83, 83A-C, 87, 89, 91, 97 and 103A Ti Rakau Drive:

A temporary access road will be provided for 83, 83A-C, 87, 89, 91 and 97 Ti Rakau Drive at the back of the acquired properties. The temporary access road will head east towards Edgewater Drive. **Figure 89** shows the location of the proposed temporary access road.

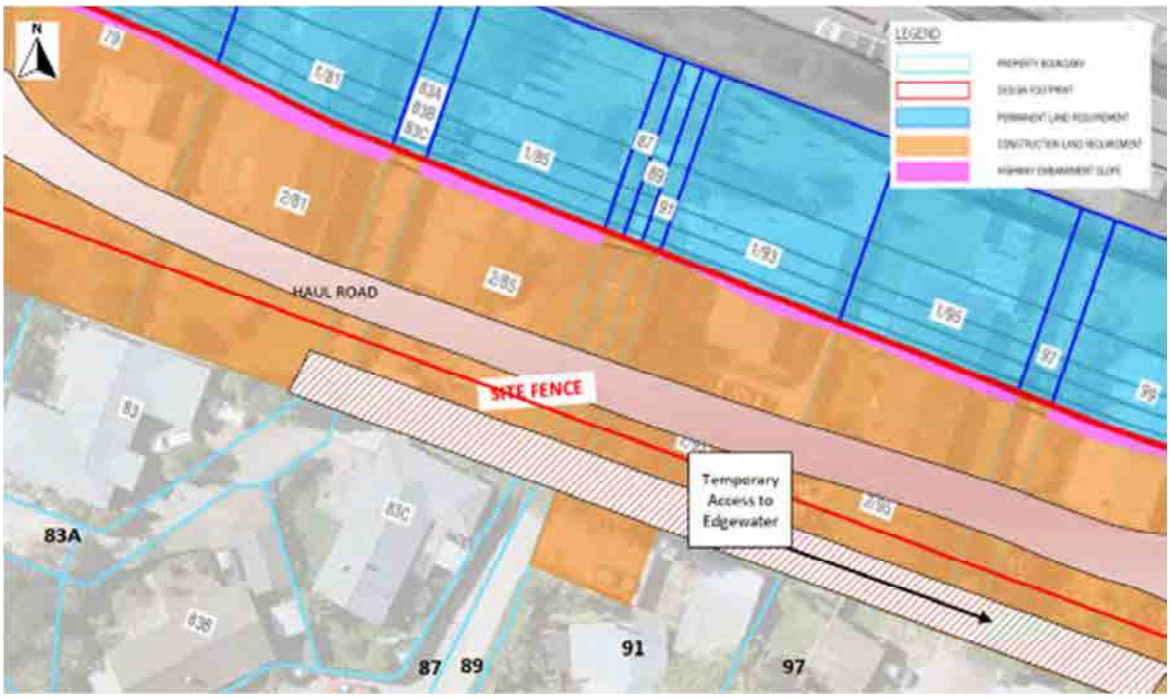

Figure 89: 83, 83A-C, 87, 89, 91 and 97 Ti Rakau Dr temporary access road

At the eastern end, the proposed temporary access road will terminate in the temporary parking area to be provided for the Edgewater Shops, located at 105 Ti Rakau Drive. A temporary access point for 103A Ti Rakau will also be provided here. **Figure 90** below shows the location of the proposed temporary accesses.

Figure 90: 103A Ti Rakau Dr temporary access

Residents will access the temporary access roads via Edgewater Drive west and the access road to the rear of the Edgewater Shops. The site haul road will also intersect the temporary parking area, but will be accessed by site traffic via Ti Rakau Drive. Therefore, the temporary effects to property access are considered to be very low.

129 Ti Rakau Drive:

A temporary access point will be provided for 129 Ti Rakau Drive on the western side of Wheatley Avenue. The driveway will intersect with Wheatley Avenue close to the existing access of 1 Wheatley Avenue and will be separated from the haul road. Therefore, the effects to property access are considered to be negligible. **Figure 91** shows the location of the proposed temporary access.

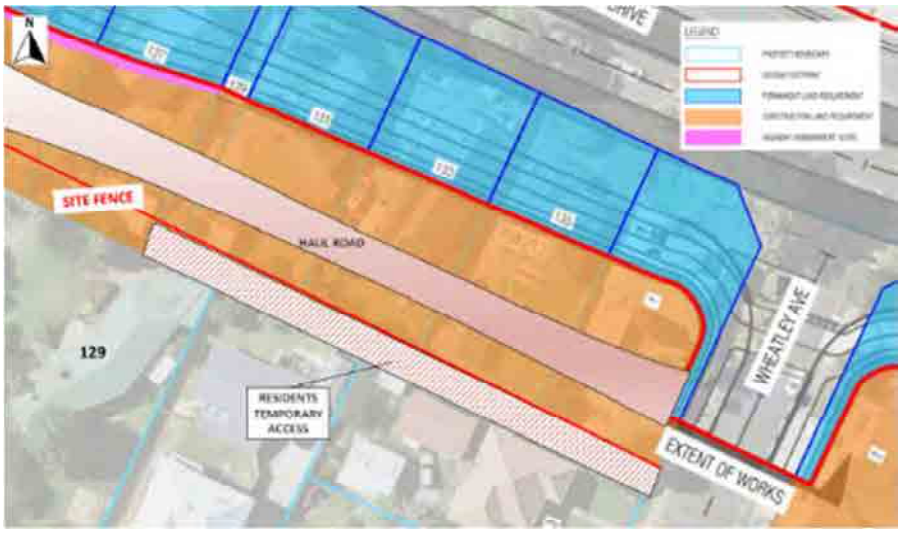

Figure 91: 129 Ti Rakau Dr temporary access

145 Ti Rakau Drive:

A temporary access point will be provided for 145 Ti Rakau Drive on the western side of Edgewater Drive east. The access road will intersect with Edgewater Drive at the existing access of 149 Ti Rakau Drive. A haul road is not proposed between Wheatley Avenue and Edgewater Drive east. Therefore, the effects to property access are considered to be negligible. **Figure 92** below shows the location of the proposed temporary access.

Figure 92: 145 Ti Rakau Dr temporary access

175A, 177, 183, 185 and 191 Ti Rakau Drive:

A temporary access road will be provided for 175A, 177, 183 and 185 Ti Rakau Drive at the back of the acquired properties. The temporary access road will head east towards Freemantle Place. **Figure 93** shows the location of the proposed temporary access road.

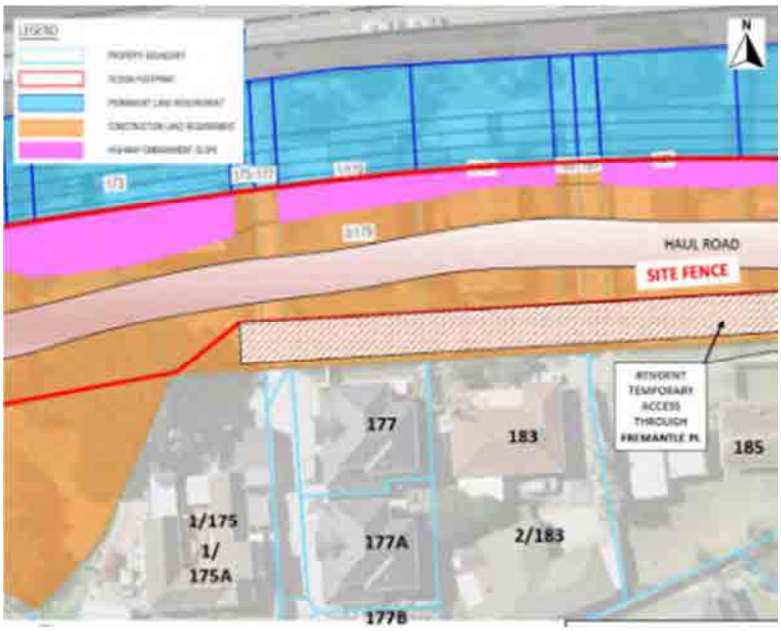

Figure 93: 175, 177, 183 and 185 Ti Rakau Dr temporary access

Near the eastern edge of 185 Ti Rakau Drive, the proposed haul road and temporary access road will curve northward, which will allow for access to also be provided to 191 Ti Rakau Drive. The temporary access road will continue eastwards and intersect Freemantle Place at the existing access to 201 Freemantle Place. Therefore, the effects to property access are considered to be negligible. **Figure 94** shows the location of the proposed temporary access road.

Figure 94: 191 Ti Rakau Dr temporary access

5.5.6.4 107 and 109 Ti Rakau Drive – Edgewater Shops

The Edgewater Shops, located at 107 and 109 Ti Rakau Drive, is a block of local shops. The parking area currently provides 26 parking spaces on the northern side of the property and an additional four parking spaces on the eastern side, for a total of 30 parking spaces (see **Figure 95**). It should be noted that these parking spaces are within the road reserve.

Figure 95: Edgewater Shops parking area

During construction, the new westbound lanes on Ti Rakau Drive as well as the redesigned Edgewater Drive west approach will result in the loss of all of the parking spaces at the shops.

As stated in **Section 5.5.6.3** above, the property at 105 Ti Rakau Drive (immediately west of the Edgewater Shops) has been acquired by AT and will provide a temporary parking area for customers of the shops (see **Figure 96**).

Figure 96: Edgewater Shops temporary parking area during construction

As stated in **Section 3.7.5**, utilization of the existing carpark is not expected to exceed 60% or 18 occupied spaces during a typical weekday or weekend. The temporary carpark will provide 18 parking spaces and access to the parking area will be from Edgewater Drive west via the access road at the back of the commercial properties. Access to the refuse collection area to the rear of the property will be maintained. Temporary signage will be provided to direct customers to the temporary parking area during construction. Therefore, temporary effects to property access and parking at the Edgewater Shops are considered to be very low.

As stated in **Section 5.5.6.3**, the temporary site haul road (blue polygon) will intersect the temporary carpark, but will be accessed by site traffic from Ti Rakau Drive. The proposed temporary access roads to 83, 83A-C, 87, 89, 91, 97 Ti Rakau Drive (green polygon) and 103A Ti Rakau Drive (yellow polygon) will also intersect the temporary carpark and will be accessed via Edgewater Drive west.

5.5.6.5 32 Edgewater Drive – Edgewater College

As stated in **Section 5.3.6**, the existing school bus services operating to and from the school will experience small route changes during the proposed Edgewater Drive intersection closures (Phase 1 of EB3R between Mattson Road and Gossamer Drive). However, these school bus services will still be able to access the existing off-street bus stop similar to the existing environment. Therefore, the temporary effects to property access and parking are considered to be negligible.

5.5.6.6 207, 219 and 229 Ti Rakau Drive – Pakuranga Baptist Church

Figure 97 shows the location of the Pakuranga Counselling Centre located at 207 Ti Rakau Drive (blue outline. The figure also shows the location of the Pakuranga Chinese Baptist Church, Pakuranga Baptist Kindergarten and the Pakuranga Baptist Church located at 219 Ti Rakau Drive (yellow outline) and the Congregational Church of Samoa located at 229 Ti Rakau Drive (purple outline). Lastly, the figure also shows the areas that will be occupied temporarily for drainage works (orange polygons), and the indicative drainage works segments (red outline).

It should be noted there is no intention to occupy the building at 207 Ti Rakau Drive and no demolition is planned.

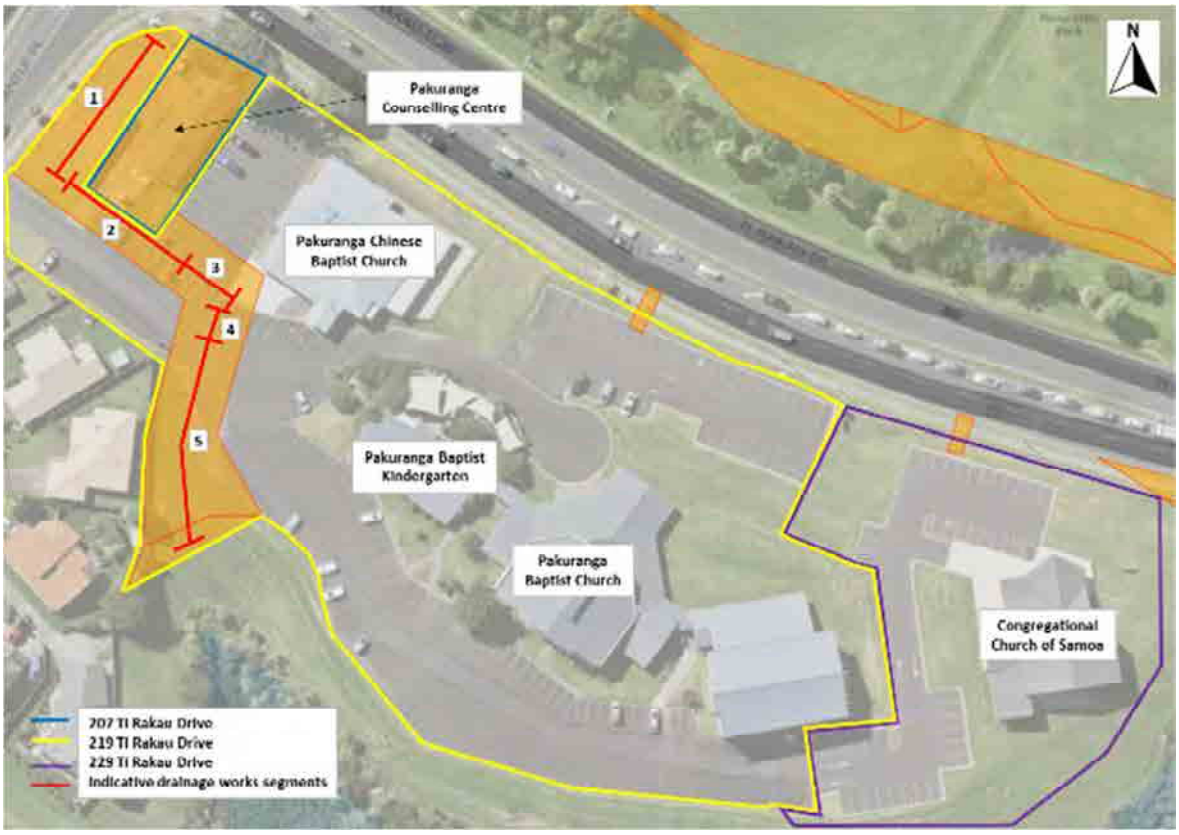

Figure 97: 207, 219 and 229 Ti Rakau Dr drainage works

Drainage works will be undertaken on these properties over a period of approximately one month. It is envisaged that the works will be completed in sections to maintain vehicle access to all the properties at all times. Furthermore, the drainage works will be undertaken during weekdays, with the possibility of works being undertaken on Saturdays as well.

At the end of each work week, the work zone will be reduced in size, while maintaining the safety of the work zone, to free up as many occupied parking spaces as possible. The Pakuranga Chinese Baptist Church currently offer one Saturday evening service, one Sunday morning service and one Sunday evening service. The Pakuranga Baptist Church currently offer one Sunday morning service.

Property Access:

In the existing environment, the Pakuranga Counselling Centre has one access off Ti Rakau Drive and one access off the private internal road to the off-street parking on the property. At least one of these accesses will be maintained at all times. Pedestrian access will be maintained at all times, and CTMPs will be employed to ensure this. Therefore, temporary effects to property access at 207 Ti Rakau Drive are considered negligible.

To avoid lateral shifts of the access and loss of parking as a result, the internal access to the Pakuranga Chinese Baptist Church will be reduced to a one-way system for a short period and will be managed through the CTMP. Appropriate liaison and advanced notice will be provided of the planned works.

Two-way access will be maintained for circulation on the internal roads of the property at 219 Ti Rakau Drive by using steel plating across trenches where necessary. Therefore, the temporary effects to property access at 207, 219 and 229 Ti Rakau Drive are considered to be very low.

Parking:

In the existing environment, the Counselling Centre at 207 Ti Rakau Drive has five parking spaces on site. The proposed drainage works will not have any effect on these parking spaces.

In the existing environment, 219 Ti Rakau Drive has a total of 220 parking spaces on site. The proposed drainage works in front of the Pakuranga Chinese Baptist Church are expected to affect 19 of these parking spaces. However, as stated above, the planned works will be staggered and is not expected to result in the loss of more than 10 parking spaces at any one time. Each segment of works will require roughly one week to complete.

To maintain two-way circulation on the internal roads, parking spaces will be removed temporarily. The planned works will result in the temporary loss of 15 parking spaces on the southern side of 219 Ti Rakau Drive during the work week. However, as stated above, the work zone size will be reduced at the end of the work week to free up as many parking spaces as possible. Therefore, it is expected that the temporary effects on parking will be very low.

5.5.6.7 168R Gossamer Drive – River Hills Park

A parcel of land along the southern boundary of 168R Ti Rakau Drive River Hills Park has been acquired by AT to allow for the eastbound Gossamer Drive bus station. Discussions are ongoing with the River Hills Park as well as the Fencibles United Football Club on the rearrangement of the fields on the property as a result of the Project.

However, from a transport perspective, the Project will have no temporary effects to property access and parking on-site.

5.5.7 Summary of Temporary Effects to Property Access and Parking

Overall, the temporary effects during construction on property access and parking will be mitigated appropriately and are considered to be negligible or very low. Where existing vehicle access arrangements and parking provisions cannot be maintained, appropriate mitigation measures have been proposed to provide levels of access and parking commensurate with the existing environment as far as is reasonably practicable.

Engagement with property owners or operators will be undertaken during construction to communicate the planned works and duration, the potential disruption and proposed mitigation measures as well as to develop additional measures or improve upon proposed measures if required. This will be a requirement of the CTMP.

Lastly, pedestrian access to properties will be maintained at all times. This will be ensured through the CTMPs.

5.6 Effects to Safety Performance

Safety measures will be in place during construction, ensured by the CTMPs. The safety and protection of the public, traffic and construction team is paramount, and all site operations will be focused on zero harm to all involved, associated and traveling through the project areas. This will be achieved through the following:

- Traffic management that separates the public / traffic operations as well as managing and maintaining public and traffic flow entering and exiting the construction operations within the project areas.
- Active communications with the local community and public travelling through the construction work zones to ensure they will be regularly updated on temporary traffic management operations.
- Before each work zone is ready to be opened following construction, an independent safety audit will be completed, and public notifications of the opening and new layouts will be made available.

5.7 Construction Traffic Management Plan

Construction Traffic Management Plans (CTMPs) will be employed for both EB2 and EB3R. The purpose of the CTMPs will be to avoid, remedy or mitigate the adverse effects of construction of the Project on transport, parking and property access so far as is reasonably practicable. The CTMPs will be developed in accordance with the conditions of the Notice of Requirement (NoR) / resource consent associated with the Project and will include management methods, controls and reporting to manage the potential effects on transport, parking and property access associated with the Project.

The CTMPs will be informed by practical experience with traffic management during construction and will reflect best practice through drawing on:

- The Code of Practice for Temporary Traffic Management prepared by the New Zealand Transport Agency, 4th Edition 2018 (CoPTTM)
- NZ Guide to Temporary Traffic Management (NZGTTM) which is currently in pre-consultation draft and will supersede the CoPTTM in due course

The CTMPs will set out the traffic management strategies that will be employed to manage the temporary effects during construction, including, but not limited to:

- Design standards
- Hours of operation
- Public transport
- Property access and parking
- Pedestrian and cyclists
- Emergency services
- Impacts on heavy haulage
- Impacts on taxi users
- Construction access and laydown
- Staff parking
- Site offices and satellite compounds
- Construction vehicle movements
- Transport network management
- Communicating traffic management impacts
- Temporary traffic management auditing
- Monitoring and reporting

The Project will be acting in and impacting on the network over the whole length of the construction period and over that time the construction's impacts will be monitored. The EBA will agree upon certain Key Performance Indicators (KPIs) to assess how well the EBA is performing at minimising community disruption. These KPIs will be reported to AT at an agreed interval.

The EBA will use the monitoring system SMATS iNode to track travel time through defined routes and compare these travel times to the normal travel time for that road at that time of day. This allows impacts of works to be identified without false-triggering of the system which may arise through normal congestion on busy routes. Additionally, Site Traffic Management Supervisors (STMSs) will monitor as part of their regular site checks and take action where possible to address the congestion.

Where disruption is identified as exceeding the trigger levels agreed with AT, the STMS will take action to reduce the impact of the works. This may include uplifting the closure or re-opening traffic lanes if this can be achieved quickly and safely.

Where disruption is occurring as a result of long-term Temporary Traffic Management (TTM), the Traffic Manager or Traffic Engineer will review the TTM measures and consider options to reduce the impact. The specific review process will depend on the nature and magnitude of each issue but will typically involve consultation with Auckland Transport Operations Centre (ATOC) and the Corridor Access Request (CAR) team from AT, and AT within the EBA to determine the acceptable level of disruption.

The review process may include reviewing staging of the construction activities, ability to provide further bus prioritisation at the expense of the general traffic, providing additional bus services as focus will be directed to provide prioritisation to bus service, or revised bus servicing. It is acknowledged that the retention of current public transport users is important for the busway utilisation after the project is completed.

6 Assessment of Permanent Effects upon Completion

The sections below provide an assessment of the permanent effects of EB2 and EB3R including:

- Future transport network
- General traffic effects
- Effects to bus services and facilities
- Effects to pedestrians and cyclists
- Effects to property access and parking
- Effects to safety performance

6.1 Project Benefits

In order to provide context to the benefits of the EB2 and EB3R sections of the Project and to reaffirm the benefits of the Project as a whole, the main elements of **Section 1.1.3** are reiterated here. Once delivered, the Project (EB2, 3 and 4) will provide:

- Better connections and sustainable travel options for pedestrians, cyclists, motorists, bus and train customers
- A reliable 40-minute bus and train trip between Botany Town Centre and Britomart (saving 20-minutes)
- Increase in public transport trips from 3,700 to 18,000 per day by 2028
- Increase in public transport mode share from 7% to 25% by 2028
- Reduce carbon emissions by 9,292 kg per day by 2028
- 24,000 more people with access to a rapid transit bus station within 1 km from home
- 5 km of busway between Pakuranga and Botany fully separated from other traffic
- 5 new bus stations with quality facilities
- 12 km of safe and separated walking and cycling infrastructure
- Reeves Road flyover to reduce vehicle congestion around Pakuranga Town Centre
- Encourage and support development of a more sustainable urban form and improve urban amenity
- Accommodates electric buses, a key part of AT's low-emission vehicle fleet by 2040

Although EB2 and EB3R are only two components of the Project as a whole, these sections will nevertheless provide:

- Significantly improved travel options for all modes of transport
- Increased public transport patronage and mode share through increased catchment and dedicated bus lanes
- Reduced carbon emissions
- Improved walking and cycling amenity and safety through dedicated infrastructure
- Reduced congestion, particularly around the Pakuranga Town Centre, through the new Reeves Road flyover

6.2 Future Transport Network

As stated in **Section 3.3**, a full RASF assessment was completed for the Project[30] and the section below summarises the key aspects of the future transport network and modal priority in the EB2 and EB3R project areas. Again, the RASF provides a systematic and consistent methodology for identifying the Place and Movement functions of roads and streets. In so doing, it reflects the needs and catchment of the adjoining land use as well as the movement of people, goods and services. Refer to **Figure 4** in **Section 3.3** which shows the RASF typology matrix, which is a function of Movement and Place significance.

In the future, the primary function of the Ti Rakau Drive and Pakuranga Road corridors will remain as Movement, but with more strategic functions. The Pakuranga Town Centre Masterplan promotes mixed-use retail zones along Ti Rakau Drive between Pakuranga Road and William Roberts Road. The primary function of the RRF will be Movement between Pakuranga Road and SEART. The proposed Eastern Busway bus stations will also attract more people within the area as the activities served by these bus stations will become local attractions.

Figure 98 outlines the future typology of the EB2 area.

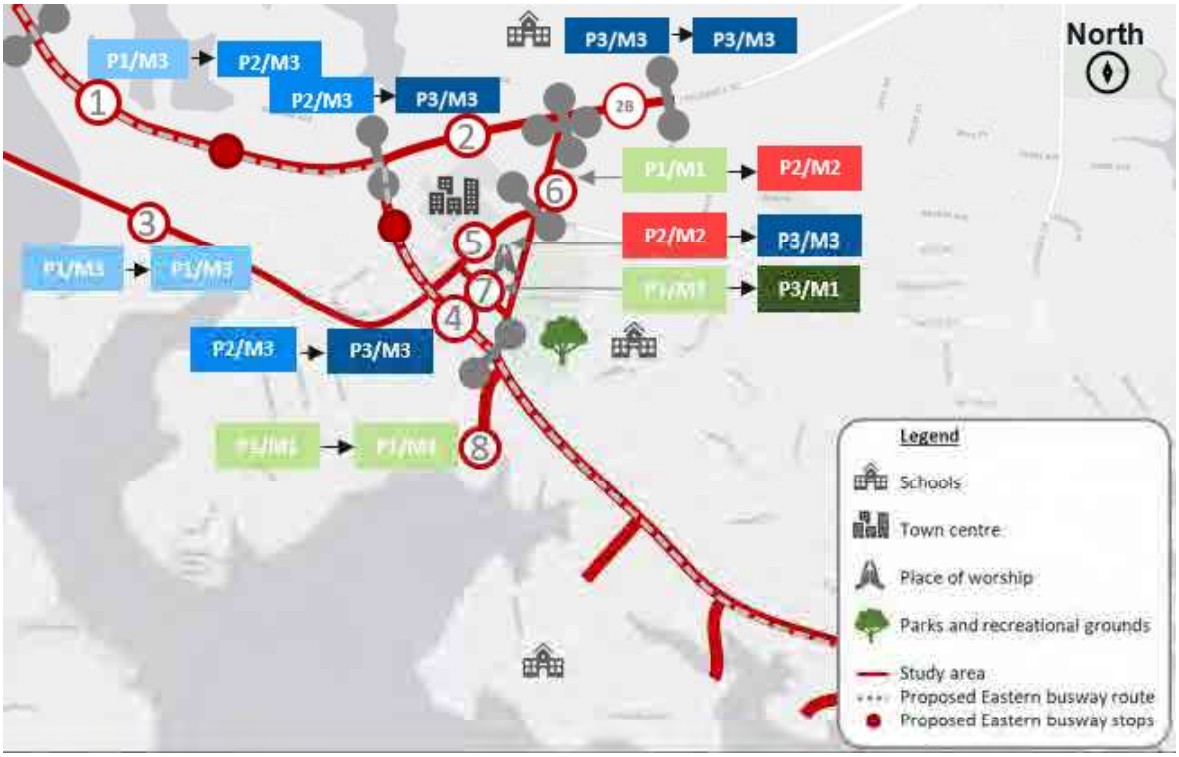

Figure 98: EB2 future typology

Figure 99 below outlines the future model priorities of the EB2 area.

[30] EB234-1-TE-RP-Z0-A2-Roads and Street Framework

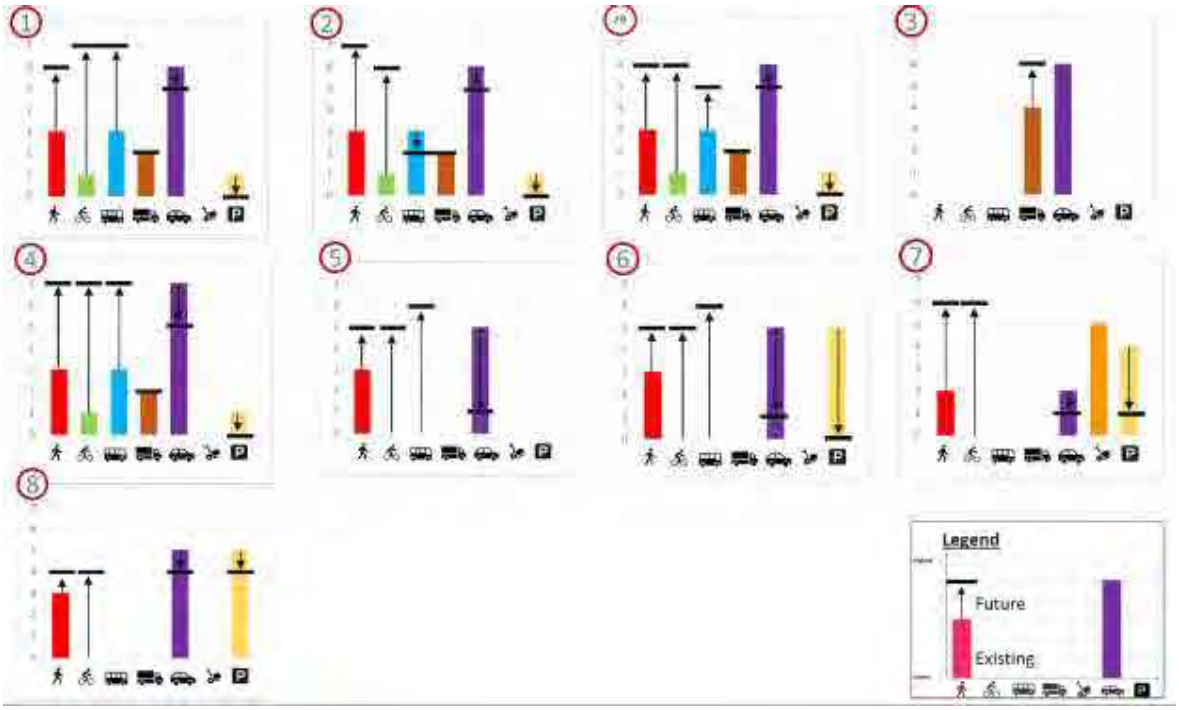

Figure 99: EB2 future modal priorities

While the corridors of Pakuranga Road and Ti Rakau Drive will carry more movements in future, Place function around the proposed bus stations in EB2 will become more important as these will attract more people. For this reason, the future Place typologies around the bus stations are marked as P2' as the stations will become more accessible with increased catchment and footfall.

The RRF will accommodate traffic from SEART and will largely prioritise active modes and public transport movements on the ground level. Reeves Road and William Roberts Road, which are currently town centre adjacent streets, will also be better integrated with the wider Town Centre. As a result, Place function on these streets will increase to 'P3'.

A general trend of improved pedestrian, cycling and bus modal priority is observed throughout the EB2 project area, as shown in **Figure 99**. As a result, the modal priority of general traffic as well as parking will decrease.

Figure 100 below outlines the future typology of the EB3R area.

Figure 100: EB3R future typology

Similar to EB2, the Place function around the proposed bus stations in EB3R are also marked as 'P2' (compared to the existing 'P1') as the stations will become more accessible, have increased catchments and higher footfall. The Movement and Place functions of the surrounding side roads will remain as per the existing environment.

Figure 101 outlines the future modal priorities of the EB3R area.

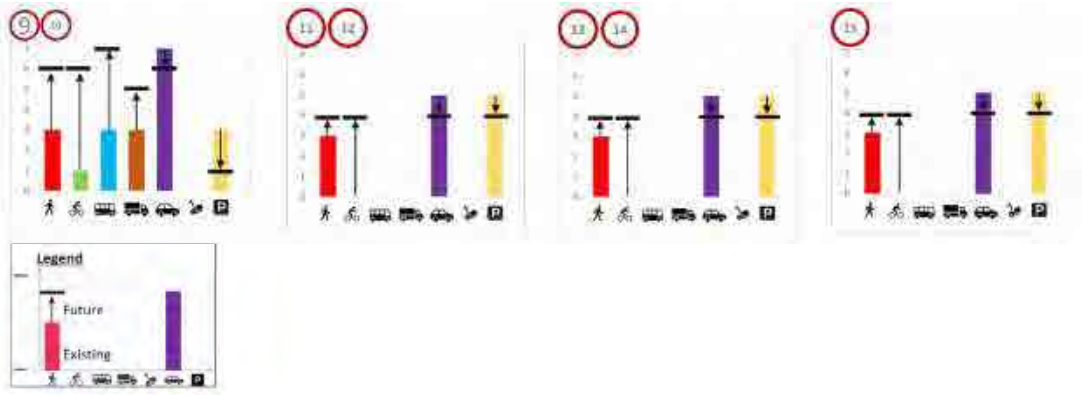

Figure 101: EB3R future modal priorities

Again, the modal priority of pedestrians, cyclists and buses will be improved throughout the EB3R project area, with a resultant decrease in modal priority of general traffic and parking.

6.3 General Traffic Effects

The sections below provide an assessment of permanent effects to general traffic upon completion of EB2 and EB3R. As stated in **Section 5.2.2**, general traffic effects refer to the movement of traffic across the road network as a whole. Similar to the assessments of the traffic environment during construction, the AIMSUN and SIDRA traffic modelling assessments were undertaken as per the methodology set out in **Section 2.4**.

6.3.1 Traffic Volumes

Table 35 outlines the expected AM and PM peak hour traffic volumes of the Do-Minimum and EB2/EB3R scenarios upon completion along key sections of the network, with a 2028 horizon year.

Table 35: Do-Minimum and EB2/EB3R (post construction) traffic volumes (2028)

Location	Direction	AM Peak		PM Peak	
		Do-Minimum [veh/h]	EB2/EB3R [veh/h]	Do-Minimum [veh/h]	EB2/EB3R [veh/h]
Pakuranga Rd (West of the RRF)[31]	Westbound	2,246	1,044	1,337	701
	Eastbound	1,548	1,005	2,725	1,326
Pakuranga Rd (East of the RRF)[32]	Westbound	2,304	2,951	1,331	1,572
	Eastbound	1,491	1,481	2,794	2,665
William Roberts Rd (Ti Rakau Dr – Reeves Rd)[33]	Northbound	35	503	42	485
	Southbound	35	249	75	224
Reeves Rd (West of William Roberts Rd)	Westbound	526	110	256	71
	Eastbound	240	86	791	221
Reeves Rd (East of William Roberts Rd)	Westbound	348	402	175	130
	Eastbound	310	414	607	665
RRF	Northbound	-	881	-	1,535
	Southbound	-	2,311	-	1,066
SEART (West of ramps)	Westbound	2,934	3,321	1,622	1,951
	Eastbound	1,387	1,786	3,135	2,905
Ti Rakau Dr (Pakuranga Rd – Reeves Rd)	Westbound	1,261	1,141	2,094	1,246
	Eastbound	1,319	691	958	778
Ti Rakau Dr (Reeves Rd – William Roberts Rd)	Westbound	2,062	1,720	1,524	1,635
	Eastbound	738	1,260	1,447	1,425
Ti Rakau Dr (William Roberts Rd – Edgewater Dr west)	Westbound	1,962	1,549	1,582	1,740
	Eastbound	740	974	1,446	1,171

[31] Relates to the section of Pakuranga Road west of William Roberts Road in the Do-Minimum scenario.
[32] The section of Pakuranga Road east of William Roberts Road in the Do-Minimum scenario.
[33] The section of William Roberts Road south of Reeves Road, prior to the completion of the extension, in the Do-Minimum scenario.

Location	Direction	AM Peak		PM Peak	
		Do-Minimum [veh/h]	EB2/EB3R [veh/h]	Do-Minimum [veh/h]	EB2/EB3R [veh/h]
Ti Rakau Dr (Edgewater Dr west – Gossamer Dr)	Westbound	1,600	1,615	1,652	1,866
	Eastbound	920	1,045	1,178	1,203
Gossamer Dr (At Ti Rakau Drive)	Northbound	359	399	697	621
	Southbound	1,224	681	499	615

A benefit of the RRF upon completion will be that less traffic is expected to travel on Pakuranga Road west, between Ti Rakau Drive and the RRF, as this is treated as the minor approach at the intersection. Instead, this traffic will travel along the RRF directly towards SEART. This trend is expected to occur in both the AM and PM peaks. Conversely, more traffic is expected to travel on Pakuranga Road east, to and from Howick, as this is treated as the major approach at the intersection.

The RRF is expected to experience somewhat cyclical traffic volumes with the majority of traffic heading southbound during the AM peak and returning northbound during the PM peak. A further benefit of the RRF is that Ti Rakau Drive in EB2, between Pakuranga Road and Reeves Road, is also expected to experience less traffic volumes in both directions during the AM and PM peaks.

The majority of the sections of Ti Rakau Drive in EB3R are predicted to experience increased traffic volumes in both directions during the AM and PM peaks. This likely due to the RRF diverting demand from Pakuranga Road directly to SEART, thus allowing more green time to be allocated at the Ti Rakau Drive / Reeves Road / SEART intersection to vehicles on Ti Rakau Drive.

As expected with the completion of the William Roberts Road extension, more traffic is predicted to travel along William Roberts Road between Ti Rakau Drive and Reeves Road in both directions during the AM and PM peaks.

Since general traffic will not be able to access Reeves Road from Ti Rakau Drive in the future and with the William Roberts Road link completed, traffic volumes are expected to be lower on Reeves Road west between William Roberts Road and Cortina Place. This section of Reeves Road will provide access to the Pakuranga Plaza. Reeves Road east, from William Roberts Road towards Pakuranga Heights, is expected to carry roughly the same traffic volumes westbound and eastbound in the future.

SEART is also expected to experience cyclical traffic volumes (similar to the existing environment), with the majority of traffic heading westbound during the AM peak and returning eastbound during the PM peak.

Gossamer Drive is expected to experience lower traffic volumes in the southbound direction during the AM peak. This is likely due to the removal of the left-turn slip lane on the northern approach at the intersection. However, Gossamer Drive is expected to experience marginally higher traffic volumes in the northbound direction in the AM peak. This is likely due to the increased length of the northbound kerbside exit lane.

6.3.2 Intersection Performance upon Completion

Intersection performance analyses of the transport network comprised of selected intersections in the EB2 and EB3R project areas was undertaken using SIDRA. Again, the analyses consisted of a comparison between the Do-Minimum and EB2/EB3R scenarios, with a 2028 horizon year, for both the AM and PM peak hours. The performance criteria for the assessment were based on the Level of Service (LOS), degree of Saturation (DOS) or v/c ratio and delay in seconds.

Permanent effects upon completion of EB2 and EB3R were assessed in a final scenario. The EB2/EB3R Final scenario simulates the completion of all EB2 works (see **Section 4.2.1**) and all EB3R works (see **Section 4.2.2**).

Traffic signal phasing diagrams per intersection are provided in **Appendix H** and lane performance summaries per intersection are provided in **Appendix I**.

Table 36 below provides a comparison of the intersection performance between the Do-Minimum and EB2/EB3R Final scenarios during the AM peak, with a 2028 horizon year.

Table 36: Intersection performance – Do-Minimum vs EB2/EB3R Final (AM peak)

Intersection	Do-Minimum			EB2/EB3R Final		
	LOS	DOS (v/c)	Delay [s]	LOS	DOS (v/c)	Delay [s]
Pakuranga Rd / Ti Rakau Dr	C	0.89	32	D	0.91	36
Pakuranga Rd / Brampton Ct	N/A	2.31	10	N/A	1.25	11
Pakuranga Rd / RRF	Built during EB2			D	0.92	42
Reeves Rd / Aylesbury St	N/A	0.24	1	D	0.95	41
William Roberts Rd / Reeves Rd	N/A	0.69	8	E	0.91	75
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.39	2
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			D	0.99	55
Ti Rakau Dr/ Reeves Rd / SEART	D	0.91	54	D	0.84	40
Ti Rakau Dr / William Roberts Rd	Built during WRRE			C	0.84	33
Ti Rakau Dr / Mattson Rd	B	0.78	15			
Ti Rakau Dr western U-turn facility	Built during EB3R			A	0.66	4
Edgewater 3-Stage Pedestrian Crossing	Built during EB3R			C	0.86	23
Ti Rakau Dr / Edgewater Dr east	N/A	2.00	17	B	0.72	12
Ti Rakau Dr / Gossamer Dr	F	1.07	91	E	1.10	65

SIDRA analysis indicates that, overall, in the AM peak the EB2/EB3R Final scenario is expected to result in minimal adverse effects on intersection performance at the majority of intersections along the network.

Minor increases in delay are expected at the Pakuranga Road / Ti Rakau Drive intersection, however the intersection is still expected to operate at an acceptable LOS D.

Compared to the Do-Minimum scenario, similar intersection performance is expected at the Pakuranga Road / Brampton Court intersection overall during the AM peak. The high v/c ratio is governed by the

right-turn out from the Pakuranga Plaza, but is still expected to be lower than the Do-Minimum scenario.

The Pakuranga Road / RRF intersection is expected to operate at an acceptable LOS D during the AM peak under the EB2/EB3R Final scenario.

The signalisation of the Reeves Road / Aylesbury Street and William Roberts Road / Reeves Road intersections is expected to result in acceptable levels of service and midblock queues blocking the bus lanes are predicted to be unlikely.

Once constructed, the following new intersections are expected to operate with spare capacity during the AM peak under the EB2/EB3R Final scenario, all with acceptable LOS and DOS:

- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads
- Ti Rakau Drive / William Roberts Road / Mattson Road crossroads
- Edgewater 3-stage pedestrian crossing
- Ti Rakau Drive western U-turn facility

Improved intersection performance is expected at the Ti Rakau Drive / Reeves Road / SEART and Ti Rakau Drive / Edgewater Drive east intersections under the EB2/EB3R Final scenario during the AM peak. The intersections are predicted to operate at an acceptable LOS D and LOS B, respectively.

Although an improvement, the Ti Rakau Drive / Gossamer Drive intersection is expected to operate near capacity. The movements operating near capacity are the southern Freemantle Place approach, one right-turn lane on the eastern Ti Rakau Drive approach and the Gossamer Drive approach. The trade-off is that all bus movements are expected to operate at LOS C and significant travel time improvements are predicted for the Botany to Pakuranga and SEART routes (see **Section 6.3.3**).

The performance of this intersection is a balance between all the competing modes in a constrained corridor. Different intersection layouts, phasing and cycle times have been investigated and assessed to balance the competing modes. The intersection DOS < 1.2 is within the TMRs for the overall intersection performance guiding the design of the Project. The only alternative to improve LOS would be to provide additional lanes.

Lastly, it should be noted that the proposed design of the Ti Rakau Drive / Gossamer Drive intersection under this assessment (EB2/EB3R only), is not identical to the proposed design of the intersection under the full Project (EB2, 3 and 4). Under the full Project, the intersection would have a more efficient geometric layout, and as a result would also have a more efficient traffic signal phasing.

Overall, the proposed design of EB2/EB3R is expected to lead to improved operations and reduced congestion for general traffic across the network, and importantly, bus movements are predicted to operate at LOS C and with spare capacity. Furthermore, despite the poor performance at some of the intersections, significant improvements in travel time are expected overall. Lastly, further improvements are expected to be achieved once the full Project (EB2, 3, and 4) has been implemented.

Table 37 below provides a comparison of the intersection performance between the Do-Minimum and EB2/EB3R Final scenarios during the PM peak, with a 2028 horizon year.

Table 37: Intersection performance – Do-Minimum vs EB2/EB3R Final (PM Peak)

Intersection	Do-Minimum			EB2/EB3R Final		
	LOS	DOS (v/c)	Delay [s]	LOS	DOS (v/c)	Delay [s]
Pakuranga Rd / Ti Rakau Dr	D	0.92	53	D	0.94	43
Pakuranga Rd / Brampton Ct	N/A	1.81	9	N/A	1.98	29
Pakuranga Rd / RRF	Built during EB2			D	0.90	38
Reeves Rd / Aylesbury St	N/A	1.03	42	E	0.91	70
William Roberts Rd / Reeves Rd	N/A	1.05	26	E	0.90	53
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.39	3
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			E	0.99	70
Ti Rakau Dr/ Reeves Rd / SEART	E	0.98	56	D	0.98	51
Ti Rakau Dr / William Roberts Rd	Built during WRRE			C	0.75	32
Ti Rakau Dr / Mattson Rd	B	0.68	13			
Ti Rakau Dr western U-turn facility	Built during EB3R			A	0.80	6
Edgewater 3-Stage Pedestrian Crossing	Built during EB3R			B	0.82	17
Ti Rakau Dr / Edgewater Dr east	N/A	3.41	28	A	0.80	9
Ti Rakau Dr / Gossamer Dr	D	0.91	45	F	1.58	122

Similar to the AM peak, SIDRA analysis indicates that, overall, in the PM peak the EB2/EB3R Final scenario is expected to result in minimal adverse effects on intersection performance at the majority of intersections along the network.

Minor improvements in DOS and delay are expected at the Pakuranga Road / Ti Rakau Drive intersection, and the intersection is expected to operate at an acceptable LOS D.

Average delay at the Pakuranga Road / Brampton Court intersection is expected to increase due to the increased demand on the right-turn out from the Pakuranga Plaza. However, on average, the intersection is still expected to operate with an acceptable level of delay and all other access points to the Plaza are expected to have spare capacity should these vehicles wish to divert elsewhere.

Once constructed, the following new intersections are expected to operate with spare capacity during the PM peak under the EB2/EB3R Final Scenario, all with acceptable LOS and DOS:

- Pakuranga Road / RRF
- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads
- Ti Rakau Drive / William Roberts Road / Mattson Road crossroads
- Edgewater 3-stage pedestrian crossing
- Ti Rakau Drive western U-turn facility

Similar to the AM peak hour, the signalisation of the Reeves Road / Aylesbury Street and William Roberts Road / Reeves Road intersections is expected to result in acceptable levels of service during the PM peak hour. Midblock queues blocking the bus lanes are predicted to be unlikely.

Improved intersection performance is expected at the Ti Rakau Drive / Reeves Road / SEART intersection under the EB2/EB3R Final Scenario in the PM peak. The intersection is predicted to operate at an acceptable LOS D.

The signalisation of the Ti Rakau Drive / Edgewater Drive east intersection is expected to significantly improve the average delay experienced during the PM peak.

The Ti Rakau Drive / Gossamer Drive intersection is expected to operate at LOS F during the PM peak. The failing movements are the through and right-turn lanes on the western Ti Rakau Drive approach, the right-turn lanes on the eastern Ti Rakau Drive approach, the Gossamer Drive approach and the Freemantle Place approach. Similar to the AM peak hour, the trade-off is that all bus movements are expected to operate at LOS C or better and significant travel time improvements are predicted for the Pakuranga and SEART to Botany routes (see **Section 6.3.3**).

As discussed above, the performance of the intersection is a balance between all the competing modes in a constrained corridor. The only alternative to improve LOS would be to provide additional lanes. Different intersection layouts, phasing and cycle times have been investigated to balance the competing modes. Also, the proposed design of the Ti Rakau Drive / Gossamer Drive intersection under this assessment (EB2/EB3R only), is different to the proposed design of the intersection under the full Project (EB2, 3 and 4). Under the full Project, the intersection would have a more efficient geometric layout and traffic signal phasing.

Again, the proposed design of EB2/EB3R is expected to lead to overall improved operations for general traffic across the network, and importantly, bus movements are predicted to operate at LOS C and with spare capacity. Furthermore, despite the poor performance at some of the intersections, significant improvements in travel time are expected overall as a result of EB2 and EB3R, and will further improve once the full Project has been implemented.

6.3.3 General Traffic Travel Times

Route travel times were determined using the AIMSUN model, with a 2028 horizon year. The same four routes presented in **Section 5.2.3** are assessed here for permanent effects to general traffic travel times in the EB2/EB3R Final Scenario.

Table 38 provides a comparison of the route travel times between the Do-Minimum and EB2/EB3R Final scenarios, with a 2028 horizon year.

Table 38: General traffic travel times – Do-Minimum vs EB2/EB3R Final (2028)

AM Peak						
Route	Westbound			Eastbound		
	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]
Botany - Pakuranga	24.7	15.4	-9.3	13.9	22.5	8.5
Botany - SEART	20.9	16.0	-4.9	13.7	21.9	8.3
Howick - Pakuranga	5.3	6.2	0.9	4.7	6.3	1.6
Howick - SEART	11.6	5.7	-5.9	8.0	7.6	-0.3
PM Peak						
Route	Westbound			Eastbound		
	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]
Botany - Pakuranga	18.4	13.0	-5.4	24.6	18.4	-6.2
Botany - SEART	11.6	10.0	-1.6	24.5	19.7	-4.8
Howick - Pakuranga	4.7	3.9	-0.8	3.4	4.6	1.2
Howick - SEART	5.0	2.8	-2.2	7.5	8.5	1.0

During the AM peak period, westbound (citybound) movements are prioritised along the transport network upon completion of EB2 and EB3R. Along with the completion of the RRF, this is predicted to lead to significant improvements in travel times from Botany to SEART and Pakuranga as well as from Howick to SEART. The route from Howick to Pakuranga is predicted to experience a negligible increase, as it is treated as a minor movement at the Pakuranga Road / RRF intersection. The prioritisation of westbound movements is however predicted to lead to manageable increases in travel times of some of the eastbound routes. However, this is expected to improve once the remaining sections of the Project are constructed.

Similarly, in the PM peak eastbound movements are prioritised. This is predicted to lead to significant improvements in travel times from Pakuranga and SEART towards Botany. The eastbound routes from Pakuranga and SEART towards Howick are predicted to experience negligible increases in travel time. Westbound routes are predicted to experience improvements in travel time during the PM peak period upon completion of EB2 and EB3R.

6.4 Effects to Bus Services and Facilities

The sections below provide details and assessment of the permanent effects upon completion to bus services and facilities in the EB2 and EB3R project areas. **Figure 102** shows the existing bus services operating through project areas. These include the 70, 72C, 72M, 72X, 352, 711 and 712 services.

As noted above, school bus service operating in the EB2 and EB3R project areas include the following:

- S415 – Pakuranga to Sacred Heart College
- S416 – Botany Downs to Sacred Heart College
- S440 – Bucklands Beach to Sancta Maria College
- S013 – Otara to Edgewater College
- S073 – Otahuhu to Edgewater College

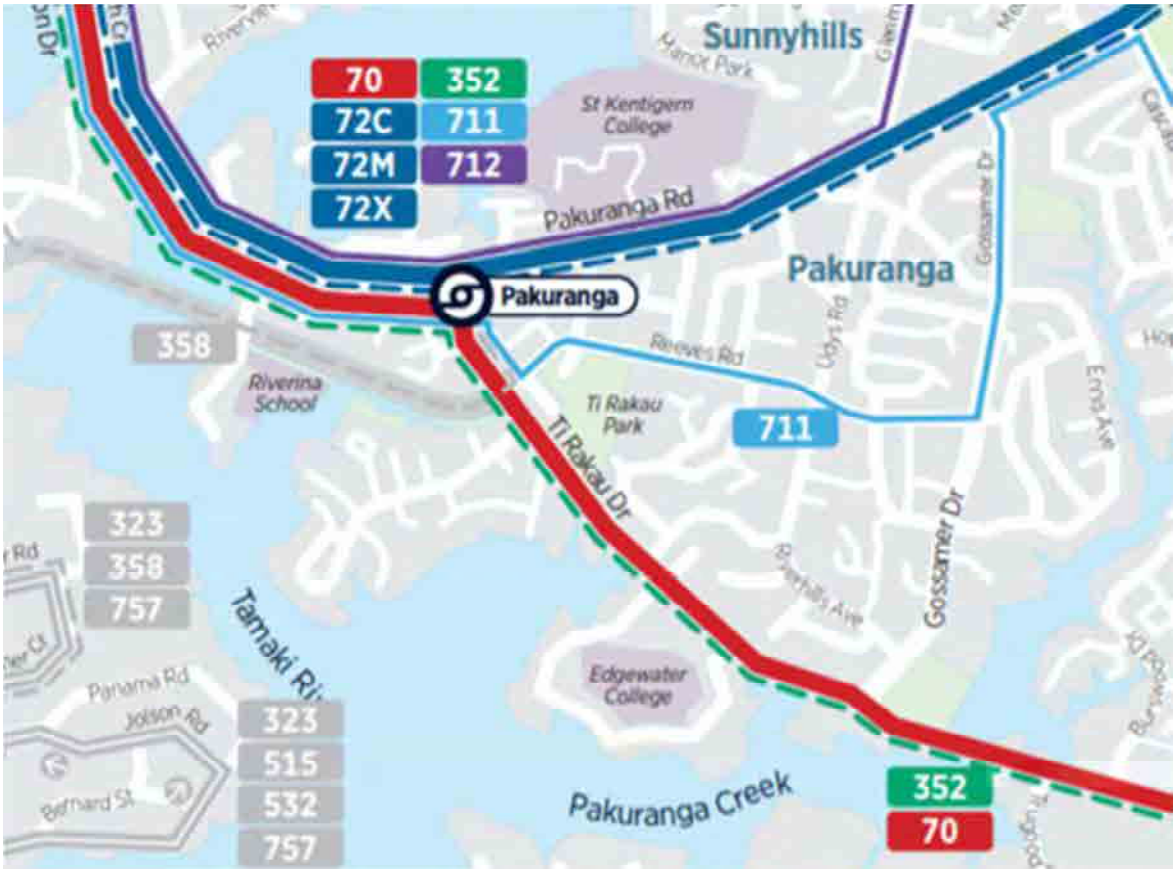

Figure 102: Existing bus services in the EB2 and EB3R project areas

6.4.1 Bus Station Overview

The sections below provide an overview of the bus stations that will be provided upon completion of EB2 and EB3R.

The benefits of the new stations will be the ability to support significantly higher public transport patronage through increased catchment and higher service frequencies through increased capacity. These benefits, in combination with improved customer accessibility, amenity and safety, will lead to an increase in mode share of public transport. A particular benefit of the Pakuranga Town Centre bus station will be the integration of all bus services in the EB2 and EB3R project areas, which will provide an improved transfer experience for passengers. Another benefit of the stations will be improved safety for buses.

6.4.1.1 Pakuranga Town Centre

A major interchange station will be provided in the Pakuranga Town Centre, on the northern side of Ti Rakau Drive, between Aylesbury Street and Reeves Road. The bus station will provide seating and sheltered cover for passengers boarding and alighting here. Furthermore, real-time information on service's estimated arrival times will be displayed on variable message boards along the platforms. Bicycle, scooter and e-bike storage will also be provided at this station. The bus station will be accessible to pedestrians and cyclists from all directions along all of the surrounding roads via separated footpaths, cycleways and signalised crossings. General vehicle access will be provided through a Kiss-and-Ride facility providing five drop-off spaces. **Figure 103** shows the layout of the proposed bus station in the Pakuranga Town Centre.

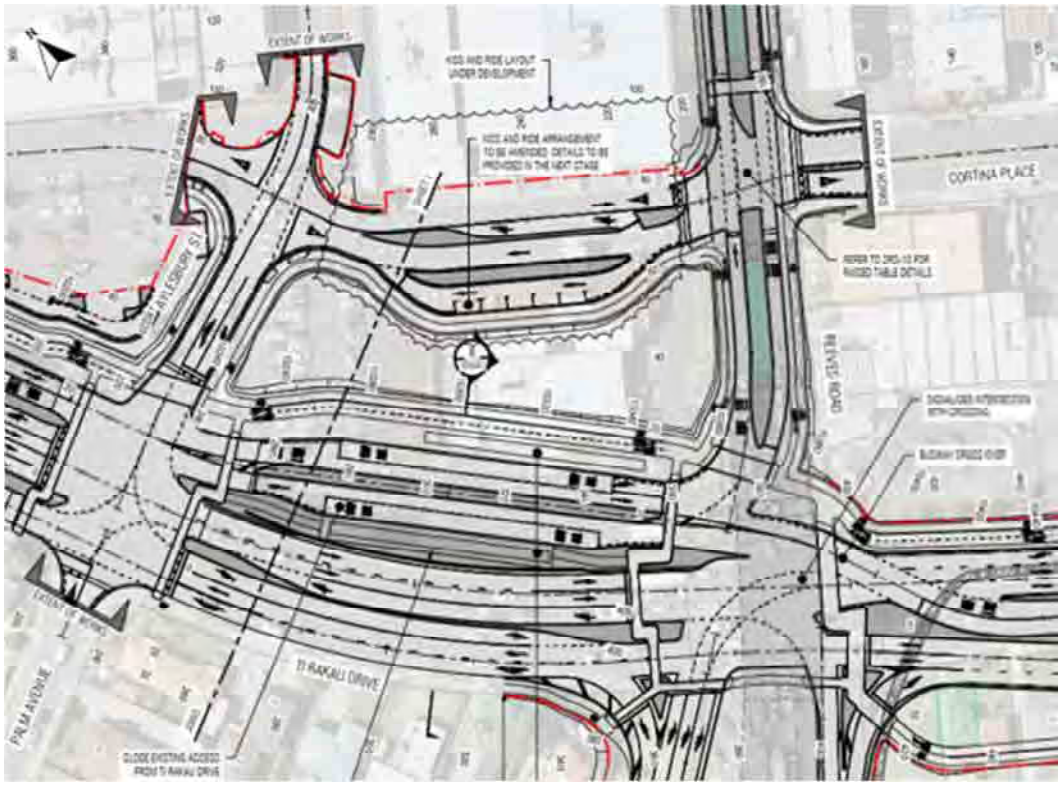

Figure 103: Proposed Pakuranga Town Centre major interchange station layout

6.4.1.2 Edgewater Drive

An intermediate station will be provided in the centre of Ti Rakau Drive, near Edgewater Drive west. As above, the bus station will provide seating and sheltered cover for passengers as well as real-time service information. Bicycle and scooter storage will also be provided. The bus station will be accessible to pedestrians and cyclists from both sides of Ti Rakau Drive via separated footpaths, cycleways and signalised crossings. **Figure 104** shows the layout of the proposed bus station at Edgewater Drive.

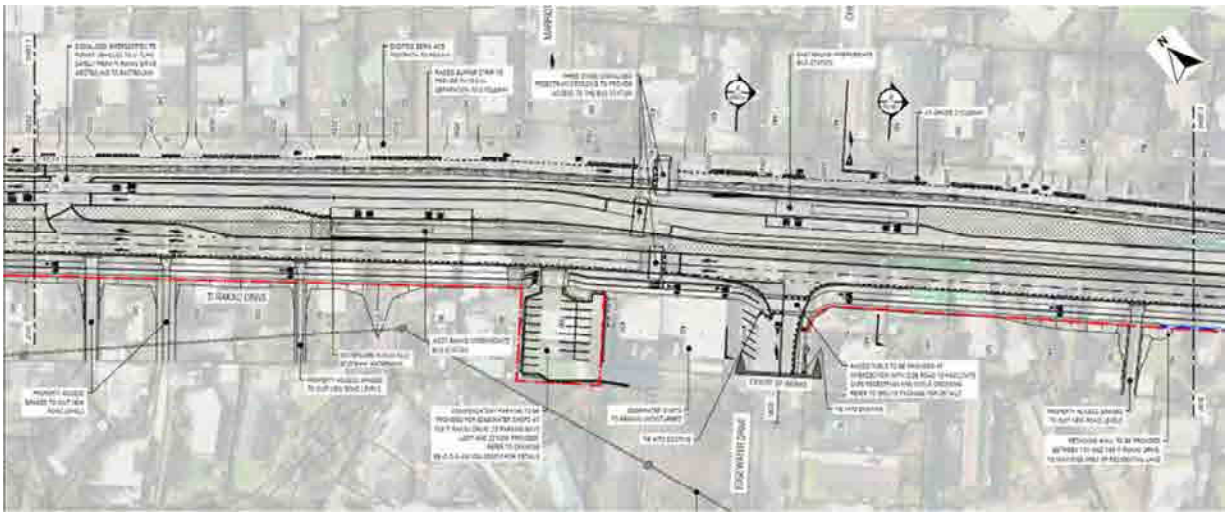

Figure 104: Proposed Edgewater Dr intermediate station layout

6.4.1.3 Gossamer Drive

An intermediate station will also be provided along Ti Rakau Drive, near Gossamer Drive. The westbound station will be provided along the centre of Ti Rakau Drive, while the eastbound station will be provided on the northern side of the Ti Rakau Drive carriageway.

With the full Project in place (EB2, 3 and 4), the bus lanes will continue on the northern side of Ti Rakau Drive and across the Pakuranga Creek towards Burswood (subject to a separate resource consent process). However, for the purposes of this ITA, the central running bus lanes will terminate at the western approach of the Ti Rakau Drive / Gossamer Drive intersection. Buses departing from the eastbound station will merge back into general traffic before the Ti Rakau Bridge. Similar to the Edgewater Drive station, this station will also provide seating, sheltered cover, real-time service information, and bicycle and scooter storage. The bus station will be accessible to pedestrians and cyclists from both sides of Ti Rakau Drive via separated footpaths, cycleways and signalised crossings.

Figure 105 below shows the layout of the proposed bus station at Gossamer Drive.

Figure 105: Proposed Gossamer Dr intermediate station layout

6.4.2 Future Patronage

Future patronage of bus services in the EB2 and EB3R project areas were determined from the MSM Auckland Regional Transport Models (EMME). These models forecast demands based on Auckland Council's Scenario I Modified Version 11.5 demographic and land use data. The outputs of these models include public transport demand and are based on a 2-hour period during the AM and PM Peaks.

Table 39 provides a comparison of bus patronage, predicted by the 2018 Base Model and the 2028 EB2/EB3R Model, at each of the proposed bus station locations during the AM peak period. It should be noted that the public transport demand shown below is a combination of both inbound and outbound services at these locations.

Table 39: AM peak period bus patronage – 2018 Base Model vs 2028 EB2/EB3R Model

Station	2018 Base Model			2028 EB2/EB3R Model		
	Boarding	Alighting	Total	Boarding	Alighting	Total
Pakuranga Town Centre	37	8	**45**	407	413	**820**
Edgewater Dr	72	0	**72**	208	60	**268**
Gossamer Dr	7	2	**9**	69	20	**89**

Table 40 provides a comparison of bus patronage, between the 2018 Base Model and the 2028 EB2/EB3R Model, during the PM peak period.

Table 40: PM peak period bus patronage – 2018 Base Model vs 2028 EB2/EB3R Model

Station	2018 Base Model			2028 EB2/EB3R Model		
	Boarding	Alighting	Total	Boarding	Alighting	Total
Pakuranga Town Centre	13	4	**17**	380	317	**697**
Edgewater Dr	50	0	**50**	69	143	**212**
Gossamer Dr	5	5	**10**	23	48	**71**

The proposed bus stations in the EB2 and EB3R project areas, as well as the proposed busway, are predicted to significantly increase public transport patronage during both the AM and PM peak periods. This trend is expected to continue throughout the day, leading to significant increases in daily public transport uptake.

As expected, the largest increase in bus patronage is predicted to occur at the major interchange station in the Pakuranga Town Centre. Nevertheless, the intermediate stations are also predicted to experience large increases in patronage, compared to the existing environment.

The benefit of increased public transport patronage is that it will lead to increased public transport mode share on the network. This will not only reduce congestion on the network, but will also reduce greenhouse gas emissions via a more sustainable movement of passengers through the network.

6.4.3 Platform Pedestrian Circulation

The level of service for customer circulation at the bus stations was determined based on the peak patronage at each location[34], with a target of LOS C (minimum 1.4 m^2 per person), for the peak 5-minute demand for boarding and peak 1-minute demand for alighting passengers. **Table 41** outlines the forecasted peak patronage by 2048, the resultant platform area required and the platform footprint of the design at each of the stations.

Table 41: Station patronage and platform area

Station	Direction	AM Peak period		PM Peak Period		Design Platform Footprint [m^2]
		Peak Patronage	Area Required [m^2]	Peak Patronage	Area Required [m^2]	
Pakuranga Town Centre	Inbound	73	102	60	84	**165**
	Outbound	41	57	45	63	
Edgewater Dr	Inbound	18	25	24	34	**105**
	Outbound	18	25	9	13	
Gossamer Dr	Inbound	18	25	24	34	**105**
	Outbound	18	25	9	13	

All station platform areas are being well provided for, with all stations requiring less area compared to provided platform footprint in the proposed design.

[34] EB234-2-TE-RP-Z0-0001_A1_Traffic Modelling and Analysis Report

6.4.4 Bus Station Loading Areas

An assessment was undertaken to determine the number of bus bays or loading areas at each of the bus stations, based on forecast patronage (EMME model) and bus numbers (provided by AT Metro) by 2048[35]. The assessment methodology to determine the number of bus bays and therefore the number of platforms required was determined using guidance from the Transit Capacity and Quality of Service Manual – Part 2 Transit Capacity (TCQSM). This included employing a given set of operating conditions and probability of acceptance of a bus entering a bus bay without delay.

Table 42 summarises the number of platforms and bus bays at each of the bus stations.

Table 42: Platform and bus bay requirements

Station	No. of Buses per Peak Hour	No. of Platforms (Inbound)	No. of Bus Bays (inbound)	No. of Platforms (Outbound)	No. of Bus Bays (Outbound)
Pakuranga Town Centre	74	1	3	1	3
Edgewater Dr	38	1	2	1	2
Gossamer Dr	38	1	2	1	2

The major interchange station in the Pakuranga Town Centre will consist of one platform per direction with three bus bays upon completion. The intermediate bus stations at Edgewater Drive and Gossamer Drive will consist of one platform per direction, each providing two bus bays upon completion, with the capability of providing a third bus bay in the future. Appropriate platforms and number of bus bays have been provided in the proposed design to cater for the predicted patronage and bus services by 2048.

6.4.5 Future Bus Services and Routes

The majority of bus services currently serving the EB2 and EB3R project areas will continue to do so by 2028, once EB2 and EB3R are operational. These include the 70, 72X, 352, 711 and 712 services. It is anticipated by AT that the 72C and the 72M services will be combined into one new 72 service. In addition, two new services will be added to the network; the 705 service between Meadowlands and Panmure, and the 706 service between Flatbush and Panmure.

The new 705 service will travel along Picton Street, Selwyn Road, Granger Road, Litten Road, Sandspit Road, Meadowland Drive, Millhouse Drive, Botany Road, along Ti Rakau Drive through the EB2 and EB3R project areas, on Pakuranga Road and will terminate at the Panmure Train Station.

The new 706 service will travel along Ormiston Road, Murphys Road, Stancombe Road, Chapel Road, along Ti Rakau Drive through the EB2 and EB3R project areas, on Pakuranga Road and will terminate at the Panmure Train Station.

The route of the 35 service will be extended northwards from Botany Town Centre, along Chapel Road, Whitford Road, Cook Street, and Picton Street to replace the 72C service along these roads. The new 72 service will cover the same route as the 72M service from Botany to Howick, but with higher

[35] EB234-2-TE-RP-Z0-0001_A1_Traffic Modelling and Analysis Report

frequencies. From Picton Street, the new 72 service will replace both the 72C and 72M services as it heads along Ridge Road and Pakuranga Road towards Panmure.

Services currently operating along Ti Rakau Drive, such as the 70 and 352 services, will continue to do so with no changes to their routes. The 711 service will experience a minor route change, specifically the 711 inbound service. The route of the 711 inbound service will in future proceed along Reeves Road towards Ti Rakau Drive and the new bus station in the Pakuranga Town Centre.

The services operating along Pakuranga Road will also experience a minor route change. The 72X, 712 and the new 72 services will turn off Pakuranga Road, at the intersection with the RRF, and onto the new bus lanes towards Reeves Road. These services will continue along Reeves Road towards Ti Rakau Drive and the new Pakuranga Town Centre bus station. **Figure 106** below shows the future bus services and routes that will be operating in the EB2 and EB3R project areas upon completion.

Figure 106: Future bus services and routes in the EB2 and EB3R project areas

In future, all bus services along Ti Rakau Drive will travel in dedicated bus lanes through the EB2 and EB3R project areas, as opposed to the general traffic lanes in the existing environment. All bus services travelling along Pakuranga Road will turn onto the new dedicated bus lanes alongside the RRF towards Reeves Road and Ti Rakau Drive. Overall, the new routes and the bus lanes are predicted to lead to significant improvements in bus travel times and patronage levels. The sections below discuss the improvements in bus service headways as well as the expected improvements in bus travel times.

6.4.6 Service Headways

Table 43 below provides a comparison of the bus service headways, between the existing environment and EB2/EB3R upon completion by 2028, during the AM, IP and PM peak periods. These include the 70, 72C, 72M, 72, 72X, 352, 705, 706, 711 and 712 services.

Table 43: Service headways – Existing Environment vs EB2/EB3R (2028)

Service Description	Direction	Existing Environment			EB2/EB3R 2028		
		AM Headway [min]	IP Headway [min]	PM Headway [min]	AM Headway [min]	IP Headway [min]	PM Headway [min]
70 – Botany to Auckland CBD	Inbound	8	10	10	5	7	7
	Outbound	10	7	7	7	7	5
72C – Botany and Howick to Panmure	Inbound	20	30	30	-	-	-
	Outbound	30	30	20	-	-	-
72M – Botany and Howick to Panmure	Inbound	-	30	30	-	-	-
	Outbound	30	30	-	-	-	-
72 – Botany and Howick to Panmure (replacement for 72C and 72M)	Inbound	-	-	-	5	12	15
	Outbound	-	-	-	15	12	5
72X – Botany and Howick to Auckland CBD	Inbound	10	-	-	10	-	-
	Outbound	-	-	10	-	-	10
352 – Manukau to Panmure	Inbound	20	20	20	12	12	12
	Outbound	20	20	20	12	12	12
705 – Meadowlands to Panmure (new route)	Inbound	-	-	-	15	-	-
	Outbound	-	-	-	-	-	15
706 – Flatbush to Panmure (new route)	Inbound	-	-	-	15	-	-
	Outbound	-	-	-	-	-	15
711 – Howick to Panmure	Inbound	20	60	60	15	30	30
	Outbound	60	60	20	30	30	15
712 – Bucklands Beach to Panmure	Inbound	23	30	30	10	20	20
	Outbound	30	30	20	20	20	10

Service headways will improve for the 70 service during all periods of the day. The benefit of this will be an increase in public transport patronage, especially during the peak periods.

Again, it is anticipated that the 72C and 72M services will be combined into one new 72 service. The new 72 service will provide improved headways compared to the services it is replacing. The 72 service headways will be 5 mins in the peak direction (AM = inbound, PM = outbound), 12 mins during the IP periods, and 15 mins in the off-peak direction.

It is expected that the service headways for the 72X service will remain the same upon completion of EB2 and EB3R. The frequencies are expected to be sufficient to service the predicted patronage by 2028 along this route.

Service headways of the 352 service will improve significantly, compared to the existing environment. It is expected that 12 min headways will be provided for this service across all of the periods.

Initially, the new 705 and 706 services are expected to run at 15 min headways in the peak directions only (AM = inbound, PM = outbound), with the capacity to expand the timetable if required in the future.

The 711 service headways will improve to 15 min in the peak directions, while service headways will be halved during the IP periods and the off-peak directions.

The 712 service headways will be halved for the peak directions, to 10 minutes, while the IP period and off-peak service headways will be improved to 20 minutes.

As above, these improved service headways will significantly increase public transport patronage and as a result lead to increased public transport mode share on the network. This will not only reduce congestion, but will also reduce greenhouse gas emissions by way of a more sustainable movement of passengers through the network.

6.4.7 Bus Travel Time

Bus route travel times were determined using the AIMSUN model, with a 2028 horizon year. The same bus routes presented in **Section 5.3.5**, with the addition of the new 72, 705 and 706 services, are assessed here for permanent effects to bus travel times in the EB2/EB3R Final Scenario. **Table 44** below provides a comparison of the bus route travel times between the Do-Minimum and EB2/EB3R Final scenarios, with a 2028 horizon year.

Table 44: Bus travel times – Do-Minimum vs EB2/EB3R Final

AM Peak						
Route Description	Westbound			Eastbound		
	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	42.3	29.2	-13.0	26.9	28.4	1.5
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	20.6	-	-	16.0	-	-
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	15.8	-	-
72 – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	20.9	-	-	19.2	-
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	24.6	23.9		-	-	-
352 – Cryers Rd / Neales Rd to Panmure bus station	36.8	25.3	-11.5	29.1	30.5	1.4
705 – Cryers Rd / Stonedon Dr to Ellerslie Panmure Hwy Clare Pl	-	28.9	-	-	-	-
706 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	-	26.6	-	-	-	-
711 – Pakuranga Rd / Stanniland St to Panmure bus station	29.1	29.3	0.2	22.7	24.4	1.7
712 – Glenmore Rd / Meadway to Panmure bus station	22.6	25.3	2.6	16.6	20.5	4.0

PM Peak						
Route Description	Westbound			Eastbound		
	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	35.7	29.7	-6.0	38.1	32.1	-6.0
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	14.6	-	-	14.8	-	-
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	15.0	-	-	-	-	-
72 – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	17.3	-	-	20.6	-
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	16.8	24.2	7.4
352 – Cryers Rd / Neales Rd to Panmure bus station	33.4	29.1	-4.3	27.9	35.5	7.6
705 – Cryers Rd / Stonedon Dr to Ellerslie Panmure Hwy Clare Pl	-	-	-	-	30.1	-
706 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	-	-	-	-	32.3	-
711 – Pakuranga Rd / Stanniland St to Panmure bus station	23.8	25.2	1.4	24.5	32.2	7.6
712 – Glenmore Rd / Meadway to Panmure bus station	19.7	21.6	1.9	18.1	27.8	9.7

The 70 and 352 services, which travel along Ti Rakau Drive in the EB2 and EB3R project areas, are predicted to experience significant improvements in travel times during the AM peak in the westbound (inbound) direction. In the eastbound (outbound) direction, the 70 and 352 services are predicted to experience negligible increases in travel times. Both of these services will be running at higher frequencies during all periods of the day.

The new 72 route is predicted to have marginally longer travel times, in both directions during the AM peak, compared to the 72C and 72M routes it is replacing. Firstly, due to a longer route distance (+2.17km). Secondly, due to the expected increase in traffic volumes on Pakuranga Road, to the east of the RRF (see **Section 6.3.1**). However, the new 72 service will be running at higher frequencies in both directions.

The 711 and 712 routes are predicted to experience small to moderate increases in both directions during the AM peak. Again, headways for the 711 and 712 service will be significantly improved in the future.

The 70 service is predicted to experience improvements in travel times during the PM peak in both directions upon completion of EB2 and EB3R. The combination of improved travel times and higher service frequencies will lead to a faster and more reliable public transport trip between Botany and the Auckland CBD.

Similar to the AM peak, the new 72 service is predicted to have marginally longer travel times, in both directions, during the PM peak compared to the routes it is replacing. This is likely due to the longer route distance and expected increase in traffic volumes on Pakuranga Road, east of the RRF. However, the new 72 will be running at higher frequencies.

Travels times for the 72X, 711 and 712 services are predicted to increase in the outbound (eastbound) direction during the PM peak. This is likely due to the route changes of these services, particularly the additional number of intersections these services have to pass through as well as the expected increase in traffic volumes on Pakuranga Road, east of the RRF. Again, while service frequencies for the 72X are expected to remain the same, service headways for the 711 and 712 services however will be significantly improved. Furthermore, the integration off all services at the Pakuranga Town Centre station will provide for an improved transfer experience between services. Passengers will not be required to walk across the Pakuranga Plaza to transfer between services on Pakuranga Road and Ti Rakau Drive.

The 352 service is predicted to experience an increase in travel times in the outbound (eastbound) direction during the PM peak. This is likely due to the operation of the Ti Rakau Drive / Gossamer Drive intersection. As stated in **Section 6.3.2,** the proposed design of the Ti Rakau Drive / Gossamer Drive intersection under this assessment (EB2/EB3R only), is not identical to the proposed design of the intersection under the full Project (EB2, 3 and 4). Under the full Project, the intersection would have a more efficient geometric layout, and as a result would also have a more efficient traffic signal phasing. Therefore, additional travel time savings would be likely upon completion of the whole Project. Furthermore, under this assessment the 352 service turns right into Harris Road further downstream, which is predicted to be congested. Under the full Project, an improvement in travel time is expected as the 352 service would travel along the dedicated busway, along Burswood Drive and a short section of Ti Rakau Drive to turn left into Harris Road.

In line with the Project objectives, significant public transport capacity and travel time improvements are expected for bus services travelling on Ti Rakau Drive between Botany and Panmure, particularly in the peak directions of travel (westbound in the AM peak and eastbound in the PM peak). The expected travel time results do however indicate the potential need for future investment in public transport infrastructure on Pakuranga Road between the Pakuranga Town Centre and Howick.

In order to provide buses with a LOS of C or better, as per the TMRs, the following measures were included in the traffic signal design of EB2 and EB3R:

- Some form of priority is provided for buses, to balance the delays to vehicles and pedestrians
- Extending the current bus phase to enable an approaching bus to pass through the intersection
- Allowing the bus phase to interrupt once per cycle when a bus is on approach to the intersection
- Bus priority added in the form of approach and departure loops following review of traffic modelling
- Managing bus priority through SCATS using advance calls and departure loop inputs at each site
- Queue detection loops are provided on an as-needed basis only and in collaboration with AT

The above measures have been designed to adjust bus priority to suit traffic conditions and flow patterns, and to avoid blockage to busway movements and operate intersections efficiently. Therefore, the modelled average delay to buses at intersections within the project areas could potentially be reduced, further improving bus travel times.

Overall, bus travel times are predicted to improve across the network during the AM and PM peaks. The combination of improved travel times and higher service frequencies will lead to faster and more reliable public transport trips. In some cases where bus services are not expected to experience improvements in travel times, these services will still be improved in the form of the new bus stations, improved reliability and efficiency, and increased service frequencies.

6.4.8 School Bus Services

The S415 school bus service between Pakuranga and Sacred Heart College will in future also benefit from EB2. The S415 will depart from the Pakuranga Town Centre bus station, in the AM peak, and head westbound along the new Ti Rakau Drive bus lanes. At the intersection with Pakuranga Road, the S415 will join onto the EB1 bus lanes. In the afternoon, the S415 will return down Pakuranga Road, turning right onto the new Ti Rakau Drive bus lanes and terminate at the Pakuranga Town Centre bus station.

The S416 school bus service between Botany and Sacred Heart College will in future also benefit from EB2 as well as EB3R. In the AM peak, students will be able to board the S416 at the Gossamer Drive, Edgewater Drive and Pakuranga Town Centre bus stations as the service travels westbound along the new bus lanes on Ti Rakau Drive. As above, the S416 will turn left onto the EB1 Pakuranga Road bus lanes. In the afternoon, the S416 will return down the new Ti Rakau Drive bus lanes and students will be able to alight at the new EB2 and EB3R bus stations.

In the future, the S440 school bus service between Bucklands Beach and Sancta Maria College and Primary will remain on its current route and students will board and alight at the existing bus stops. The S440 will continue to proceed southbound on Gossamer Drive and turn left at the Ti Rakau Drive / Gossamer Drive intersection into the general traffic lanes and will not stop at the new Gossamer eastbound station in the AM peak. In the afternoon, the S440 will continue to turn right from Ti Rakau Drive onto Gossamer Drive from the general traffic lanes, and will not be able to stop at the Gossamer Drive westbound station.

The S013 school bus service between Otara and Edgewater College will in future continue to travel westbound along Ti Rakau Drive in the general traffic lanes during the AM peak, and will turn left into Edgewater Drive east. It will not stop on Ti Rakau Drive in the EB3R project area. In the afternoon, the S013 will experience a small change to its route. As the S013 departs from Edgewater College, the service will turn left at the Ti Rakau Drive / Edgewater Drive west intersection into the westbound general traffic lanes. The service will execute a U-turn manoeuvre at the western U-turn facility on Ti Rakau Drive and proceed as normal along the eastbound general traffic lanes. Again, the S013 will not stop along Ti Rakau Drive. The permanent effects to this school bus service are considered to be negligible.

In the future, the S073 school bus service between Otahuhu and Edgewater College will continue to turn right from SEART onto the eastbound general traffic lanes on Ti Rakau Drive, during the AM peak. The service will not be able to use the EB2 and EB3R bus lanes nor the Pakuranga Town Centre and Edgewater bus stations. The service will not stop along Ti Rakau Drive. As the Edgewater Drive west intersection is left-in left-out only in the proposed design, the S073 will experience a small change to its route. The service will proceed eastbound along Ti Rakau Drive and execute a U-turn manoeuvre at the Edgewater Drive east intersection, to be able to turn left into Edgewater Drive west. In the afternoon, the S073 will continue to turn left onto the westbound Ti Rakau Drive general traffic lanes at Edgewater Drive west and head towards SEART. Again, the service will not be able to use the new bus lanes nor the new bus stations and will not stop along Ti Rakau Drive. The permanent effects to this school bus service are considered to be negligible.

Overall, school bus services travelling in the bus lanes are expected to experience similar travel time improvements as presented in **Section 6.4.7** and services travelling in the general traffic lanes are expected to experience similar travel time improvements as presented in **Section 6.3.3**.