proposal area. There are four accessible parking spaces within the proposal area. Two accessible parking spaces are available within the Hydro Majestic Hotel car park.

Public and hotel guest car parks are located within the Hydro Majestic Hotel complex at the northern and southern ends with capacities of around 35 and 90 car spaces respectively. An informal rail customer car park exists on Railway Parade with a capacity for around eight parking spaces, identified to service railway customers.

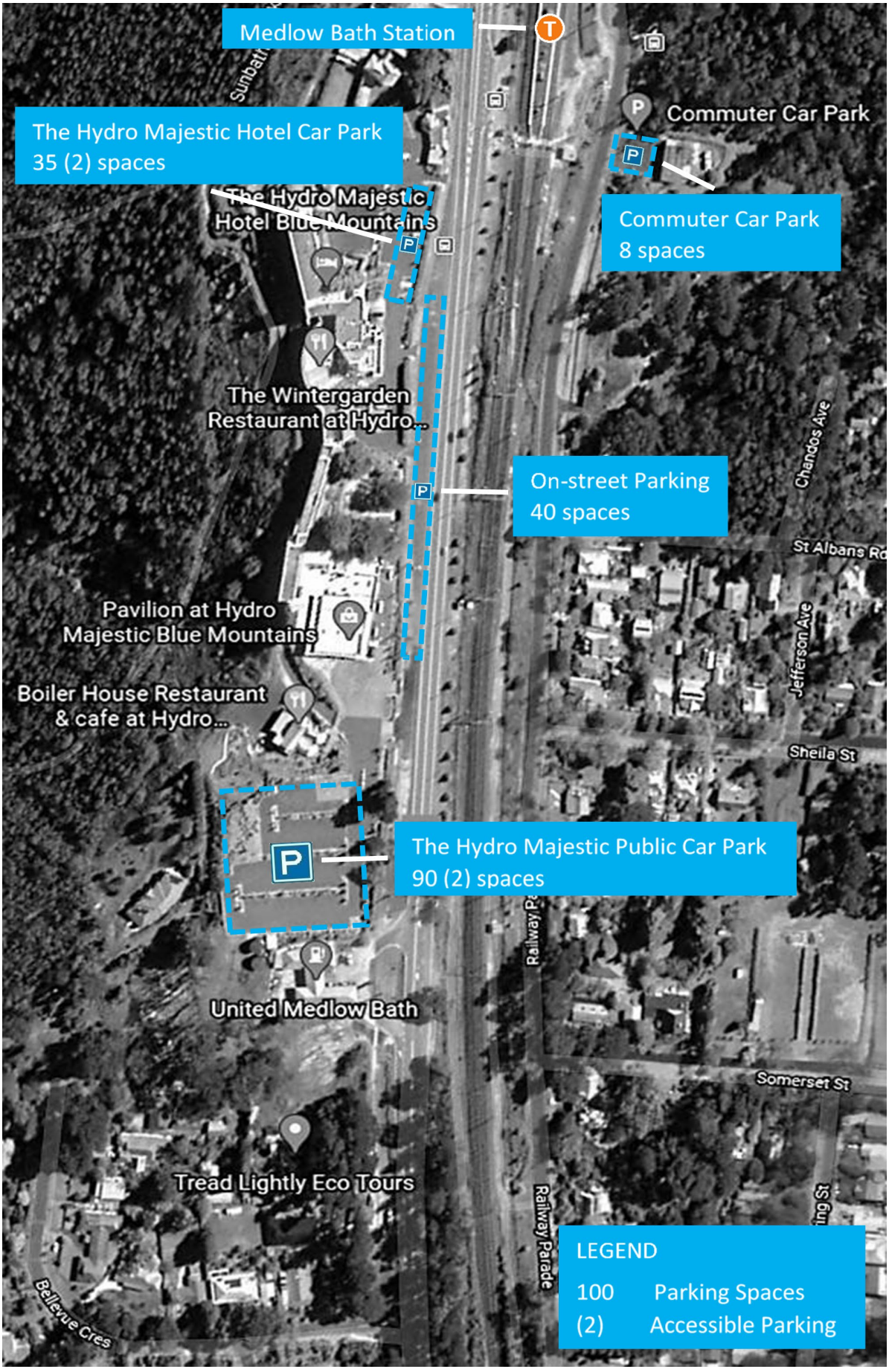

Figure 6-9: Medlow Bath existing corridor parking provisions (Mott MacDonald, 2021c)

Walking and cycling

Walking and cycling facilities on and around the Great Western Highway are shown in Figure 6-10. There is a lack of an accessible path of travel to the station from surrounds. Relevant details for these facilities are as follows.

- There are no dedicated cycling facilities within the proposal area. However, the Great Western Highway, Railway Parade and Rutland Road are marked as on-road cycling routes. This forms a regional on-road cycle route along the Medlow Bath alignment in which little protection for cyclists is provided along the narrow road shoulders. Shared pedestrian and bicycle paths begin along Bellevue Crescent and Station Street.
- No bicycle parking exists within the proposal area.
- A push button activated pedestrian crossing on the westbound approach of the Great Western Highway and Railway Parade intersection.
- A zebra crossing across the left turn slip lane from Railway Parade to the highway. This zebra crossing connects to a footpath that provides access to a pedestrian overbridge.
- A pedestrian overbridge north of the station platform. Pedestrian access to this overbridge is possible from:
    - west of the railway line via a footpath that runs along the eastern side of the Great Western Highway
    - east of the railway line via footpath that connects to Railway Parade.
- Pedestrians can access Medlow Bath Station and bus stops through two access points:
    - access from the north is via the rail overbridge and pedestrian crossing connecting the Great Western Highway and Railway Parade
    - a pedestrian/railway level crossing south of the station platform. This crossing is accessed from the western side of the highway via a refuge crossing. This refuge island can accommodate around three people at a time. Access to the level crossing from east of the railway line is via a footpath that connects to Railway Parade.
- A paved pedestrian footpath around 560 metres exists along the west side of the Great Western Highway while no formal footpath exists along the eastern side.
- A paved pedestrian footpath along the eastern side of the highway extending for around 195 metres between the level crossing and the overbridge. There are also various sealed and unsealed bush walking tracks in the area.

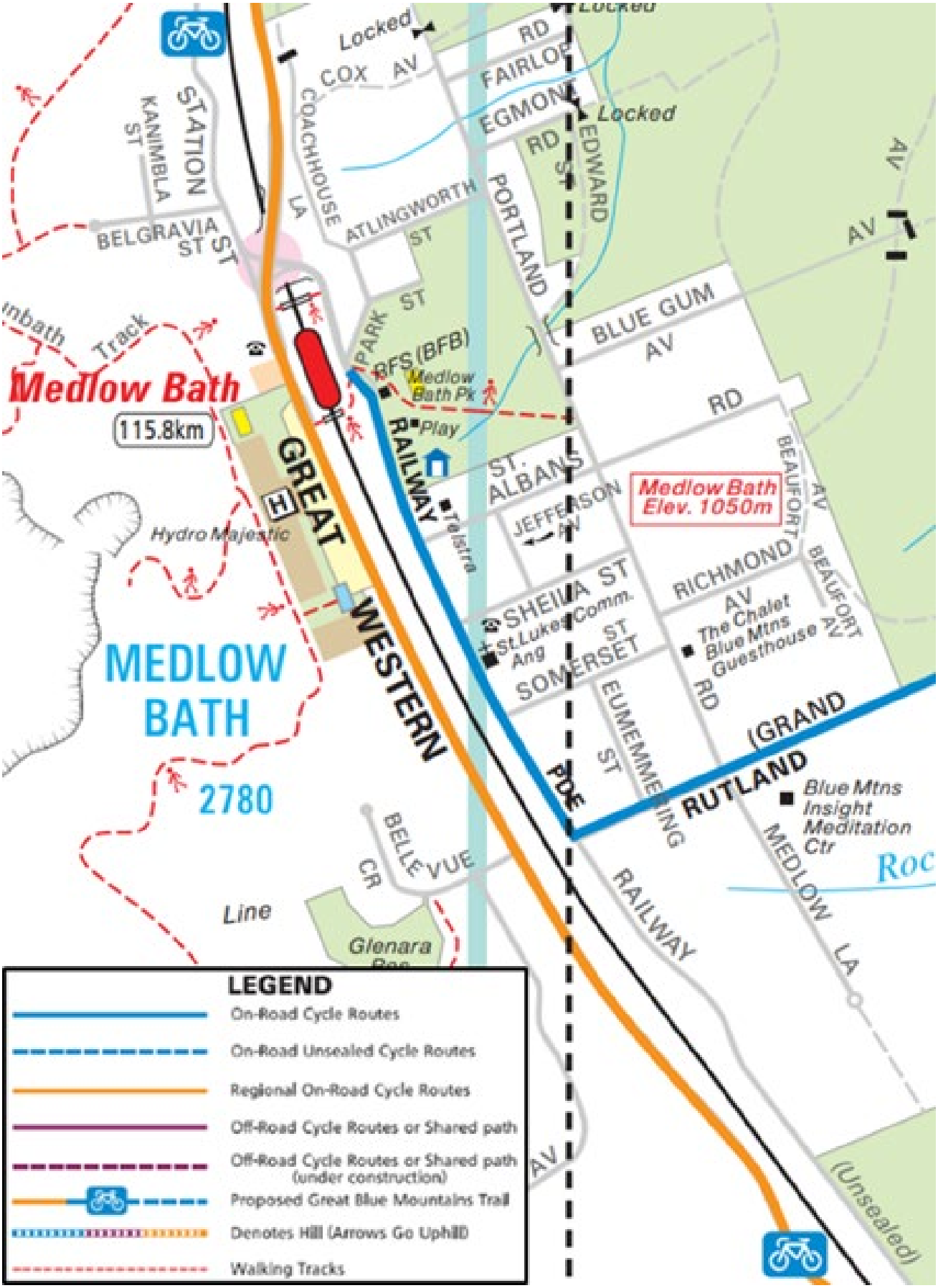

Figure 6-10: Cycle routes along the Medlow Bath corridor (Source: Blue Mountains City Council)

Public transport

Train services

Medlow Bath Station is serviced by the Blue Mountains Line, providing services between Central and Bathurst. Train frequencies are on average one service per hour.

Bus services

Bus stops within the proposal area are located on both sides of the highway at the Medlow Bath Station pedestrian level crossing. The Proposal area is serviced by the following bus routes:

- 698 – Katoomba to Blackheath (loop service) which extends across the entire length of the Proposal with four bus stops
- 698V – Katoomba to Mt Victoria (loop service) which extends across the entire length of the Proposal with three bus stops
- 8718 – Blue Mountains Christian School to Hazelbrook Station. This is a school bus that runs eastbound and stops at the eastern-side bus stop only.

The 698 service has an average of one service per hour between 7.30am to 6.30pm for both the eastbound and westbound directions. The 698V service has two services running westbound at 11.25am and 2.31pm and four services running eastbound at 8.16am, 8.44am, 12.19pm and 4.50pm. The Railway Parade Bus Stop is provided for 3.30pm exchange of students between bus routes on the local street to prevent the need to cross the highway.

Figure 6-11 illustrates the bus stops and their routes.

Figure 6-11: Medlow Bath Corridor Bus Stops and Bus Routes (Source: TfNSW)

Taxi

There are no existing taxi ranks located within Medlow Bath. Taxi services are located within the neighbouring Blue Mountains villages including Wentworth Falls, Lawson, Springwood, Winmalee, Harrington Park, Wetherill Park, Hinchinbrook and Prospect. Members of the community are able to book a taxi by phone call, online booking on agency's webpage or by hailing down a taxi.

6.5.3 Potential impacts

Construction

During construction, traffic and transport impacts and risks include:

- potential increases in vehicle movements and changes to traffic flows which may lead to short traffic delays, for example:
    - a temporary road closure of one hour would be required to allow for the operation of a crane to lift in and install the new pedestrian bridge
    - other temporary partial road or lane closures would be required at times to allow for road works (such as new pavement, kerb and gutter works) however it is proposed that alternating one-way traffic flow would be able to be maintained
- changes for pedestrians and cyclists accessing the station and surrounding footpath/road network which could mean detours and longer walking/cycling distances. There may also be an increased risk to safety as a result of changed conditions
- delays to buses on the Great Western Highway and temporary reduction in accessibility to bus stops as some bus stops would need to be relocated particularly where work activities being undertaken within the highway corridor
- removal of 40 perpendicular parking spaces to allow for construction works to establish the widened highway along the western side but which have already been compensated for by the Hydro Majestic Hotel southern car park works.

Theses impacts would be temporary and would only occur during construction work. The duration of construction is expected to be about 20 months, weather depending (refer to Section 3.2.4) for construction staging and timing of activities).

The number of truck movements to the work sites is unknown at this stage, however based on similar projects is likely to be less than 200 per day. Trucks movements would be distributed throughout the day equating to less than 30 movements per hour based on an eight-hour workday, which is estimated to be around a ten per cent increase in the hourly heavy vehicle movements. This additional traffic is unlikely to have a significant impact on the road network. However, if required, the movements of trucks would be scheduled to avoid peaks such as during local school zone hours.

Access to the construction site for trucks would be via the Great Western Highway, Bellevue Crescent and Railway Parade. Light vehicles to the site would be permitted to use all existing roads. Staff parking is likely to be provided within each construction site.

Light vehicle traffic to the site would be associated with the movements of construction personnel. The peak construction workforce is currently unknown but is likely to be a maximum of 200 at any one time based on similar projects. Assuming that five per cent of personnel travel to the site by public transport and 95 per cent travel by private car and an average car occupancy factor of 1.05, this equates to 362 light vehicle movements per day (181 in the morning and 181 in the afternoon). Assuming that 80 per cent of these light vehicles arrive and depart in the same peak hour, an additional 145 vehicles would be generated during each of the AM and PM peak hours. Given that two-way peak hours flow on the Great Western Highway are about 1500 vehicles per hour, there is sufficient capacity to accommodate this additional traffic.

There are a number of properties with direct access to the road network within the proposal area. Access to affected properties would be maintained throughout, and temporary property access would be provided where required.

Operation

Traffic and network impacts

A comparison of future (2036) intersection performance with and without the proposal for the AM and PM peak hours is presented in Table 6-14.

The SIDRA modelling indicates that the Great Western Highway/Railway Parade intersection would perform at an excellent LOS both with and without the proposal. Queue lengths and the DOS in the 'with proposal' scenario are slightly higher, but this is due to the overall increase in traffic volumes resulting from an assumption in the model that all Great Western Highway Upgrade Program improvements are operational by 2036 (ie improved travel speeds would attract traffic from alternative routes). It is noted that the intersection still performs with an excellent LOS and the impact of the slightly longer queues on intersection performance would be negligible.

The SIDRA modelling comparison of the 2036 intersection performance at the Great Western Highway/Bellevue Crescent intersection without and with the proposal (assumed to be a signalised intersection from the existing (stop) intersection) revealed that:

- there would be a reduction in average delays and DOS upon signalisation of the intersection
- the conversion of this intersection from a stop sign control system to signalisation would result in increased queuing on the highway. However, the proposed turning bay lengths of 100 metres for westbound left turning vehicles and 80 metres eastbound right turning vehicles would be sufficient to accommodate the modelled queueing.

Overall, the proposal would improve the existing performance of the highway including accommodating future increases to traffic volumes in 2036. Alterations to the existing alignment, particularly the signalised control system and U-turn bay at Bellevue Crescent and the addition of right turn bays eastbound into key amenities would improve the safety of vehicles and the community. The 5-year crash data reveal a 44 per cent of total crashes within Medlow Bath at Bellevue Crescent and so the modification to provide dedicated turning movement provisions at this location would improve vehicle safety.

Table 6-14: 2036 Scenario SIDRA outputs

Intersection	With proposal					Without proposal				
	Intersection type	Peak Hour	Average delay per vehicle (seconds)	LOS	Degree of Saturation	Intersection type	Peak Hour	Average delay per vehicle (seconds)	LOS	Degree of Saturation
Great Western Highway and Railway Parade	Signalised	AM	12	A	0.38	Signalised	AM	12	A	0.35
		PM	13	A	0.45		PM	12	A	0.39
Great Western Highway and Bellevue Crescent	Signalised	AM	6	A	0.35	Stop (unsignalised)	AM	38	C	0.56
		PM	5	A	0.35		PM	39	C	0.55

Modelling of the alternate Bellevue Crescent option (shown in Table 6-15) indicated an excellent LOS and that:

- turning lanes on both the west and east approaches of the highway would not block through movements
- queues at the new Bellevue Crescent at the approach to the highway would not block the new entry/exits of the United Petrol Station or Hydro Majestic Hotel.

Table 6-15: 2036 Scenario SIDRA outputs for alternative Bellevue Crescent option (with proposal)

Intersection	Intersection type	Peak hour	Average delay per vehicle (seconds)	LOS	Degree of Saturation
Great Western Highway and Railway Parade	Signalised	AM	12	A	0.36
		PM	12	A	0.43
Great Western Highway and Alternate Bellevue Option	Signalised	AM	6	A	0.33
		PM	6	A	0.34

When compared to the concept design. the alternate Bellevue Crescent option would lead to fewer vehicles making a U-turn at the Station Street/Railway Parade intersection. This is because the alternative design allows for traffic exiting the United Petrol Station and Hydro Majestic Hotel to turn right at the proposed new Bellevue Crescent intersection and travel eastbound (towards Sydney). The preferred design does not provide an opportunity for traffic exiting the United Petrol Station and Hydro Majestic Hotel to make this right turn movement requiring vehicles intending to travel eastbound to make a U-turn at the Station Street/Railway parade intersection.

Road and station user impacts

The proposal would result in the following positive impacts or changes to road and station users.

- The highway would be able to support longer, heavier vehicles that are able to transport more freight per vehicle. This would provide improvements to safety and sustainability as well as improvements in productivity. This is expected to increase the volume of freight, but reduce the number of vehicles required to transport the freight along the highway.
- The existing pedestrian refuge and level pedestrian/railway crossing would be removed and replaced with a new raised pedestrian crossing on Railway Parade and pedestrian bridge with stairs/lifts at Railway Parade, Medlow Bath Station and on both sides of the highway. The incorporation of lifts and stairs would significantly improve connectivity of the area for customers and tourists and provide an accessible path of travel to the station and across the highway/rail corridor. It would also improve safety by removing pedestrian/vehicle interactions.
- Enhanced pedestrian safety and connectivity through the provision of dedicated cycling and pedestrian facilities along the length of the Great Western Highway in respect to the proposal, where currently there are limited facilities.
- The relocation of existing bus stops and shelters on both sides of the highway is proposed to provide a safe interchange area that is close to the station. The relocated bus stop on the western side would be relocated as close as possible to the proposed lift at the pedestrian bridge and would allow for one bus. The relocated bus stop with bus shelter on the eastern side would also be located as close as possible to the proposed lift.

- Two new kiss and ride bays would be provided at Railway Parade providing a safe environment for customers to drop off and pick up.
- Parking changes, including:
    - the rail customer car park at Railway Parade would be formalised and expanded to include nine parking bays and include one accessible parking space
    - the loss of around 40 perpendicular car parking spaces along the western side of the highway but which have already been compensated for by the Hydro Majestic Hotel southern car park works.

6.5.4 Safeguards and management measures

Table 6-16: Safeguards and management measures – Traffic and transport

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	A Traffic Management Plan will be prepared and implemented as part of the CEMP. The plan will be prepared in accordance with the *Traffic Control at Work Sites Manual* (TfNSW, 2020c) and *QA Specification G10 Control of Traffic.* The plan will include: • confirmation of haulage routes • measures to maintain access to local roads and properties • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • requirements and methods to consult and inform the local community of impacts on the local road network • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident • consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • monitoring, review and amendment mechanisms.	Contractor	Detailed design / Pre-construction	*QA Specification G10*
Traffic and transport	• The local bus operators will be consulted to confirm alternative temporary bus stop and operations during construction. • The local community will be notified about the agreed local temporary bus stop location, as coordinated and managed under the consultation strategy.	Contractor	Construction	
Property access	• Property access will be maintained where feasible and reasonable and property owners will be consulted	Contractor	Construction	

Impact	Environmental safeguards	Responsibility	Timing	Reference
	before starting any work that may temporarily restrict or control access. • (Side) road and lane closures will be minimised where feasible and reasonable.			