Photo 3.7 **Construction compound S4 to the right of the photo - The Crescent looking west from construction site access**

Photo 3.8 **Construction compound S4 to the left of the photo - The Crescent looking east from construction site access**

Photo 3.9 **Construction compound S5 - located east of Wongala Crescent adjacent to the Beecroft station commuter car park**

Photo 3.10 **Construction compound S5 - Wongala Crescent looking north from construction site access**

Photo 3.11 Construction compound S5 - Wongala Crescent looking south from construction site access

Map Source: ©2012 Google, Whereis ®, Sensis Pty Ltd

Photo 3.12 Construction compound S6 – Yarrara Road looking east to the construction site access

3.4 Construction vehicle routes

As the exact source of the construction materials is not currently known, specific routes for construction vehicles, especially trucks, cannot be identified. However, a list of the roads for which there is a high likelihood of being included as the key access routes is provided below and shown in Figure 3.1.

These truck haulage routes were recommended for the following reasons:

- they provide the most direct access to the project sites
- they provide the shortest route to the wider arterial road network
- they are located on roads of a higher hierarchy level which could better accommodate increased vehicle volumes and larger/heavier vehicles and where possible limit the use of local roads.

Construction truck haulage routes to/from the western side of the rail line to construction compound S1 access gate would be via:

  - Epping Road
  - Beecroft Road.

- Alternative route to construction compound S1 access gate would be via:

  - M2 Motorway
  - M2 Motorway Beecroft Road off ramp
  - Beecroft Road.

Construction truck haulage routes to/from the western side of the rail line to construction compound S2 access gate would be via:

  - Beecroft Road
  - Old Beecroft Road.

Construction truck haulage routes to/from the western side of the rail line to construction compound S3 and S4 access gates would be via:

  - Beecroft Road
  - Cheltenham Road
  - The Crescent.

Construction truck haulage routes to/from the western side of the rail line to construction compound S5 access gate would be via:

  - Beecroft Road
  - Wongala Crescent.

Construction truck haulage routes to/from the western side of the rail line to construction compound S6 access gate would be via:

- Pennant Hills Road
- Wells Street
- Yarrara Road.

These roads do not have any access restrictions for large/heavy vehicles and are currently used by trucks.

3.5 Construction traffic generation and distribution

Traffic generation during construction of the project is assumed to comprise traffic generated by construction personnel and construction vehicles travelling to and from the site. The amount of construction traffic generated by the site is discussed in this section. The impact on intersection operation is assessed in Section 4.

Typically, there would be 200 construction personnel for the weekday during the peak construction period. For the purposes of this assessment it has been assumed that all construction personnel will arrive and depart at the site using light vehicles. Although the project work sites are located adjacent to train stations, construction personnel would likely travel to and from the work site using their own vehicles as they would be required to transport tools and equipment, which could not be achieved if catching the train. The adopted worst case for vehicle occupancy rate is one person per vehicle. During a typical working day, up to 200 vehicles would arrive in a 60 minute period prior to the shift start at 7.00 am and depart at the end of the shift, between 3.00 pm and 7.00 pm. It is assumed that all construction personnel would park their vehicles within the rail corridor itself and not on adjacent roads to the rail line. However, should additional car parking spaces be required on-street, then the project team would liaise closely with Council on this matter.

During track closedowns, construction personnel vehicles would be expected to arrive and depart the compounds, before and after the shift working hours. Due to the intense nature of weekend track closedowns (to maximise the work completed before the rail tracks must be opened up for weekday passenger services), the arrival and departure of construction staff could occur late at night/early in the morning, and would not typically coincide with peak traffic periods. The peak weekday construction is therefore considered to be the time of highest traffic impact and hence forms the basis for this assumption.

It is assumed that construction personnel trips would be equally distributed to the compound sites as follows:

- 50% of the construction personnel trips would come from the north via Beecroft Road and Pennant Hills Road
- 50% from the south via Beecroft Road, the M2 Motorway and Epping Road.

Construction vehicles would include semi-trailers delivering construction plant and equipment, dump trucks, cranes and concrete mixer trucks. The material to be imported requires a maximum of 15–20 heavy vehicle movements to/from the site per hour during the peak stages of construction during a typical working day.

Construction vehicles would require access throughout the working hours between 7.00 am and 6.00 pm. It is assumed that:

- 50% of heavy vehicles would come from the north via Beecroft Road, Pennant Hills Road and Copeland Road
- 50% from the south via Beecroft Road, the M2 Motorway, Epping Road or Carlingford Road or Kirkham Street.

Table 3.2 shows the estimated hourly construction vehicle trips for this project on a typical working weekday.

Table 3.2 Estimated hourly construction vehicle trips at the site accesses on a typical working weekday

Working hours	Direction of traffic	Trip type	Time	Contributors
Between 7.00 am and 6.00 pm	Inbound traffic	Construction personnel trip	Between 6.00 am and 7.00 am	200 construction personnel trips by light vehicles at the start of the shift
	Inbound and outbound traffic	Constriction vehicle trip	Throughout the day between 7.00 am and 6.00 pm	Four inbound and four outbound construction heavy vehicle trips per hour for each access to S1 and S4. two inbound and two outbound construction heavy vehicle trips per hour for each access to S2, S3, S5 and S6.
	Outbound traffic	Construction personnel trip	Between 3.00 pm and 7.00 pm	200 construction personnel trips by light vehicles at the end of the shift

As construction staff would arrive at the site before the shift start at 7.00 am and depart the site after the shift between 3.00 pm and 7.00 pm. The construction light vehicle trips were not considered for the AM peak hour traffic assessment as they do not coincide with the background AM traffic peak. However they were considered for the PM peak hour traffic assessment as they would coincide with the background PM traffic peak. It is assumed that 33% of construction light vehicle outbound trips would occur during the PM peak hour. Construction vehicle trips (heavy vehicles) were considered for the assessment during both the AM and PM peaks as they would occur throughout the working day (shift).

Based on the identified traffic generated by the ETTT Project the impacts from both light vehicles (construction personnel) and heavy vehicles (construction vehicles) are considered minor when spread across the entire project to the various construction access locations. A minor increase in the overall traffic volumes at key intersections along the haulage/access routes is expected, however this low amount of vehicles would not impact on intersection operation.

3.6 Station access impacts during construction

Access to station platforms would be maintained during construction, with the exception of rail closedowns periods. Temporary relocation of entrances and passenger facilities such as ticket offices may be required. At Cheltenham Station Platform 2 entry for example, sections of the platform may be not available to allow construction to occur while the platform remains in use. New or temporary pedestrian bridges would be built before the existing ones are demolished to maintain access.

Disruptions to the operation of buses, taxis and the location for kiss-and-ride may occur, for example during the works proposed on the western side of Pennant Hills and Beecroft Stations. Interchanging passengers between bus and rail services at Pennant Hills and Beecroft Stations may experience longer walk times between the station and temporarily relocated facilities.

A preliminary investigation of the locations of bicycle parking indicates that the facilities at Pennant Hills and Cheltenham Stations may be affected during construction.

These station access impacts described in this section of the report are illustrated in more detail in the project staging diagrams in Attachment A of this assessment.

3.7 Road closures and restrictions during construction

Temporary construction impacts on the road network may result in the temporary closure of the footpath, parking lanes and traffic lanes. Further more detailed information would be provided at the detailed design stages of this project. Applications for any temporary lane or road closures required would be contained within the Construction Traffic Management Plan to be developed by the construction contractor in consultation with the relevant authorities.

Some of the locations where closures or restrictions to footpath access, parking lanes, traffic lanes and rail overbridges could be expected for this project include:

Restrictions to footpath access:

- on Beecroft Road (to allow temporary installation of combined services route (CSR)
- on Yararra Road (near Pennant Hills Station)
- on Wongala Crescent (near Beecroft Station)
- on The Crescent (near Cheltenham Station)
- on Sutherland Road (near Cheltenham Station)
- adjacent to the construction access gates.

Parking lanes:

- on Yararra Road (near Pennant Hills Station)
- on Wongala Crescent (near Beecroft Station)
- on The Crescent (near Cheltenham Station)
- adjacent to the construction access gates

- rail overbridges
- partial road closures may be required for installation of anti-throw screens. However, these closures are likely to be short and would occur outside peak traffic times.

Impact on the M2 Motorway:

The discussion below relates to the following hierarchy of potential impacts (greatest to least) on the M2 Motorway:

- Motorway closure
- carriageway closure (westbound or eastbound)
- lane closure.

The M2 Motorway Upgrade is scheduled to be completed in the first half of 2013. Hence the M2 Motorway Upgrade works will be completed prior to commencement of ETTT works at Epping. In order to reduce impacts on the M2 Motorway during ETTT construction, early works to construct foundations in the centre of the motorway to support the proposed rail bridge are currently being undertaken as part of the M2 Motorway Upgrade.

Full motorway closure

Based on preliminary construction planning, it is anticipated that impacts on operation of the M2 Motorway would be limited to lane or carriageway closures only during the ETTT works. This would be confirmed during detailed construction planning once the construction contractor is engaged. However, if full M2 Motorway closures are required, these would be undertaken in consultation with the RMS and Hills Motorway. Any closures would aim to coincide with other scheduled road maintenance activities and be undertaken during off-peak hours.

While full Motorway closures are not anticipated, it is expected that other short term closures would be required to construct the rail bridge at Epping. These closures would involve either carriageway closures (where one side of the motorway is closed) or lane closures (where one or more lanes are closed at a time).

Carriageway closures

Carriageway closures would typically involve several instances of two to three consecutive night time closures during the construction period. These intermittent carriageway closures will be required at specific times during launching or lifting of the bridge deck. Construction of structures or rail systems above the bridge deck that cannot be undertaken safely over live traffic may also trigger the need to close a carriageway.

Carriageway closures would typically occur at night. Mitigation measures such as implementation of a contraflow would be developed in consultation with Hills Motorway and RMS and be incorporated as part of the TMP.

Lane closures

Intermittent lane closures of the M2 Motorway and the Beecroft Road on/off ramps will also be required at specific times during the following activities:

- construction of foundations and piers on the northern and southern sides of the motorway
- construction of a pier in the motorway central median
- installation of anti-throw screens.

Lane closures will only occur outside of peak commuting hours (typically at night for intermittent durations over several months) and by agreement with Hills Motorway and RMS. This will ensure that closures do not affect the capacity of the motorway. Some congestion and increases in travel time may be experienced during these times by motorists due to speed restrictions that will be required for safety reasons. The exact times during which lane or carriageway closures would occur will be agreed with Hills Motorway and RMS once detailed design and construction planning has been completed.

Consultation with stakeholders and traffic management

The RMS, Transurban and other stakeholders would be consulted to coordinate any potential lane closures and to implement appropriate traffic management plans including notification processes for the affected public.

Should the closure of one or more lanes on the M2 Motorway be required, the implementation of contraflows may be required. Wherever possible, lane closures or contraflow arrangements would be implemented outside of peak commuting times.

3.8 Parking impacts during construction

3.8.1 Designated commuter car parking

Existing designated commuter car parking at Cheltenham and Beecroft Stations would be affected by the construction of the ETTT Project.

Construction activities at Cheltenham station are expected to result in the temporary closure of approximately 10 car parking spaces in the western (The Crescent) commuter car park, and approximately 5 parking spaces in the eastern (Sutherland Road) commuter car park. At Beecroft station are expected to result in the temporary closure of approximately 20 car parking spaces in the western (Wongala Crescent) commuter car park. This temporary loss of parking would occur for a period of approximately 12 months for both stations.

These impacts would be minimised wherever possible by staging the construction activities. The construction of the reconfigured commuter car parks at Cheltenham and Beecroft Stations would be staged to minimise disruptions to car parking facilities. New facilities would be opened where possible before the old facilities are closed however this staging would need to consider other environmental impacts such as minimising vegetation clearing requirements. Any commuter car parking removed temporarily during construction would be accommodated on local streets within a 400 m walking distance of Cheltenham and Beecroft Stations.

3.8.2 On-street parking

On-street parking at Cheltenham, Beecroft and Pennant Hills Stations would be affected by the construction of the ETTT project. These impacts would be minimised wherever possible by staging the construction activities. Any on-street parking affected temporarily during construction would be accommodated on local streets within a 400 m walking distance of Cheltenham, Beecroft and Pennant Hills Stations.

The following unrestricted on-street car parking spaces is provided within 400 m walking distance:

- 833 car parking spaces at Cheltenham Station
- 810 car parking spaces at Beecroft Station
- 625 car parking spaces at Pennant Hills Station.

Based on this information, ample unrestricted car parking is provided on-street during the construction phase.

3.8.3 Construction workers

Parking for construction workers would typically be provided within the rail corridor, with access gained by the gated accesses. Should additional car parking spaces be required on-street, associated impacts would be assessed including thorough consultation with Council on this matter.

3.9 Transport network impacts

As a result of the need to maintain the safety of rail workers, and the proximity of some works to the operational rail tracks, sections of the Main North Line would need to be closed to undertake some components of the construction works.

The ETTT Project would take advantage of routine rail closedowns. These are scheduled periods when part of the rail network is temporarily shut down and trains are not operating. These periods are scheduled by RailCorp up to twelve months in advance and therefore are a key driver in construction staging. Approximately 17 routine closedown periods have been identified as being required.

During these periods, rail services are temporarily suspended and replacement buses operate. Freight services are also rescheduled to avoid closedowns. Rail closedowns are routinely conducted at weekends or during holiday periods as these periods are traditionally associated with lower passenger patronage and therefore, the disruption and inconvenience is reduced.

While every effort would be made to co-ordinate construction with scheduled closedowns, it is likely that additional closedown periods may be required to ensure the proposal is completed on time. One such additional closedown has been identified between the Christmas and New Year period in December 2014, for a period of five days. It is likely that these works would be undertaken 24 hours a day.

During these track closedowns charter buses will replace train services. Longer closedowns would be required for track commissioning and would occur outside of commuter peak periods.

Bus services would be affected during the construction work at Beecroft and Pennant Hills interchanges which may require the temporary relocation of bus stops. A temporary pedestrian enclosure structure would be established for the underpass at Beecroft Station to enable continued access for pedestrians during construction.

3.9.1 Impacts on rail services

Impacts during construction would be minimised by timing track closedowns (which have the largest impact) during weekends and long weekends to minimise the impact on commuter passengers. During track closedowns, charter buses would replace trains. Freight services would be rescheduled to avoid the track closedowns or operated through the construction sites under special conditions.

Longer closedowns would be required for track commissioning. Details of the timing and alternative transport provisions of these longer closedowns are not currently available.

3.9.2 Impacts on bus services

The potential changes to the western side bus stop at Pennant Hills Station may create difficulties interchanging from bus to bus and bus to rail services during construction. This is separate from the primary bus interchange on the eastern side of the station which the majority of buses at Pennant Hills use. Suitable temporary arrangements would be agreed between Transport for NSW and bus operators once further details and timeframes are known. The construction works at other stations may necessitate localised moving of bus stops during works. This may result in increased walk distances and times.

3.9.3 Pedestrian and cyclists

At Cheltenham Station, there will be some changes to pedestrian and commuter access to Platform 2 during construction such as the installation of the new temporary access to platform 2 from the new southern commuter car park. However, the activities in and around platform 2 are expected to have little or no impact on commuters as access will be maintained throughout the construction of the project until the new overhead concourse is available for use.

The Beecroft Station underpass would be closed during rail closedowns, and there will be no access to pedestrians from the western side of the corridor. Pedestrians using the underpass as a connection across the rail corridor and train passengers accessing the temporary bus services would be affected. Alternative access routes will be via either Chapman Road or Copeland Road overbridges.

At Pennant Hills Station, there would be some changes to pedestrian routes on the existing footpaths on the eastern side of Yarrara Road whilst the construction of the third track takes place. This would include closure of the footpath between its northern end opposite the library and the intersection with Pennant Hills Road. Access to the station and the existing footbridge would be maintained.

A new temporary pedestrian crossing on Yarrara Road approximately opposite the library will be established to maintain access to the station. Platform 2 would be accessed directly from the adjacent temporary pedestrian crossing, while access to platform 1 would be via the existing stairs and lift from platform 2. Refer to Attachment A for an illustration of these arrangements.

The construction of the project would not require closure of the pedestrian path and cycleway which connects Cambridge Street and Beecroft Road under the rail line, other than temporary closures during critical construction works. Should temporary closures be required, then adequate pre warning, directional and advisory signage would be erected to inform users.

3.10 Cumulative traffic impacts from other projects

A review of the project's relationship and/or interaction, including potential cumulative impacts associated with the construction stages and construction traffic from other projects is discussed below. These projects include the North West Rail Link (NWRL), the M2 Motorway Upgrade and the other Northern Sydney Freight Corridor (NSFC) projects.

3.10.1 North-West Rail Link (NWRL)

The NWRL is a priority railway transport infrastructure project for the Sydney metropolitan area. The NWRL and ETTT proposal alignments would generally overlap in the vicinity of Epping Station. However, at this location, the NWRL would be located underground.

The major civil construction works are planned to commence in mid-2013 and be completed in late 2016. Construction-related light and heavy vehicle movements would be associated with spoil and waste removal, material deliveries and the arrival and departure of construction workers.

Two of the NWRL construction sites (and site accesses) would be located in close proximity to some of the ETTT proposal vehicle access routes and construction site accesses. These sites locations comprise the construction sites for the Epping Services Facility and Cheltenham Services Facility.

The North West Rail Link: Environmental Impact Statement Stage 1 – Major Civil Construction Works (the NWRL EIS) (TfNSW 2012e) was on public exhibition at the time of undertaking this assessment.

Epping Services Facility

The NWRL EIS identified that the Epping Services Facility would be located on the western side of Beecroft Road, about 100 m north of the Carlingford Road intersection. As identified in sections 3.3 and 3.4, the ETTT project would have construction traffic travelling along Beecroft Road and a construction compound, with an access point to Beecroft Road, approximately 600 m to the north of the Epping Services Facility, on the opposite side of Beecroft Road.

The NWRL site currently encompasses three commercial buildings. As part of the NWRL project the proposed construction works at this site include tunnel shaft excavation, removal of spoil and to support the road header tunnel excavation works.

Access to and egress from the Epping Services Facility site would be a left-in left-out arrangement directly from Beecroft Road. Indicative construction activities at this location would occur between 2013 and mid-2015. The daily traffic generated by this worksite is 80 heavy vehicle movements and 34 light vehicle movements (this equates to approximately 7 heavy vehicle movements and 3 light vehicle movements in the peak hour). A vehicle movement is defined as a vehicle entering the site or a vehicle leaving the site. Therefore, each vehicle would generate two movements. The NWRL EIS identified that the intersection performance would remain largely unaffected by the addition of construction traffic from

NWRL on the intersections of Carlingford Road/Beecroft Road, M2 Motorway off ramp/Beecroft Road and M2 Motorway on ramp/Beecroft Road. As identified in section 3.5, the ETTT project would contribute an additional four heavy vehicle movements in the peak hour to these intersections in the vicinity of access point S1. This is a very small increase in traffic volumes during peak periods and therefore intersection performance would remain largely unaffected.

The NWRL EIS identified no impacts to bus services on Beecroft Road are foreseen. No pedestrian footpaths are provided on the eastern side of Beecroft Road (adjacent to the proposed ETTT project access); however there is a pedestrian path and cycleway which connects Cambridge Street and Beecroft Road under the rail line which would need to be maintained during construction. As identified in section 3.9.3, the ETTT project would continue to keep this pedestrian path and cycleway open. The construction of the project would not require closure of the pedestrian path and cycleway which connects Cambridge Street and Beecroft Road under the rail line, other than temporary closures during critical construction works. Should temporary closures be required, then adequate pre warning, directional and advisory signage would be erected to inform users.

Additional construction vehicle movements crossing the cycleway are foreseen; however the volume of these vehicle movements would be low, with necessary signage and traffic control measures implemented to assist pedestrians and cyclists at this crossing point.

There is no on-street parking in this section of Beecroft Road and therefore the impact on parking is negligible.

Cheltenham Services Facility

The Cheltenham Services Facility would be located predominantly on the existing netball courts to the west of Cheltenham Oval. This facility would be located on the western side of Beecroft Road at a distance from the ETTT project however; would utilise a similar vehicle access route to the site (Beecroft Road and Beecroft Road/Kirkham Street intersection).

The proposed construction works at the Cheltenham Services Facility site would include tunnel shaft excavation and removal of spoil.

Light vehicle access to and egress from the site would be directly from Castle Howard Road at the location of the road reserve for Murray Road. Two options are available for heavy vehicle access. The first would be via Kirkham Street via left-in right-out arrangement and the second, directly on and off the M2 Motorway. This option would require the construction of a new on and off ramp from the M2 Motorway subject to agreement with the M2 Motorway operator. Indicative construction activities at this location would occur between 2014 and mid-2015. The daily traffic generated by this worksite is 68 heavy vehicle movements and 34 light vehicle movements (this equates to approximately 6 heavy vehicle movements and 3 light vehicle movements in the peak hour). Intersection modelling was not undertaken for the Beecroft Road/Kirkham Street intersection in the NWRL EIS. During the road network peak hour, heavy vehicle movements are not expected to exceed 6 vehicles per hour and as such detailed intersection modelling was not warranted. In combination with the ETTT project, expected construction vehicle volumes through the intersection of Beecroft Road/Kirkham Street intersection would not impact on intersection performance given the very small increase in volumes.

No impacts to bus services on Beecroft Road, Kirkham Street and The Crescent are foreseen. There is only one scheduled bus service along Kirkham Street, route 553 operated by Sydney Buses, with a limited service of nine services a day. Any changes to pedestrian, cycle and parking facilities adjacent to this site would not have any impact on the ETTT project given the distance between the two projects for these facilities.

Summary

The expected construction traffic volumes for the NWRL project to the three construction sites documented above is minimal and would not impact on intersection performance along Beecroft Road. The combination of both the NWRL and ETTT project construction traffic to the road network, should they occur simultaneously, would not impact on existing and future base intersection performance given the low construction traffic volumes expected.

3.10.2 M2 Motorway Upgrade

M2 upgrade project works – cumulative impacts

RMS has advised the ETTT project team that the M2 Motorway upgrade works will be complete in the first half of 2013. The ETTT Project works in this area would occur later in the program and as a result no overlap of the construction activities for this project works with those of the M2 Motorway is anticipated. However, should wet weather delays be experienced and impact on the M2 Motorway upgrade works, there is potential for some overlap in construction activity.

3.10.3 Northern Sydney Freight Corridor (NSFC)

To match the predicted growth in freight demand as it occurs, the following three projects are proposed to be implemented in conjunction with the ETTT project as part of the NSFC Program:

- North Strathfield Rail Underpass
- Gosford Passing Loops
- Hexham Passing Loop (now completed by the Australian Rail Track Corporation).

Construction of the first of the other three NSFC Program proposals is anticipated to commence in late 2012 or early 2013. While the three remaining NSFC Program proposals being managed by TfNSW are located in geographically separated areas and would therefore not have any direct interfaces.

In addition, the NSFC Program was designed to deliver overall operational improvements to both the passenger and rail freight networks, which is a positive cumulative impact.

4. Intersection performance

To determine the potential impact on traffic conditions during construction, traffic modelling at key intersections (refer section 2.5) has been undertaken during periods of expected peak construction traffic movement. The greatest traffic impact is expected at nearby key intersections along the haulage routes to the construction access sites.

4.1 Scenarios assessed

The year 2014 was adopted for modelling purposes as the anticipated peak of construction is likely to occur in 2014.

The following traffic scenarios were analysed:

- 2014 base with background traffic growth
- 2014 base with background traffic growth and ETTT Project construction traffic.

4.2 Forecast traffic demand

The peak hour traffic volumes for each assessment scenario are shown in the following sections. Traffic impacts at key intersections between the base case and the base with construction phase case were assessed for 2014 during the selected intersection peak hours.

4.2.1 2014 base traffic volume

Future 2014 base traffic volumes were calculated as the sum of the 2012 existing traffic and growth in the background traffic (1.0% p.a.). Figures 4.1 and 4.2 show the 2014 base case forecast traffic volumes at the key intersections during the peak hours.

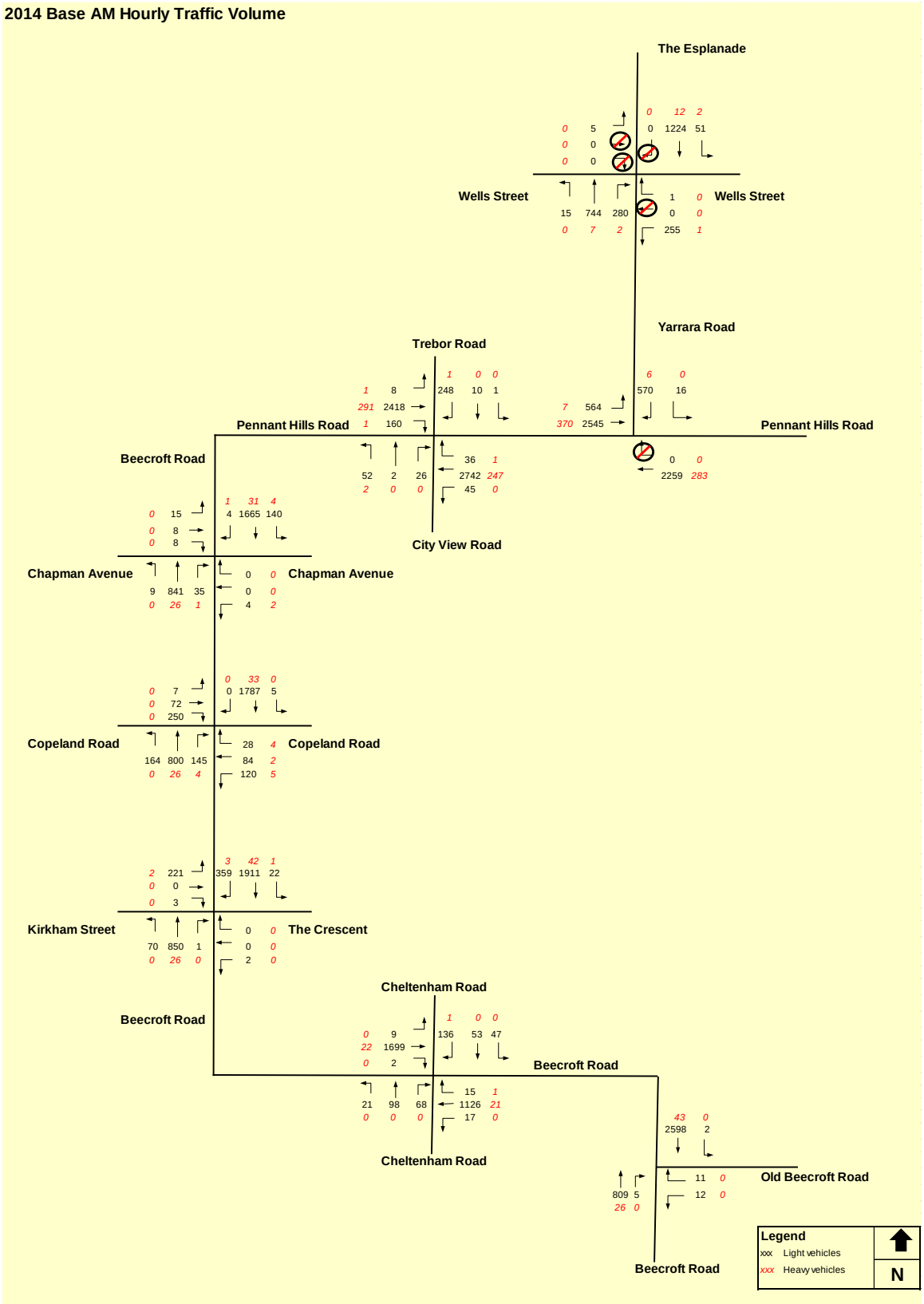


Figure 4.1 2014 base case AM peak hour traffic volumes at the key intersections

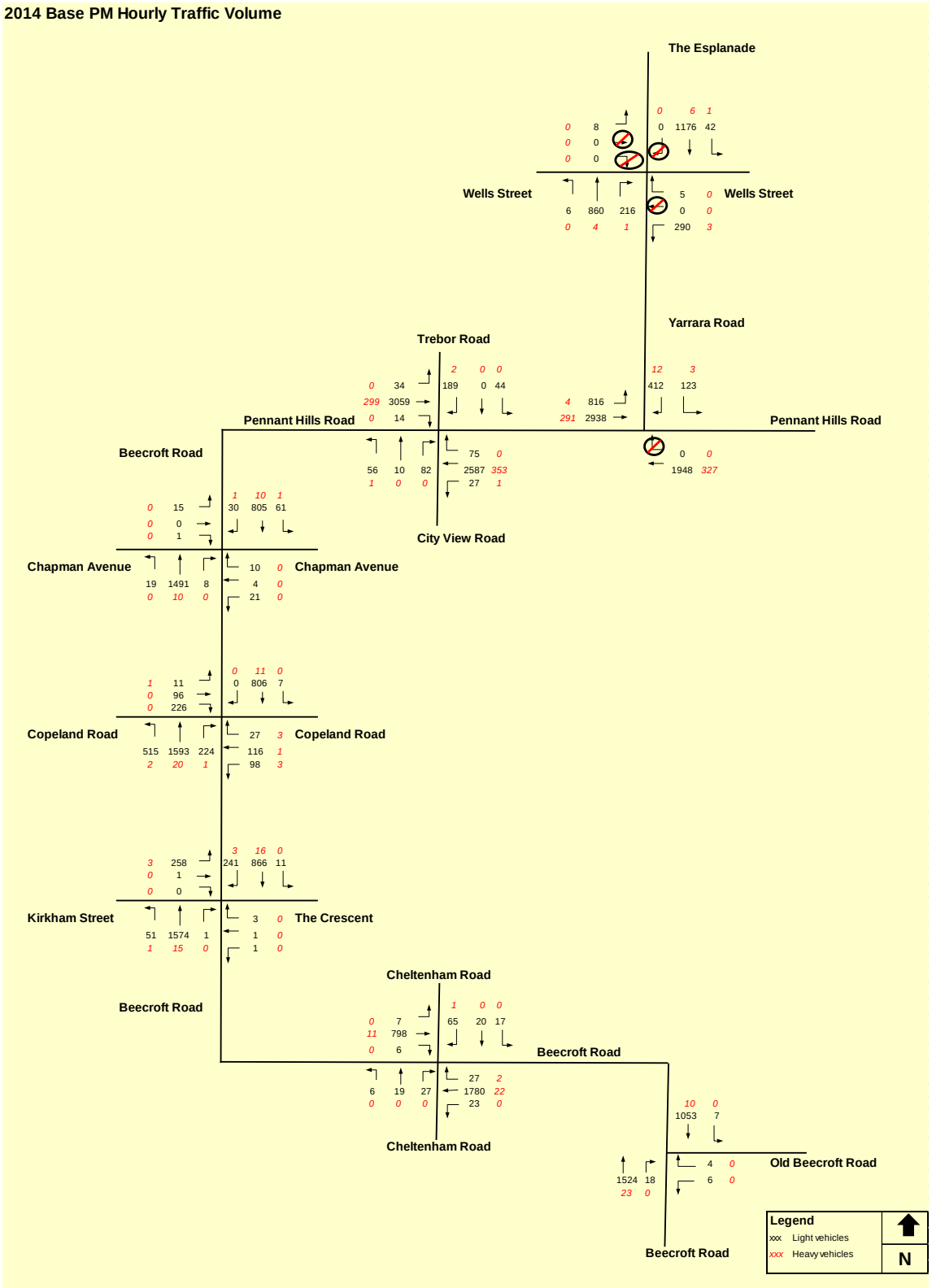


Figure 4.2 2014 base case PM peak hour traffic volumes at the key intersections

4.2.2 2014 base with construction traffic volumes

Future 2014 base with construction phase case traffic volumes were calculated as the sum of the 2012 existing traffic, growth in the background traffic (1.0% p.a.) calculated to 2014 and traffic generation associated with the construction activities. Construction staff would arrive at the site before the shift start at 7.00 am and depart the site between 3.00 pm and 7.00 pm. Therefore they were considered to travel outside the AM traffic peak and were therefore not included in the traffic assessment. However they were considered for the PM peak hour traffic assessment as some trips would coincide with the background PM traffic peak. For the purposes of this assessment, it was assumed that 33% of construction light vehicle outbound trips would occur during the PM peak hour. Construction vehicle trips (heavy vehicles) were considered for the assessment for both the AM and PM peaks as they would occur throughout the working day (shift).

Figures 4.3 and 4.4 show the 2014 base with construction phase forecast traffic volumes at the key intersections during peak hours.

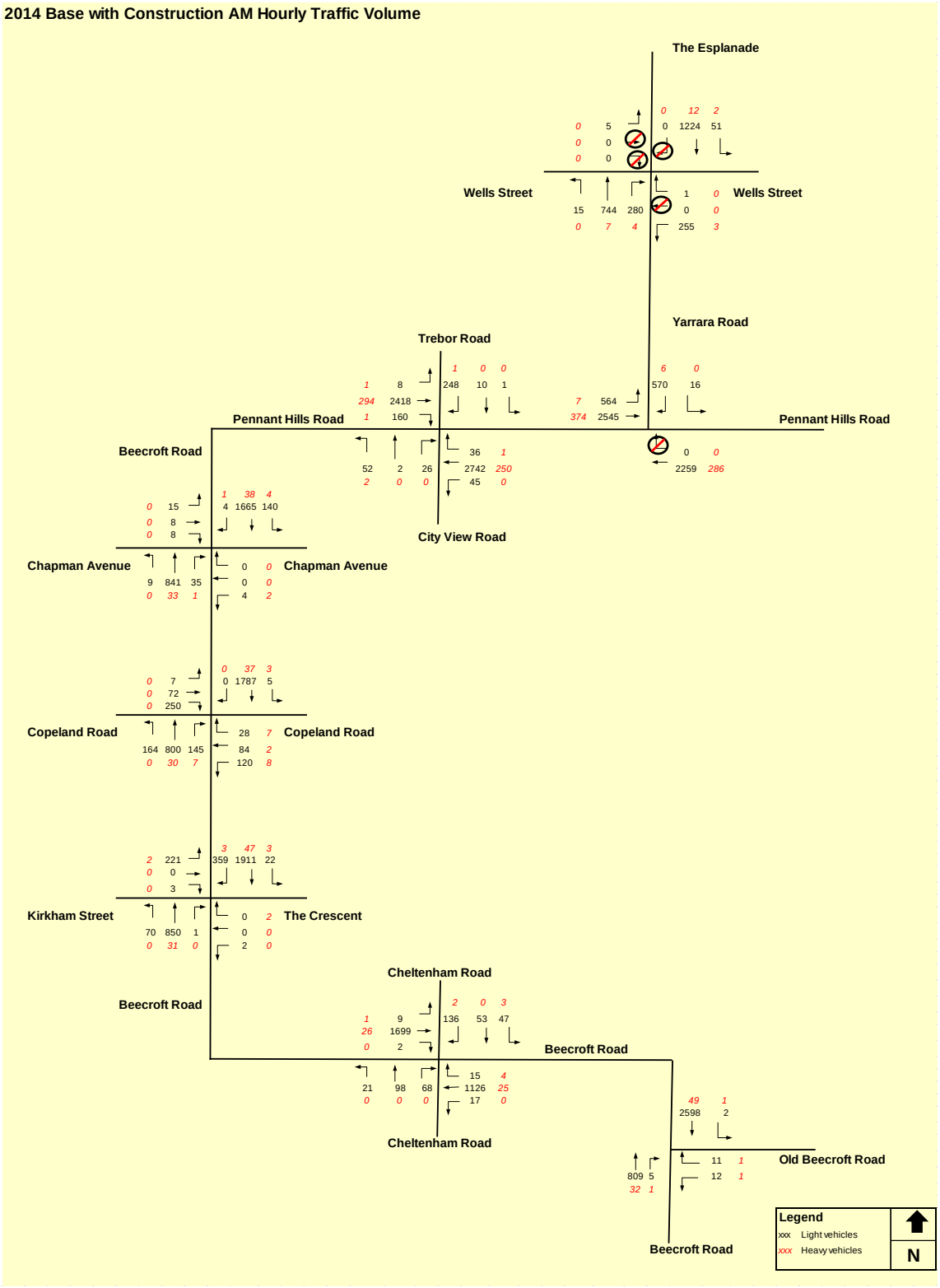


Figure 4.3 **2014 base with construction phase case AM peak hour traffic volumes at the key intersections**

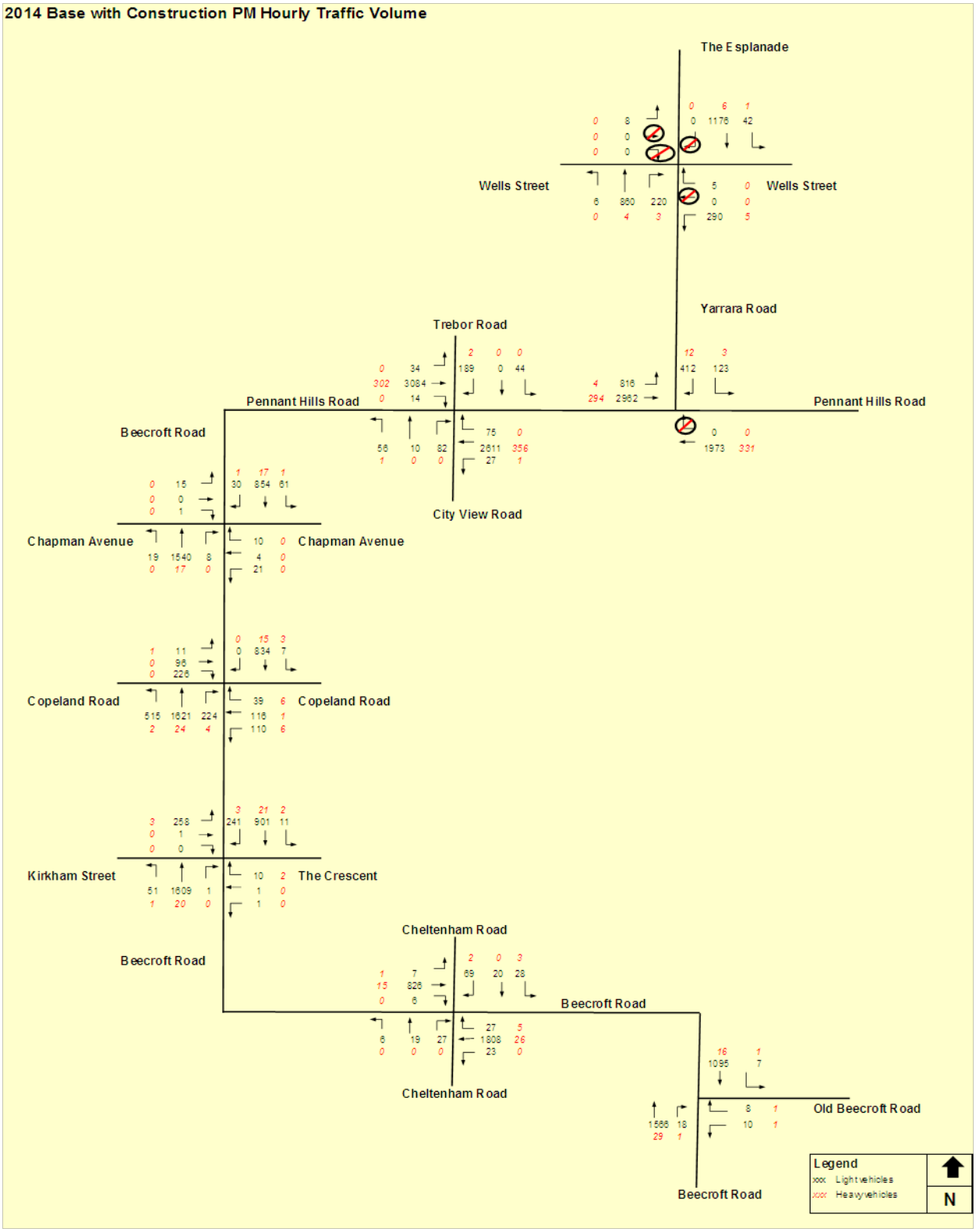


Figure 4.4 **2014 base with construction phase case PM peak hour traffic volumes at the key intersections**

4.3 Intersection operation

4.3.1 2014 base intersection performance

The SIDRA analysis for the 2014 base case utilised the forecast 2014 traffic volumes (refer to Figures 4.1 and 4.2) with the existing intersection layouts. Table 4.1 shows the intersection summary during the peak hours if the construction does not proceed in 2014. Movement summary results are shown in Attachment D.

Table 4.1 Intersection summary results for 2014 base case

Intersection	Intersection control	Peak hour	DoS	Average delays (sec)	LoS	95% queue (m)
Beecroft Road/Old Beecroft Road	Give-way priority	AM	1.00	>100	F	38
		PM	1.00	>100	F	86
Beecroft Road/Cheltenham Road	Signals	AM	0.70	13	A	172
		PM	0.69	10	A	205
Beecroft Road/The Crescent	Give-way priority	AM	>1.00	>100	F	>500
		PM	>1.00	>100	F	>500
Beecroft Road/Copeland Road	Signals	AM	>1.00	96	F	>500
		PM	>1.00	85	F	>500
Beecroft Road/Chapman Avenue	Give-way priority	AM	1.00	>100	F	147
		PM	1.00	>100	F	73
Pennant Hills Road/City View Road	Signals	AM	>1.00	>100	F	>500
		PM	>1.00	>100	F	>500
Pennant Hills Road/Yarrara Road	Signals	AM	0.96	18	B	400
		PM	>1.00	68	E	>500
Yarrara Road/Wells Street	Give-way Priority	AM	>1.00	>100	F	273
		PM	>1.00	>100	F	273

The performance of the assessed intersections in 2014 is expected to be maintained at their current levels. Most of the intersections operate unsatisfactorily at Level of Service (LoS) F, with excessive delay and queuing during both the AM and PM peak hours with the exception of Beecroft Road/Cheltenham Road and Pennant Hills Road/Yarrara Road. The performances of intersections deteriorate slightly with small increases in average vehicle delays and queue lengths when compared to their current levels. Exaggerated average vehicle delays for the give-way priority controlled intersections are recorded due to minimum capacity (very low minor road traffic volumes).

4.3.2 2014 base with construction phase case intersection performance

The SIDRA analysis for the 2014 base case with construction traffic utilised the forecast 2014 traffic volumes and construction traffic (refer to Figures 4.3 and 4.4) with the existing intersection layouts.

Table 4.2 shows the intersection summary during the peak hours in 2014 base with construction phase case. Movement summary results are shown in Attachment D.

Table 4.2 Intersection summary results for 2014 base with construction phase case

Intersection	Intersection control	Peak hour	DoS	Average delays (sec)	LoS	95% queue (m)
Beecroft Road/Old Beecroft Road	Give-way priority	AM	1.00	>100	F	41
		PM	1.00	>100	F	95
Beecroft Road/Cheltenham Road	Signals	AM	0.70	13	A	174
		PM	0.71	10	A	222
Beecroft Road/The Crescent	Give-way priority	AM	>1.00	>100	F	>500
		PM	>1.00	>100	F	>500
Beecroft Road/Copeland Road	Signals	AM	>1.00	100	F	>500
		PM	>1.00	92	F	>500
Beecroft Road/Chapman Avenue	Give-way priority	AM	1.00	>100	F	151
		PM	1.00	>100	F	80
Pennant Hills Road/City View Road	Signals	AM	>1.00	>100	F	>500
		PM	>1.00	>100	F	>500
Pennant Hills Road/Yarrara Road	Signals	AM	0.96	18	B	409
		PM	>1.00	71	E	>500
Yarrara Road/Wells Street	Give-way Priority	AM	>1.00	>100	F	273
		PM	>1.00	>100	F	273

The likely traffic generation associated with the construction activities is low. Table 4.2 shows that whilst the road network is operating at or very close to its capacity, the traffic impact would be negligible to the key intersections with a minimal increase in average vehicle delay and a slight increase in 95% percentile queue lengths. More detailed information is provided in the SIDRA movement summaries in Attachment D.

Thus the construction related traffic at these intersections is unlikely to impose adverse impacts on the surrounding road network or intersection performance, during a typical working weekday.

Given the small magnitude of the change due to the temporary construction traffic and the constrained road carriageway, traffic capacity measures for these intersections are not considered to be warranted.

Exaggerated changes in average vehicle delays for the give-way priority controlled intersections are recorded due to minimum capacity (very low minor road traffic volumes).

5. Operation impact assessment

This chapter describes the ongoing impacts of the ETTT Project following completion and opening.

5.1 Station impacts

The ETTT Project would create lasting changes to the transport network. In order to accommodate the additional third track, some adjustments to platform access may be required although this is expected to be limited to the western side of the rail corridor.

The proposed changes at Cheltenham Station would improve interchange and customer facilities such as, DDA compliant facilities, bike racks or improved station access arrangements. A new pedestrian overbridge will be provided over the new tracks, allowing cross platform interchange movements across the rail corridor compared to the existing access via the Cheltenham Road overbridge.

There will be different layouts at the adjusted stations depending on where the existing platforms are located in relation to the train tracks, i.e. island platforms or side access platforms. Impacts would be greatest at stations with platforms on the outside of the train tracks (side access platforms), e.g. Pennant Hills and Cheltenham stations.

The access changes at each of the stations are described in Table 5.1. Some would improve station access for mobility impaired passengers through the introduction of new lifts.

Table 5.1 Station platform access impacts

Station	Station/Platform access
Epping	▪ No impact.
Cheltenham	▪ New pedestrian overbridge across the new and existing track with new stairs and lift access to The Crescent. This will enable cross platform interchange movements rather than via the street overbridge and therefore enhance accessibility. ▪ Platform 2 would no longer have direct street access.
Beecroft	▪ Extended pedestrian underpass on western side of the rail corridor with similar accessibility to existing condition.
Pennant Hills	▪ Extend existing pedestrian concourse over new track with new stairs and lift access to Yarrara Road. ▪ Platform 2 would no longer have direct street access.
Thornleigh	▪ No impact.

5.2 Road network impacts

Once construction has been completed, the impacts to the road network are expected to be minor and would include only maintenance vehicles wishing to access the site. Maintenance vehicles are expected to generally utilise existing access gates to the rail corridor, apart from one new maintenance access road off Beecroft Road near Devlins Creek. The impact of maintenance vehicles would be minor and expected to be undertaken on a routine basis as per the current situation.

5.3 Non-rail transport access impacts at stations

The increased space requirements at stations could impact on the transport facilities provided.

5.3.1 Bus

The widening of the rail corridor at some stations may impact on bus stop and passenger loading and unloading such as:

- bus stops on Yarrara Road at Pennant Hills Station.

5.3.2 Taxi

No direct impacts have been identified.

5.3.3 Cycle

There are a number of bicycle facilities surrounding the stations along this section of the Main North Line, as shown in Table 2.16. A preliminary investigation of the locations of bicycle parking indicates that the facilities at Cheltenham and Pennant Hills Stations may be affected by this Project. Any bicycle parking displaced by the works would be reinstated to a position near the station entrance of the station after the works are completed.

5.4 Parking impacts

5.4.1 Designated commuter car parking

The designated commuter car parks at Cheltenham and Beecroft stations would be redesigned as part of this project. There would be no net loss of car parking spaces at the newly built commuter car parks at Beecroft and Cheltenham stations. Vehicle entry and exit locations, parking isle widths and directions of traffic flow, pedestrian desire lines as well as the general layout would be altered. Therefore commuters would be required to adjust accordingly to the changes made to the commuter car parks.

5.4.2 On-street parking

The impacts to the on-street parking are expected to be minimal during the operation of the ETTT project. There are expected to be no net losses of on-street parking spaces at Cheltenham, Beecroft and Pennant Hills stations.

6. Mitigation measures and strategies

The following mitigation measures and strategies would be applied where possible to the ETTT Project.

6.1 Construction phase

6.1.1 General requirements

As part of the Construction Environmental Management Plan (CEMP), traffic management plan(s) (TMPs) would be developed to address construction traffic and transport management. The objectives would be to:

- ensure public safety
- maintain a reasonable level of public access across the rail line and to public transport services
- minimise disruption to public transport services and, where necessary, manage any disruption in consultation with the relevant transport provider
- ensure that affected local residents and businesses are advised of any disruption to traffic flows, parking and public transport services
- ensure that disruptions to traffic flows on public streets are minimised and, where unavoidable, managed in consultation with the relevant road authority
- reduce the exposure of the community to heavy construction vehicle traffic impacts and associated noise and vibration, where possible
- ensure adequate access to work sites including sight distance and the trimming back or removal of excessive vegetation
- ensure that road damage from construction traffic is monitored and addressed in consultation with the relevant road authority.

To ensure the key objectives are achieved, the following mitigation actions would be undertaken:

- road occupancy licences for temporary closure of roads would be obtained, where required
- Traffic Control Plans would be prepared and provided to Council and the RMS
- heavy vehicles would be restricted to specified routes and route markers installed for heavy vehicles along designated routes
- signs would be provided at each access point to assist in deliveries to each work site
- signs would be provided at each access point for pedestrian and cyclist guidance
- traffic controllers would be located at each access point to assist and direct vehicle movements, vehicle deliveries, pedestrians and cyclists

- local bus operators would be consulted to ensure that the timing of short term road closures minimise impacts to bus services
- an emergency response plan would be developed for construction traffic incidents
- a pre and post construction assessment of road pavement assets would be conducted in areas likely to be used by construction traffic
- public communications would be conducted to warn the community and local residents of vehicle movements and anticipated effects on the local road network relating to site works in accordance with the CEMP
- access to all private properties adjacent to the works would be maintained during construction
- during project inductions all heavy vehicle drivers would be provided with the emergency response plan for construction traffic incidents
- RailCorp coordinate a transport management plan with the relevant Councils and transport authorities when details are available for closedowns
- undertake road safety audits where required or deemed necessary
- coordination of project staging, vehicle movement and scheduling, equipment and resourcing, joint use of access points and regular project liaison between the NWRL and ETTT projects.

Affected stakeholders, such as local government authorities, emergency services, local schools, public transport operators, public transport users, road users, local businesses, local employees and residents, would receive advance notification of scheduled construction works to allow for planning of required journeys.

6.1.2 Construction methods

In general, construction activity will occur along the rail line, with construction vehicles only entering the road network for deliveries, haulage and to access remote worksites for stockpiling and storage of materials. Access to the road network would be limited to a small number of locations for each section of the ETTT Project. Some vehicles will also need to use the road network to move spoil or materials between worksites when this is not possible within the rail corridor.

The construction of the ETTT Project would be undertaken and staged so that it does not affect timetabled passenger and freight operations other than during scheduled track closedowns.

Construction methods would seek to manage the construction traffic impacts for the following:

- heavy vehicle traffic
  - minimise the number of heavy vehicle trips on road by using the rail corridor to transport materials where feasible
  - minimise the distance travelled by heavy vehicles by encouraging multi-drop delivery trips
  - minimise disruption on the local road network by using nominated haulage routes

- minimise the running of empty trucks
- provide a traffic controller at the Beecroft Road (Epping) site access point where heavy vehicles need to cross the path of pedestrians
- minimise the number of heavy vehicles turning right from Beecroft Road into Cheltenham Road

- construction worker traffic
  - encourage the use of alternative travel modes to the work sites. Encourage car 'pooling' where alternatives are not practical
  - provide on-site parking for construction workers
  - provide emergency vehicle parking within worksites
- temporary worksite access
  - use existing accesses wherever possible
  - use traffic controllers to manage site access where required by the TMP/TCP
  - close and lock site access points/gates after construction hours
  - minimise construction traffic during school start and end times near the following:
    - Our Lady of Help Christians Primary School
    - Beecroft Primary School
    - Cheltenham Girls High School
    - Arden Anglican School
    - Beecroft Buddies Childcare Centre
    - Thornleigh Preschool
    - Pennant Hills Preschool and Long Day Care
    - Beecroft Long Day Care and Early Learning Centre
- oversize/mass deliveries
  - co-ordinate all oversize/mass deliveries with the RMS traffic management centre and Police
  - where practical, divide loads between smaller vehicles
- contingency management
  - prepare a contingency response traffic management plan
  - provide a contingency works co-ordinator

- consultation and co-ordination
  - if M2 Motorway closures are required, these will be co-ordinated with RMS and Hills Motorway
  - any closures of the M2 Motorway would aim to coincide with other scheduled maintenance closures during off-peak hours
  - develop construction methodologies to minimise the need for M2 motorway lane and carriageway closures
  - undertake regular liaison with NWRL in relation to potential cumulative construction impacts e.g. adjacent worksites at Epping.

6.1.3 Station access during construction

- Changes to station access would be staged and communicated via signage for example, so that the new facility is opened before the old facility is closed.
- Construction would be staged to maintain pedestrian access at all times (apart from track closedowns).
- Large works at stations would be undertaken simultaneously with track closedowns as far as practicable.
- Reconstruction of rail concourses, overbridges and underpasses would be staged to maintain pedestrian access at times (apart from track closedowns).

6.1.4 Temporary changes to access at stations

Bus stops, taxi ranks and kiss-and-ride locations affected by construction would be temporarily relocated to nearby convenient locations so that they remain available throughout construction.

6.1.5 Temporary arrangements for commuter parking

Any loss of commuter car parking at Cheltenham, Beecroft and Pennant Hills Stations would be accommodated on local streets within a 400 m walking distance of these stations.

6.1.6 Intersection operation

The impacts of construction traffic on the local road network and the impacts on intersection operation would be minimised by undertaking construction vehicle traffic movements outside of peak road traffic periods and outside of school peak periods where possible.

6.2 Operation phase

6.2.1 Station facilities

Any affected bicycle facilities, e.g. lockers, racks hoops/rails, would be reinstated to a location close to the new station entrance.

6.2.2 Commuter parking

The designated commuter car parks at Cheltenham and Beecroft stations would be redesigned as part of this project. There would be no net loss of car parking spaces at the newly built commuter car parks at Beecroft and Cheltenham stations. Vehicle entry and exit locations, parking isle widths and directions of traffic flow, pedestrian desire lines as well as the general layout would be altered. Appropriate information signage, road and traffic signage, pavement markings and linemarking are to be implemented to advise commuters of the changed commuter car parking conditions.

6.3 Strategy for managing traffic impacts, including bus services and pedestrian and cycle access

Given the low construction volumes expected for the ETTT Project, there is little impact expected to the road network.

Activities identified as having the greatest potential for adverse traffic flow, access or safety implications include:

- Construction worksite access
- Station access during construction
- Construction impacts on the road network
- Temporary impacts to parking during construction
- Cumulative traffic impacts from the North-West Rail Link project
- Track closedown periods.

The following strategies would be implemented to manage:

Traffic impacts

- To reduce the impacts on the local road network, dedicated truck haulage routes have been nominated to provide the most direct access via the shortest travel route. Roads of a higher hierarchy would be utilised to better accommodate increased vehicle volumes and larger/heavier vehicle types.
- Construction traffic would be spread across the entire project to the various site compounds thus reducing the total construction volumes through key intersections.
- Construction staff travel to occur outside of the background road network peak periods.
- Limit construction truck movements during background road network peak periods.
- Traffic controllers implemented at construction compound site accesses to assist and direct vehicles.
- Preparation of a Traffic Management Plan (TMP).

Bus services

- The implementation of directional signage at stations during construction.
- Charter buses would replace trains during the track closedown periods.

Pedestrian and cycle access

- Where access to platforms is changed, the new facility would be opened before the old facility is closed.
- New pedestrian bridges would be built before old ones would be demolished to maintain access to and from the stations.
- New commuter car parks would be staged to minimise disruption. New facilities would be opened where possible before old facilities are closed.
- The implementation of directional signage at stations during construction.
- The implementation of directional signage and traffic control at dedicated pedestrian and cycle crossings including the shared path linking Epping Station and Beecroft Road.
- Traffic controllers implemented at construction compound site accesses to assist and direct pedestrian and cyclists.

The above strategies would be implemented in conjunction with station plans prepared for the various stages of the project as shown in Attachments A1 to A3.

7. Conclusion

The Northern Sydney Freight Corridor (NSFC) has been designed to improve reliability and increase capacity for interstate container freight rail services on the Main North Line. The addition of the third track between Epping and Thornleigh will require the modification to stations and bridges. A number of mitigation measures have been made to address the likely impacts of the ETTT Project.

7.1 Construction impacts

7.1.1 Construction location and access

Several access gates are proposed to be used for construction access some of which are existing gates to the rail corridor. The majority of the construction accesses would be located on local roads with low traffic volumes and therefore would have no impact to vehicle access and movement. Sight distances at access locations should adhere to the relevant Austroads Guidelines for safe intersection sight distance where possible based on the road type, the design vehicle and the posted speed limit. Traffic control signage and accredited traffic controllers would be positioned at those construction accesses that do not meet sight distance requirements to assist with vehicle movements in and out of the Project.

7.1.2 Stations

Construction at stations would be staged to maintain pedestrian access with the exception of rail closedown periods. In general, where access to platforms is changed, the new or temporary facility would be opened before the old facility is closed. If possible, major works at stations would be undertaken simultaneously with rail closedowns.

Bicycle facilities at stations would be relocated if they are affected by the construction works. Temporary changes to bus stops, taxi ranks and passenger set down/pick up areas would be required.

7.1.3 Road impacts

Construction activity would mainly occur within the rail corridor, minimising the impact on the surrounding road network.

The assessment of construction traffic impact indicates that there would be negligible impact on the key intersections adjacent to the construction site therefore mitigation works are not recommended due to the construction activities.

Temporary lane/road closures may be required during construction. Details would be provided in a Construction Traffic Management Plan, with a separate approval process. Further details would be provided at the detailed design stage of the Project.

7.1.4 Parking

Existing designated commuter car parking at Cheltenham and, Beecroft Stations along with some street parking at all three stations would be affected by the construction of the ETTT Project. These impacts would be minimised wherever possible by staging the construction activities. The construction of the new commuter car parks at Cheltenham and Beecroft Stations would be staged to minimise disruptions to car parking facilities. New facilities would be opened where possible before the old facilities are closed however this staging would need to consider other environmental impacts such as minimising vegetation clearing requirements.

During construction activities 15 commuter car parking spaces at Cheltenham and 20 commuter car parking spaces at Beecroft Stations would be temporarily unavailable. These parking demands would be amply accommodated on local streets within a 400 m walking distance of these Stations.

On-street parking at Cheltenham, Beecroft and Pennant Hills Stations would be affected by the construction of the ETTT project. These impacts would be minimised wherever possible by staging the construction activities. Any on-street parking affected temporarily during construction would be accommodated on local streets within a 400 m walking distance of Cheltenham, Beecroft and Pennant Hills Stations.

The following unrestricted on-street car parking spaces is provided within 400 m walking distance:

- 833 car parking spaces at Cheltenham Station
- 810 car parking spaces at Beecroft Station
- 625 car parking spaces at Pennant Hills Station.

Based on this information, ample unrestricted car parking is provided on-street during the construction phase.

Parking for construction workers would be provided within the rail corridor, with access gained by the gated accesses. Should additional car parking spaces be required on-street, then the project team would liaise closely with Council on this matter.

7.1.5 Transport impacts

As a result of the need to maintain the safety of rail workers, and the proximity of some works to the operational rail tracks, sections of the Main North Line would need to be closed to undertake some components of the construction works.

The ETTT Project would take advantage of routine rail closedowns. These are scheduled periods when part of the rail network is temporarily shut down and trains are not operating. These periods are scheduled by RailCorp up to twelve months in advance and therefore are a key driver in construction staging. Approximately 17 routine closedown periods have been identified as being required.

During these periods, rail services are temporarily suspended and replacement buses operate. Freight services are also rescheduled to avoid closedowns. Rail closedowns are routinely conducted at weekends or during holiday periods as these periods are traditionally associated with lower passenger patronage and therefore, the disruption and inconvenience is reduced.

While every effort would be made to co-ordinate construction with scheduled closedowns, it is likely that additional closedown periods may be required to ensure the proposal is completed on time. One such additional closedown has been identified between the Christmas and New Year period in December 2014, for a period of five days. It is likely that these works would be undertaken 24 hours a day.

During these track closedowns charter buses will replace train services. Longer closedowns would be required for track commissioning and would occur outside of commuter peak periods.

Bus services would be affected during the construction work at Beecroft and Pennant Hills interchanges which may require the temporary relocation of bus stops. A temporary pedestrian enclosure structure would be established for the underpass at Beecroft Station to enable continued access for pedestrians during construction.

7.1.6 Cumulative impacts

North-West Rail Link

The NWRL is a priority railway transport infrastructure project for the Sydney metropolitan area. The NWRL and ETTT proposal alignments would generally overlap in the vicinity of Epping Station. However, at this location, the NWRL would be located underground.

The major civil construction works are planned to commence in mid-2013 and be completed in late 2016. Construction-related light and heavy vehicle movements would be associated with spoil and waste removal, material deliveries and the arrival and departure of construction workers.

Two of the NWRL construction sites (and site accesses) would be located in close proximity to some of the ETTT proposal vehicle access routes and construction site accesses. These sites locations comprise the construction sites for the Epping Services Facility and Cheltenham Services Facility.

The North West Rail Link: Environmental Impact Statement Stage 1 – Major Civil Construction Works (the NWRL EIS) (TfNSW 2012e) was on public exhibition at the time of undertaking this assessment.

M2 Motorway Upgrade

RMS has advised the ETTT project team that the M2 Motorway upgrade works will be complete in the first half of 2013. The ETTT Project works in this area would occur later in the program and as a result no overlap of the construction activities for this project works with those of the M2 Motorway is anticipated. However, should wet weather delays be experienced and impact on the M2 Motorway upgrade works, there is potential for some overlap in construction activity.

Northern Sydney Freight Corridor (NSFC)

To match the predicted growth in freight demand as it occurs, the following three projects are proposed to be implemented in conjunction with the ETTT project as part of the NSFC Program:

- North Strathfield Rail Underpass
- Gosford Passing Loops

- Hexham Passing Loop (already delivered by the Australian Rail Track Corporation).

Construction of the first of the other three NSFC Program proposals is anticipated to commence in late 2012 or early 2013. While the three remaining NSFC Program proposals being managed by TfNSW are located in geographically separated areas and would therefore not have any direct interfaces.

In addition, the NSFC Program was designed to deliver overall operational improvements to both the passenger and rail freight networks, which is a positive cumulative impact.

7.2 Operation impacts

7.2.1 Stations

Changes to platform access will be required by the addition of the new track, mainly on the western side of the rail corridor. Some stations would require new or modified pedestrian overbridges to maintain street access. This would improve vertical transport and access for mobility impaired passengers.

Passengers at Cheltenham Station would experience a small increase in walk times due to the need to cross over the additional third track. The change is not likely to cause a significant increase in passenger walk times.

7.2.2 Road network

Once construction has been completed and the project opened, the impacts to the road network are expected to be minor and would include only maintenance vehicles wishing to access the site. Maintenance vehicles are expected to utilise existing access gates to the rail corridor. The impact of maintenance vehicles would be minor and expected to be undertaken on a periodic basis as per the current situation.

7.2.3 Parking

The designated commuter car parks at Cheltenham and Beecroft stations would be redesigned as part of this project with no net loss of car parking spaces. Vehicle entry and exit locations, parking isle widths and directions of traffic flow, pedestrian desire lines as well as the general layout would be altered.

The impacts to the on-street parking are expected to be minimal during the operation of the ETTT project. There are expected to be no net losses of on-street parking spaces at Cheltenham, Beecroft and Pennant Hills stations.

7.2.4 Transport impacts

Minimal changes are likely to occur at the interchanges along where this third track will be constructed. Any active or public transport changes or impacts are likely to occur only during the construction phase and will revert back to their original condition or location where possible.

Bicycle parking at stations could be affected by the ETTT project. Any bicycle parking displaced by the works would be reinstated to a position near the station entrance of the station after the works are completed.

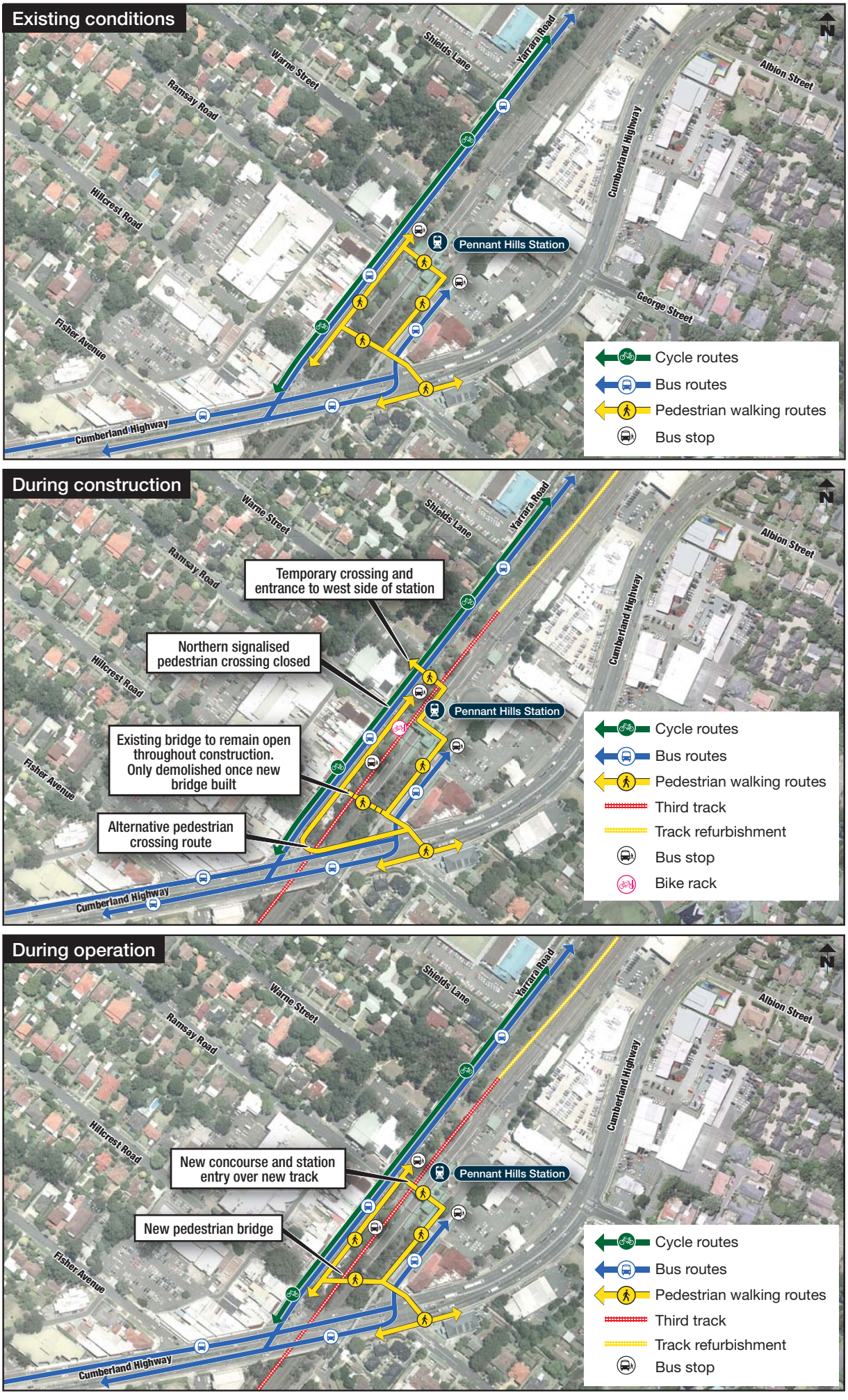
8. References

This assessment has been based on the information available from the Project Definition Reports compiled by Parsons Brinckerhoff and Gutteridge Haskins & Davies (GHD) on behalf of Transport for NSW and other additional sources and references as shown below.

- Austroads, *Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections* (2010)
- NSW Government, *Environmental Planning and Assessment Act 1979 No 203* (1979)
- CityRail timetable, effective (23 October 2011)
- CityRail, *A Compendium of CityRail Travel Statistics, 7th edition* (June 2010)
- Roads and Traffic Authority, *Restricted Access Vehicle Maps* (2011)
- Roads and Traffic Authority, *Guide to Traffic Generating Developments* (2002)
- Transport Construction Authority, *Memorandum for Calculation for train movements for NSFC acoustic modelling* (2011)
- Transport for NSW, *North West Rail Link, Environmental Impact Statement, Stage 1 – Major Civil Construction Works, Volume 1A Main Document* (2012).

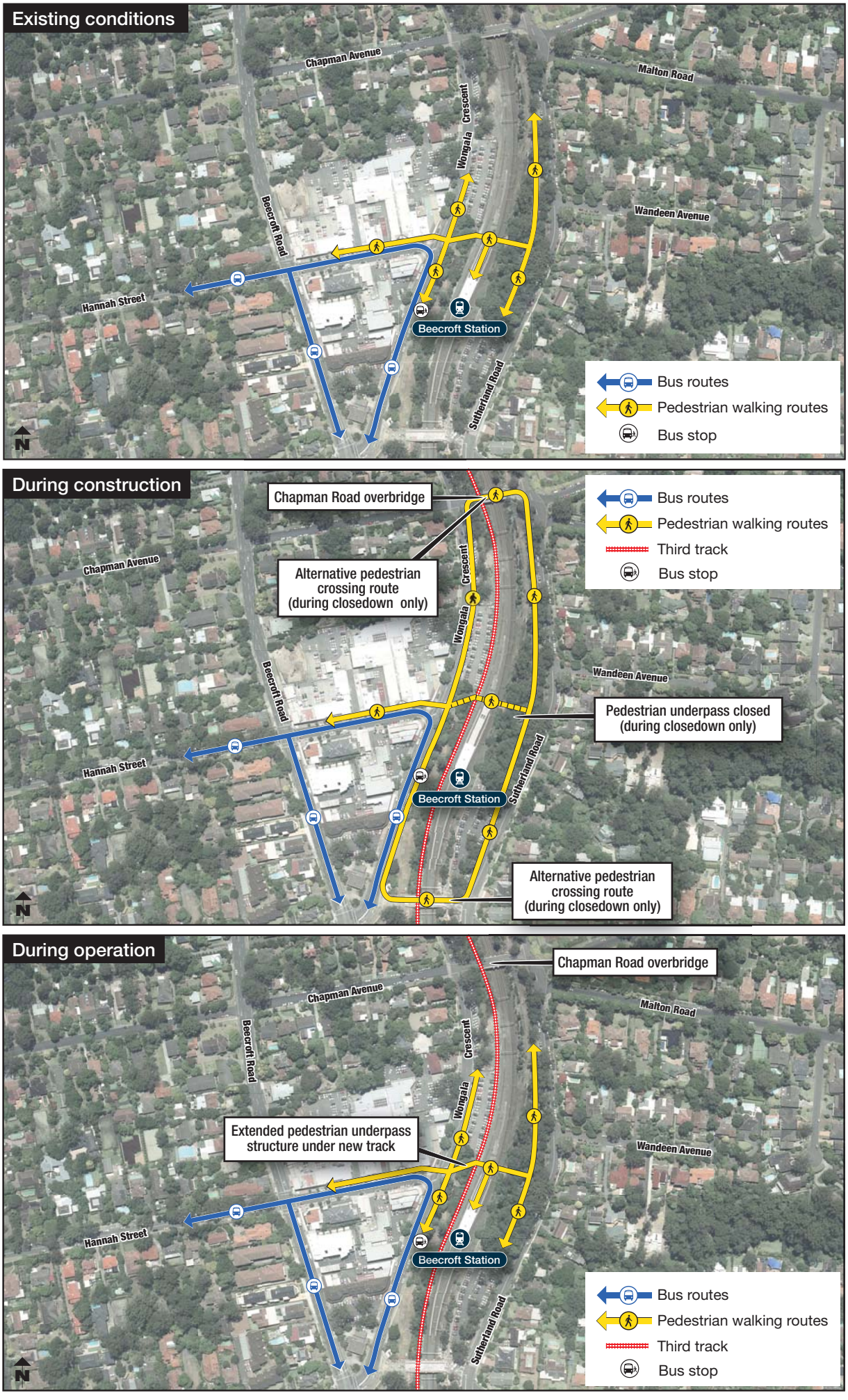
Attachment A

Public transport facilities, walking routes and cycle routes at stations under existing, construction and operation conditions



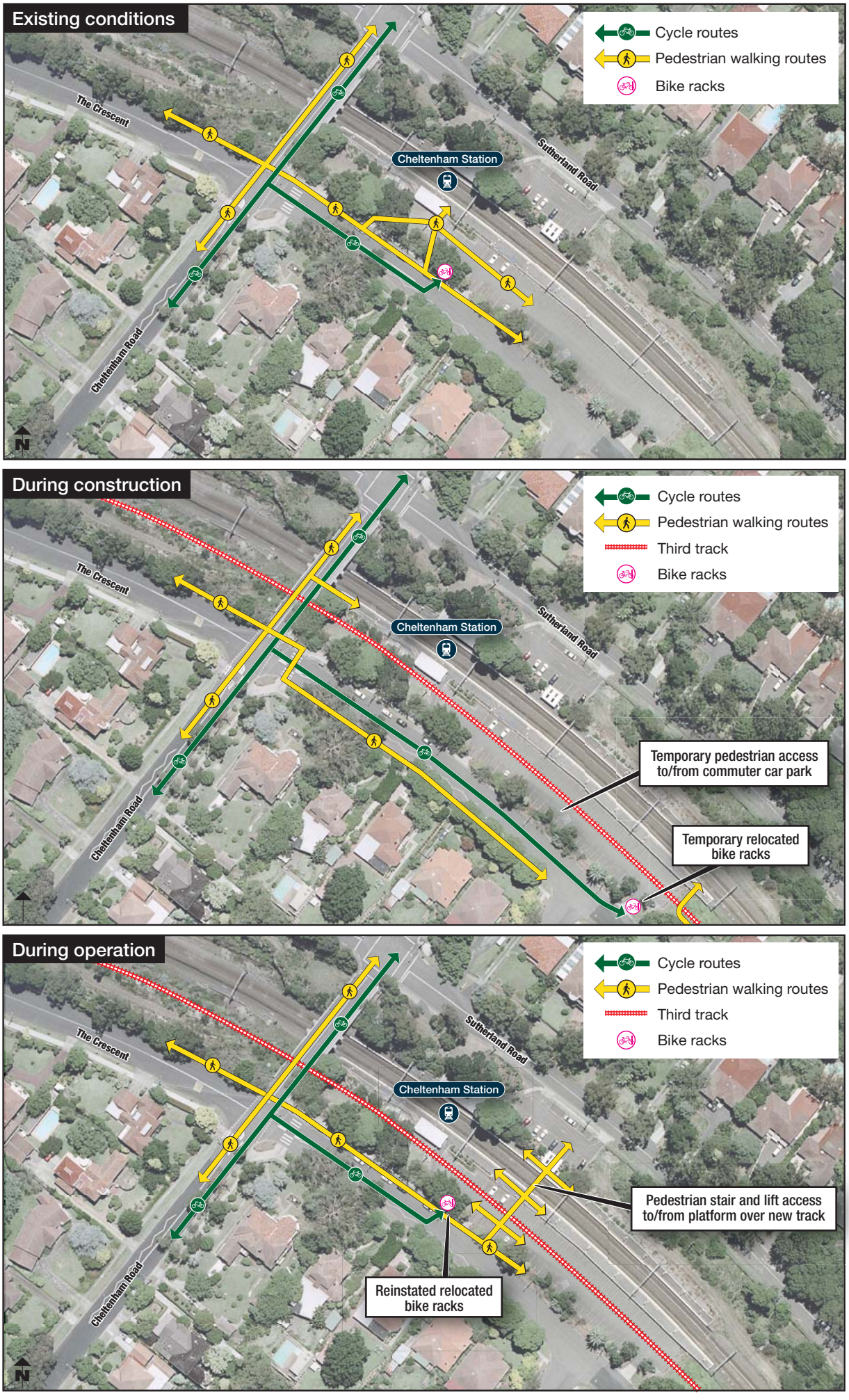
Attachment A1 **Public transport facilities, walking routes and cycle routes at Pennant Hills Station**

Note: Indicative only, subject to detailed design.



Attachment A2 **Public transport facilities, walking routes and cycle routes at Beecroft Station**

Note: Indicative only, subject to detailed design.



Attachment A3 **Public transport facilities, walking routes and cycle routes at Cheltenham Station**

Note: Indicative only, subject to detailed design.