

Memorandum

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Copy	s7(2)(a) Nathan Briggs	Reference	255585
Date	2025-11-21	Pages (including this page)	22
Subject	Waterloo Station Traffic Impacts and Access Study		

Executive Summary

This study assesses the traffic, access, and safety impacts associated with the proposed redevelopment of Waterloo Station, a key interchange on the Hutt Valley and Wairarapa Lines. The station is being redeveloped as a Priority Development Area to support transit-oriented development (TOD), improve multimodal access, and enhance the public realm.

The Reference Design optimizes land use, upgrades platforms, introduces a weather-protected pedestrian overpass, proposes a new at-grade signalised pedestrian crossing at Cambridge Terrace, and upgraded zebra crossings at Oxford Terrace and Pohutukawa Street, among other infrastructure improvements. The Park & Ride facility is reduced to release land for TOD, and the bus interchange is upgraded for balance between user experience and operational efficiency.

Recommendations to minimise traffic, access and safety impacts include considering future signalisation of crossings (especially Oxford Terrace), and highlights elements of the reference design such as the removal of the pedestrian underpass in favour of at-grade crossings for better safety and accessibility, speed restrictions, enhanced landscaping, and improved signage.

Comparisons for benchmarking with similar stations in Wellington and Auckland show that the proposed interventions at Waterloo Station are consistent with the case studies and are not expected to significantly impact traffic flow or safety compared to peer sites.

While pedestrian volumes accessing the station are expected to rise, the increase is modest. The current and future risks related to safety and congestion are considered manageable, with the proposed design and mitigation strategies aligning with successful approaches at comparable stations.

1 Introduction

Waterloo Station is a key interchange on the Hutt Valley and Wairarapa Lines and has been identified by the WRLC and GWRC as a Priority Development Area due to its end-of-life infrastructure, accessibility challenges, and its significant role as the region's first transit-oriented development (TOD) site. The Reference Design outlines how the station redevelopment supports TOD principles by optimising land use within the precinct, improving multimodal access, and enabling a more integrated and people-focused station environment. It demonstrates how the upgraded transport hub will act as a catalyst for better connectivity, public realm improvements, and more efficient use of the surrounding urban area.

Following the release of the Waterloo Station Reference Design, Greater Wellington received several public queries seeking further clarity on specific design decisions, operational assumptions, and station precinct outcomes. To support greater transparency and provide deeper insight into aspects of the design that attracted public interest, a series of targeted case studies have been developed.

2 Case Study Purpose

This technical memorandum assesses the traffic and safety outcomes associated with new and modified pedestrian crossings at Cambridge and Oxford Terraces proposed with the upgraded Waterloo Station reference design based on available traffic information. The assessment considers pedestrian, bus, cyclist and general traffic outcomes. The memorandum also provides a comparison with similar stations.

3 Reference Design

The Reference Design draws from existing network conditions, forecast travel demand, and strategic goals to identify the preferred station configuration through an integrated multi-criteria assessment process. The Reference Design has been developed to deliver a safe, legible, and customer-centric public transport interchange that directly supports multimodal connectivity, mode shift, transit-oriented development (TOD), and the long-term resilience of the Hutt Valley transport system.

The Reference Design layout is shown in Figure 3-1 below.

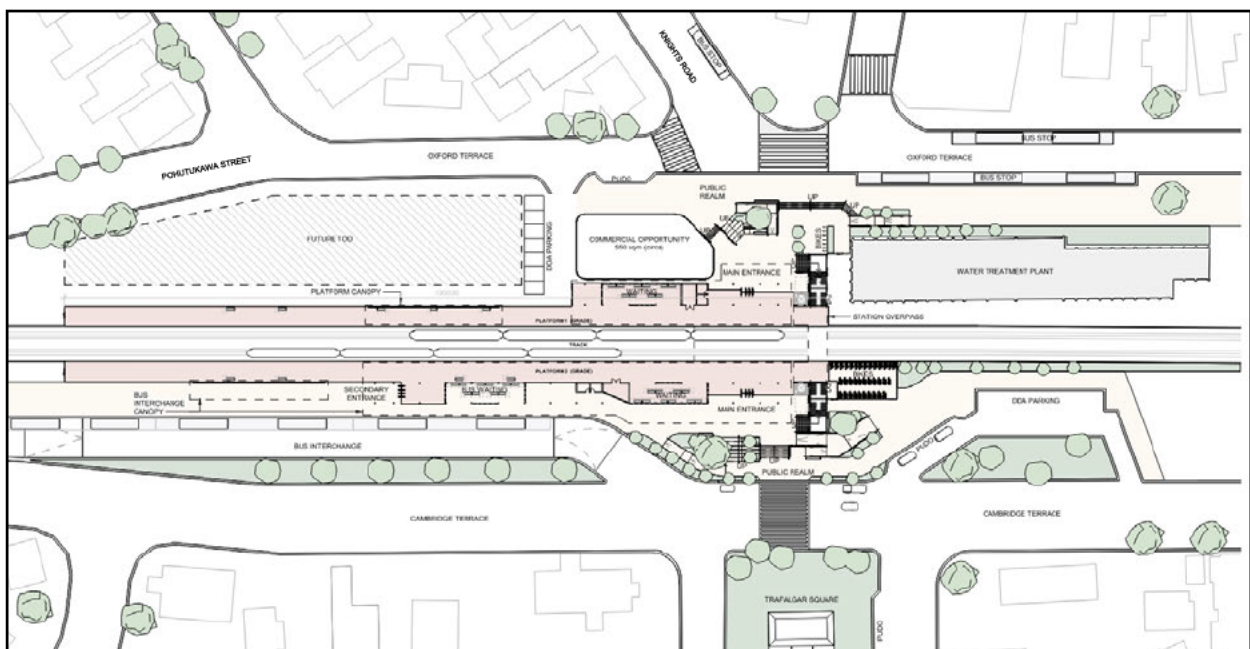


Figure 3-1: Reference Design Layout

Some of the key elements of the reference design include:

- Aligned and upgraded platforms with level boarding to improve passenger experience and operational flexibility.
- A new weather-protected pedestrian overpass at the station across the rail corridor.
- A new at-grade signalised pedestrian crossing at Cambridge Terrace.
- A reduced and rationalised Park & Ride facility to release land for TOD and public realm improvements.
- An upgraded bus interchange including a cluster of new stops separated from car-based access, a new double stop on Oxford Terrace and infrastructure improvements to existing bus facilities such as widened footpaths, weather protection, lighting and real-time service information.
- Improvement to active mode access routes with raised safety platforms across side roads.
- Integration of PUDO areas with mobility parking and separation of turning movements from pedestrian desire lines.
- Surface treatments, signage and wayfinding improvements.

4 Traffic and Pedestrian Movements

4.1 Traffic Volumes

Station access is primarily from Cambridge Terrace from the south and Oxford Terrace from the north. Both are primary collector roads with approximately 12,300 and 7,900 vehicles per day respectively (2025 estimate)¹.

Primary Collectors distribute traffic between and within local areas, serving as the primary link that connects major local economic areas or population centres. They link local roads with high-order roads such as arterials. Cambridge Terrace carries around 250 heavy vehicles daily, while Oxford Terrace carries around 400. Cambridge Terrace and Oxford Terrace fall within the classification of Main Streets in NZTA's One Network Framework (ONF).

Other approach roads of significance to the station include Knights Road and Pohutukawa Street, with the latter providing access to the Park & Ride on the southwest side of the station. Knights Road is a primary collector and carries high volumes of traffic of more 25,500 vehicles per day (2025 estimate) out of which about 510 are heavy vehicles. Pohutukawa Street is also categorised as a primary collector but carries low traffic volumes of less than 400 vehicles per day (2025 estimate), which includes about 20 heavy vehicles.

4.2 Passenger Demand at Waterloo Station

Existing rail passenger demands for Waterloo Station have been obtained from Snapper data from March 2024.

The weekday average boarding and alighting volumes were calculated to be 2,214 passengers in the AM peak (06:00 to 09:00) and 1,907 passengers in the PM peak (15:00 to 18:00). This includes the

¹ Source: Mobile Road

total passenger boarding and alighting volumes for both the Hutt Valley Line and Wairapa Line, and in both directions of travel.

Forecasted passenger demands for 2046 (design year) have been projected to be 3,101 passengers in the AM peak period (3 hours) and 2,572 passengers in the PM peak period (3 hours).

By 2046, 490 boardings and alightings are estimated during each of the busiest 15-minute periods in the morning and evening peaks. These projections indicate a sustained pattern of tidal commuter movement, characterised by elevated inbound demand during morning hours and increased outbound travel in the evening.

Station entrance passenger split assumptions that were adopted for developing the reference design are as follows:

- 67% to / from Oxford Street
- 17% to / from Cambridge Terrace Station Forecourt
- 17% to / from Cambridge Terrace

4.3 Bus Stops

Bus stops for Waterloo Station are currently situated on Knights Road and Oxford Terrace to the western side of the station, as well as two stops on the eastern side within the interchange. The interchange also includes a designated stop for rail replacement buses used when regular rail services are unavailable.

Introducing a double-stop on Oxford Terrace has been recommended in the Reference Design, along with a cluster of new stops immediately adjacent to the rail station entrance in the eastern interchange.

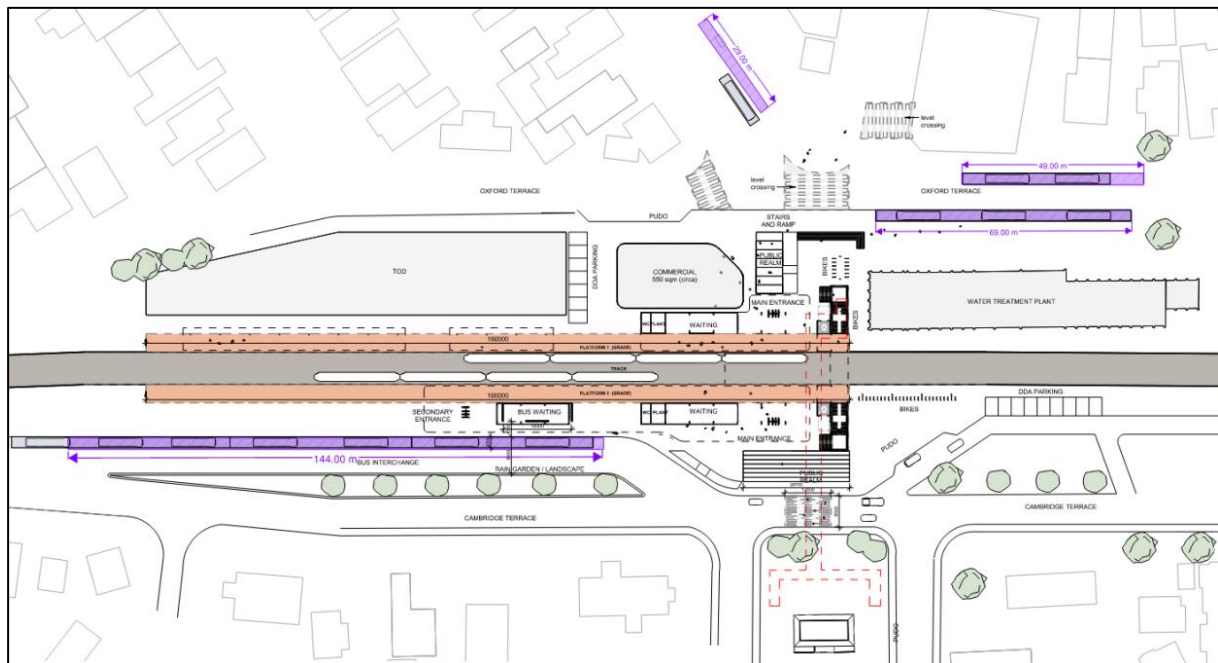


Figure 4-1: Proposed Bus Stop Layout

4.4 Existing and Proposed Pedestrian Crossings, Access Points

The station is primarily accessible from Cambridge Terrace to the south and Oxford Terrace to the north, with additional access available via Pohutukawa Street to the west. High levels of pedestrian movements occur along and across these roads for station access, especially in the morning and evening peaks.

Existing at-grade pedestrian crossings are present at Oxford Terrace and Pohutukawa Street. Oxford Street has an at-grade 2-stage staggered pedestrian zebra crossing with fenced median refuge. The reference design proposes the pedestrian crossing at Oxford Street to be upgraded to an at-grade 1-stage wide pedestrian zebra crossing.

The existing crossing at Pohutukawa Street is an at-grade 2-stage single pedestrian zebra crossing with median refuge island which is proposed to be upgraded to an at-grade 1-stage pedestrian zebra crossing.



Figure 4-2: Existing Oxford Terrace Pedestrian Crossing

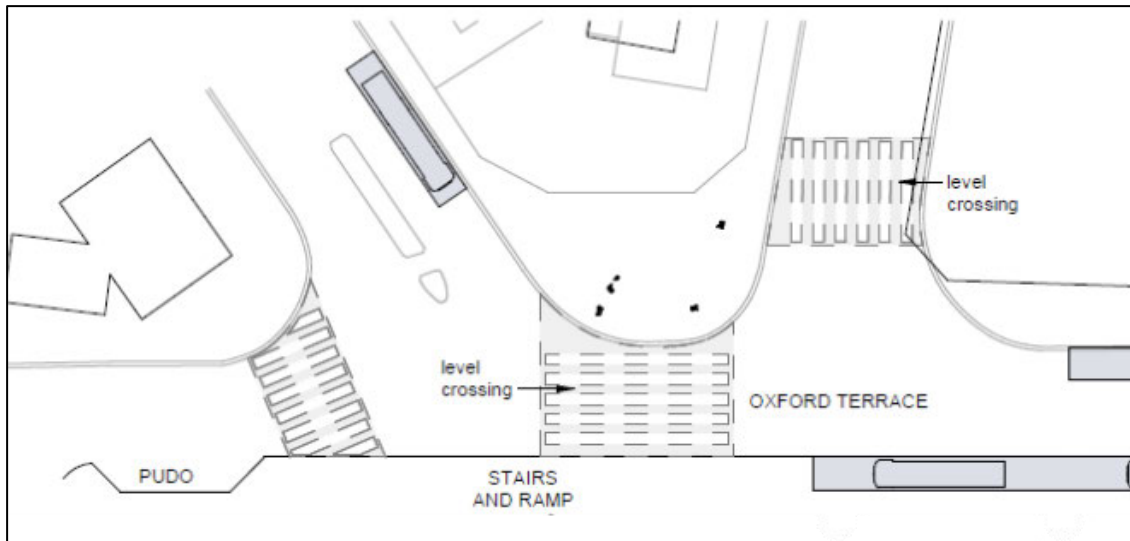


Figure 4-3: Proposed Oxford Terrace Pedestrian Crossings

There is an existing pedestrian underpass at Cambridge Terrace. The reference design proposes a signalised pedestrian crossing shown in Figure 4-5 below.



Figure 4-4: Existing Cambridge Terrace Pedestrian Crossing

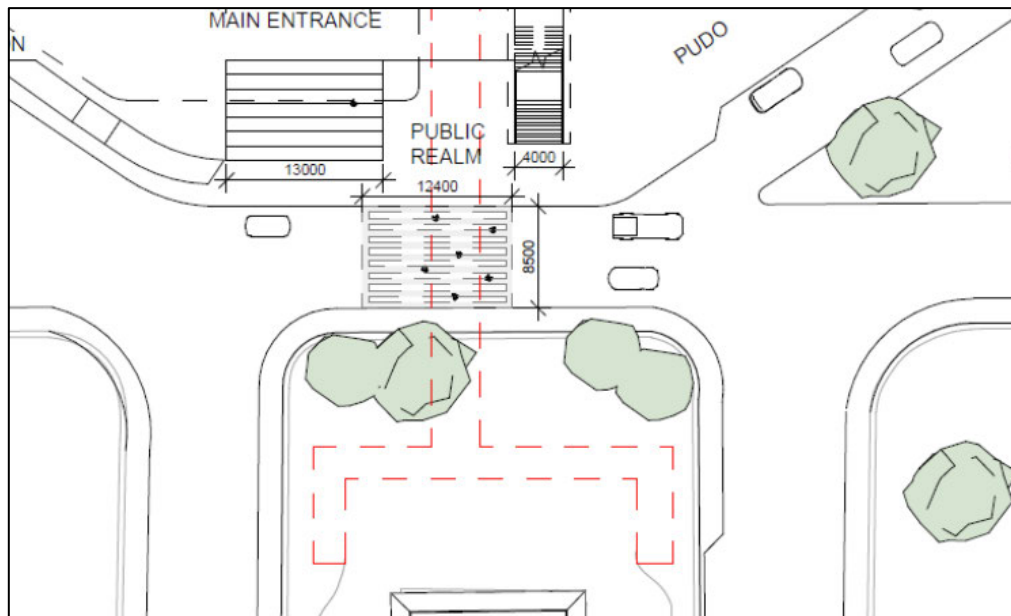


Figure 4-5: Proposed Cambridge Terrace Pedestrian Crossing

Since Oxford Terrace and Pohutukawa Street would still retain at-grade crossings, changes to current pedestrian movements on them is expected to be minimal. Compared to Cambridge Terrace where a signalised pedestrian crossing is proposed.

5 Safety Records

Crash data for the major approach roads to Waterloo Station was sourced from the Crash Analysis System (CAS) database maintained by Waka Kotahi NZ Transport Agency. The road sections for which crash data have been sourced is shown in Figure 5-1. The tables below categorise crash records from 2020-2025 based on their severity, and the type of users impacted.

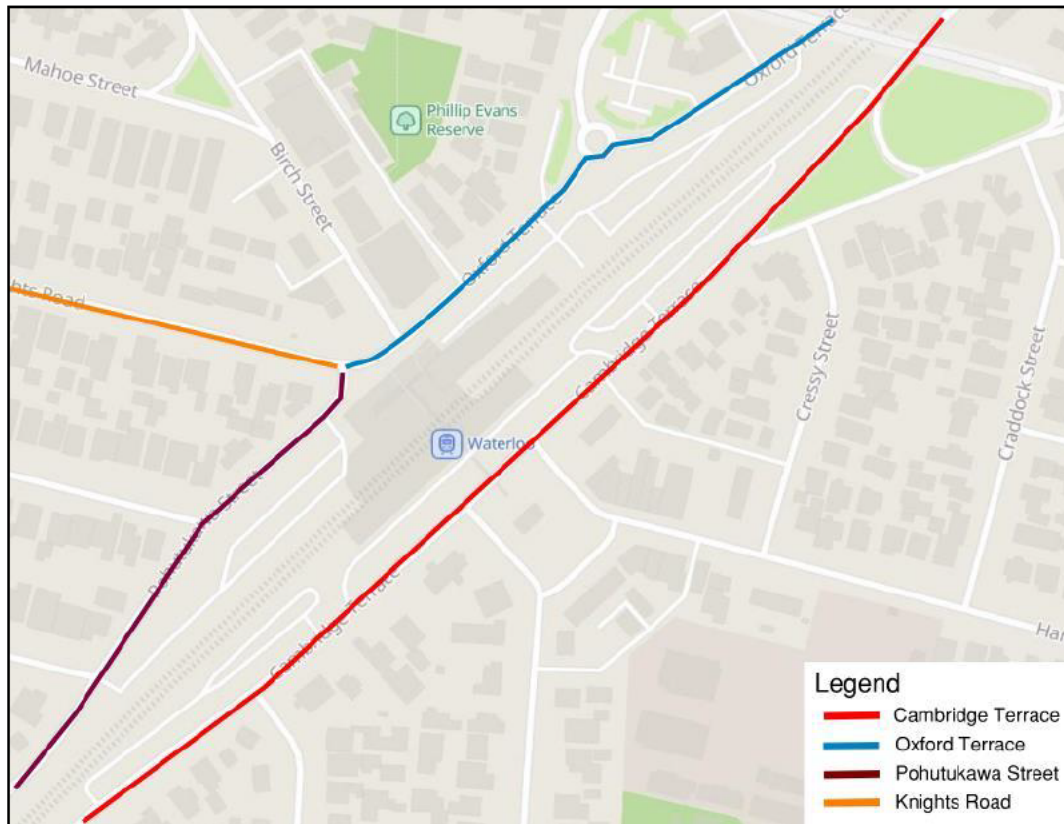


Figure 5-1: Road extents for CAS Safety Records

Table 5-1: Cambridge Terrace- CAS Record of Crashes by Injury Severity (2020-25)

Crashes Involving	Death	Serious Injury	Minor Injury	Non-Injury	Total Crashes
Pedestrians	0	0	1	0	1
Cyclists	0	0	0	0	0
Vehicles Only	0	1	4	5	10
Total Crashes	0	1	5	5	11

Table 5-2: Oxford Terrace- CAS Record of Crashes by Injury Severity (2020-25)

Crashes Involving	Death	Serious Injury	Minor Injury	Non-Injury	Total Crashes
Pedestrians	0	0	0	0	0
Cyclists	0	0	0	0	0
Vehicles Only	0	0	2	4	6
Total Crashes	0	0	2	4	6

Table 5-3: Pohutukawa Street- CAS Record of Crashes by Injury Severity (2020-25)

Crashes Involving	Death	Serious Injury	Minor Injury	Non-Injury	Total Crashes
Pedestrians	0	0	0	0	0
Cyclists	0	0	0	0	0
Vehicles Only	0	0	0	2	2
Total Crashes	0	0	0	2	2

Table 5-4: Knights Road - CAS Record of Crashes by Injury Severity (2020-25)

Crashes Involving	Death	Serious Injury	Minor Injury	Non-Injury	Total Crashes
Pedestrians	0	0	0	0	0
Cyclists	0	0	0	0	0
Vehicles Only	0	0	0	1	1
Total Crashes	0	0	0	1	1

From the data presented in the tables above, Cambridge Terrace and Oxford Terrace have seen a higher number of crashes in the past five years among the major approach roads to the station, but the number of active mode incidents are minimal.

While the recorded crashes on Knights Road and Pohutukawa Street resulted in non-injury incidents, those on Cambridge Terrace and Oxford Terrace have resulted in injuries including for pedestrians, reinforcing the need for safety improvements.

6 Traffic, Access and Safety Impacts

The measures for mitigating traffic, access and safety impacts through interventions recommended by the reference design have been discussed in this section. Further options to enhance safety and accessibility will be investigated in subsequent phases of the project.

6.1 Road Network Performance

Traffic delay plots sourced from Google have been shown below to illustrate the road network performance surrounding Waterloo Station during typical weekday peak periods. The plots present data for 8:00 am and 4:45 pm on a Thursday, corresponding to AM and PM peak conditions, respectively.



The network performance plots presented above illustrate delays on the intersection approach sections of Oxford Terrace and Pohutukawa Street during the AM peak, as well as on Pohutukawa Street during the PM peak, indicated by reduced traffic speeds. These delays are anticipated and are not regarded as significant due to their limited extent.

Delays have been noted on Birch Street during the morning peak period. However, no delays were observed on the remainder of the road network in the vicinity of the station.

6.2 Access

The reference design recommends the implementation of a suite of infrastructure improvements that remove barriers especially for walking and cycling, and unlocks access to key destinations and community facilities. These include:

- **New at-grade signalised crossing on Cambridge Terrace:** Provides a direct east–west connection between the station entrance and surrounding community, aligned with existing key walking routes. The signalised facility replaces reliance on the subway, supporting more direct and equitable access for all users, including children and people using mobility aids
- **Overpass with weather protection:** A weather-protected pedestrian overbridge at the station interchange would provide an all-weather alternative route between platforms and across the corridor. It is designed with universal access features including gentle gradients, lifts, and tactile guidance.
- **New bus interchange configuration:** The reference design improves access for buses by separating bus movement from pick-up and drop-off and private vehicle areas.
- **Integration with the Beltway Cycleway and street network:** The station improves active mode access by connecting directly into existing and future active mode corridors, including the Beltway Cycleway, Oxford Terrace, and Birch Street. These connections enable catchment expansion and support end-to-end multimodal journeys.
- **Integration with wider interchange movements:** The proposed PUDO and taxi facilities represent a shift from car-based access toward a more intentional, user-centred approach that supports accessibility and safety. PUDO facilities are strategically located to complement pedestrian and micromobility networks, enabling seamless transition for all users without compromising the overall operational efficiency of the interchange.
- **Co-located PUDO and accessible parking bays:** Drop-off areas are integrated with mobility parking near station entries, reducing walking distances and supporting universal access.

6.3 Expected Future Traffic Movements

The anticipated **General Traffic**, **Bus** and **PUDO** movements on the surrounding road network based on the proposed access arrangements for Waterloo Station is shown in the figures below.

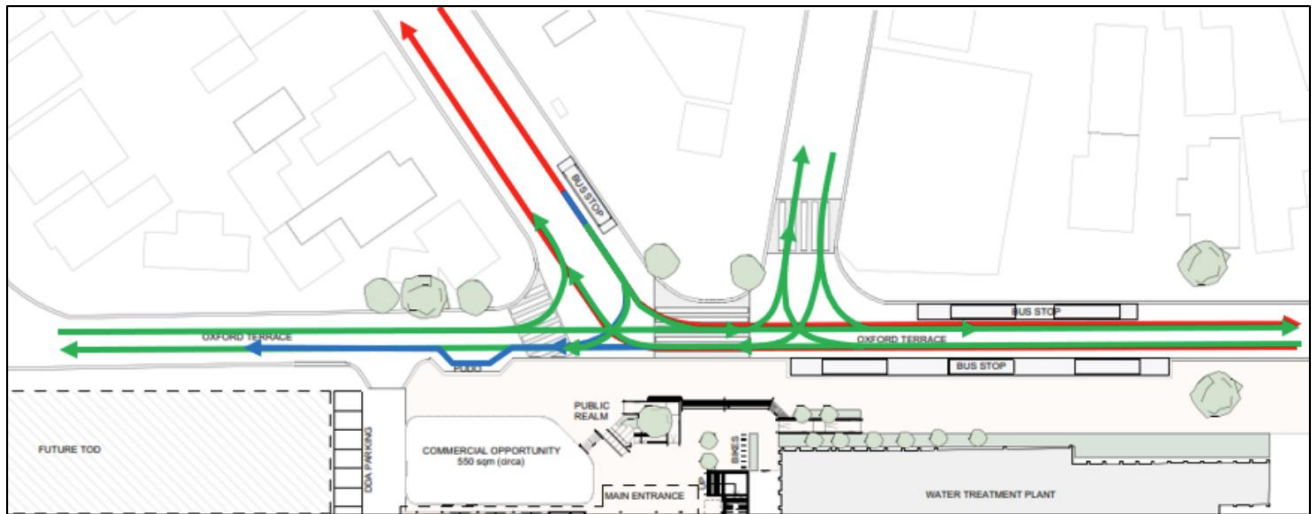


Figure 6-3: Bus / General Traffic / PUDO Movements North of Waterloo Station

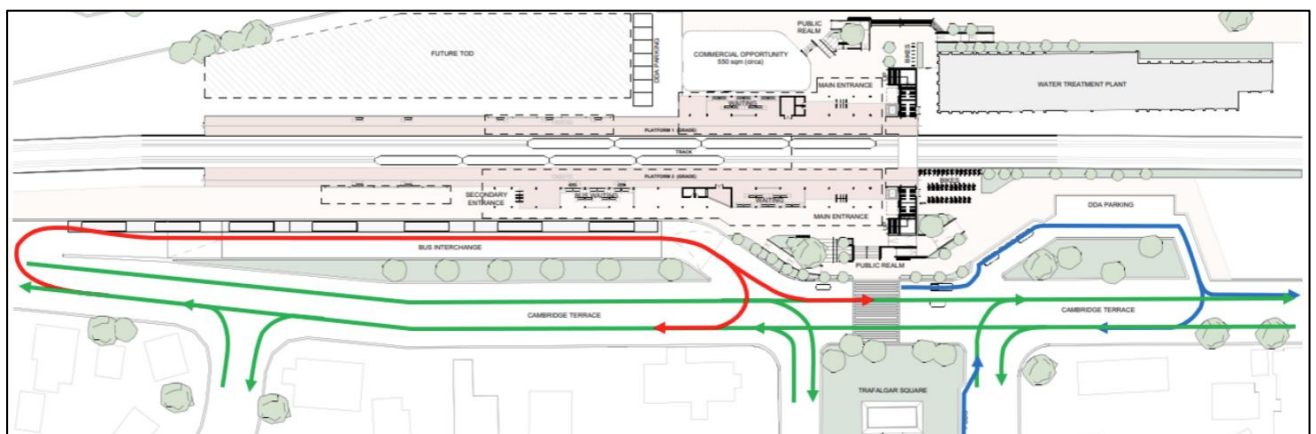


Figure 6-4: Bus / General Traffic / PUDO Movements South of Waterloo Station

6.4 Safety

Due to higher traffic and pedestrian movements, Cambridge Terrace and Oxford Terrace have a relatively higher safety risk compared to other roads surrounding the station, with a higher number of incidents and collisions that have led to minor pedestrian injuries as well. This reinforces the need to implement pedestrian crossings and other upgrades as safety measures, since the associated risks are likely to increase if there is future growth in traffic volumes.

The suite of interventions recommended to be implemented in reference design responds to identified constraints including fragmented crossings, poor visibility, and low perceptions of safety. These include:

- **New at-grade signalised crossing on Cambridge Terrace:** A strategically located and signalised pedestrian crossing that replaces reliance on the subway, improving safety and visibility.
- **Improvements to western access via Oxford Terrace:** Upgraded access routes to support safe walking connections from the western residential catchments. Raised safety platforms across side roads to reduce vehicle speeds and enhance pedestrian visibility.

- **CPTED-informed overpass:** An overbridge at the station interchange that would provide an alternative route between platforms and across the corridor and is designed with passive surveillance, clear sightlines, and universal access features.
- **New bus interchange configuration:** The reference design separates bus movement from pick-up and drop-off and private vehicle areas to improve safety and reduce modal conflict at the station entrance.
- **Safe design for PUDO areas:** PUDO areas are designed with clear wayfinding, passive surveillance. Dedicated turning movements are separated from pedestrian desire lines to reduce conflict. By formalising taxi and PUDO access, the design mitigates the safety risks associated with current practices such as stopping in live traffic lanes or at bus stops.

7 Benchmarking Case Studies

This section references other stations that are comparable in terms of traffic movements, passenger boarding/alighting volumes, layout and TOD features. These have been treated as similar case studies to assess the potential impacts of place interventions such as crossings, from both a technical and policy perspective to support the Waterloo Station TOD.

7.1 Case Study: Johnsonville Station, Wellington

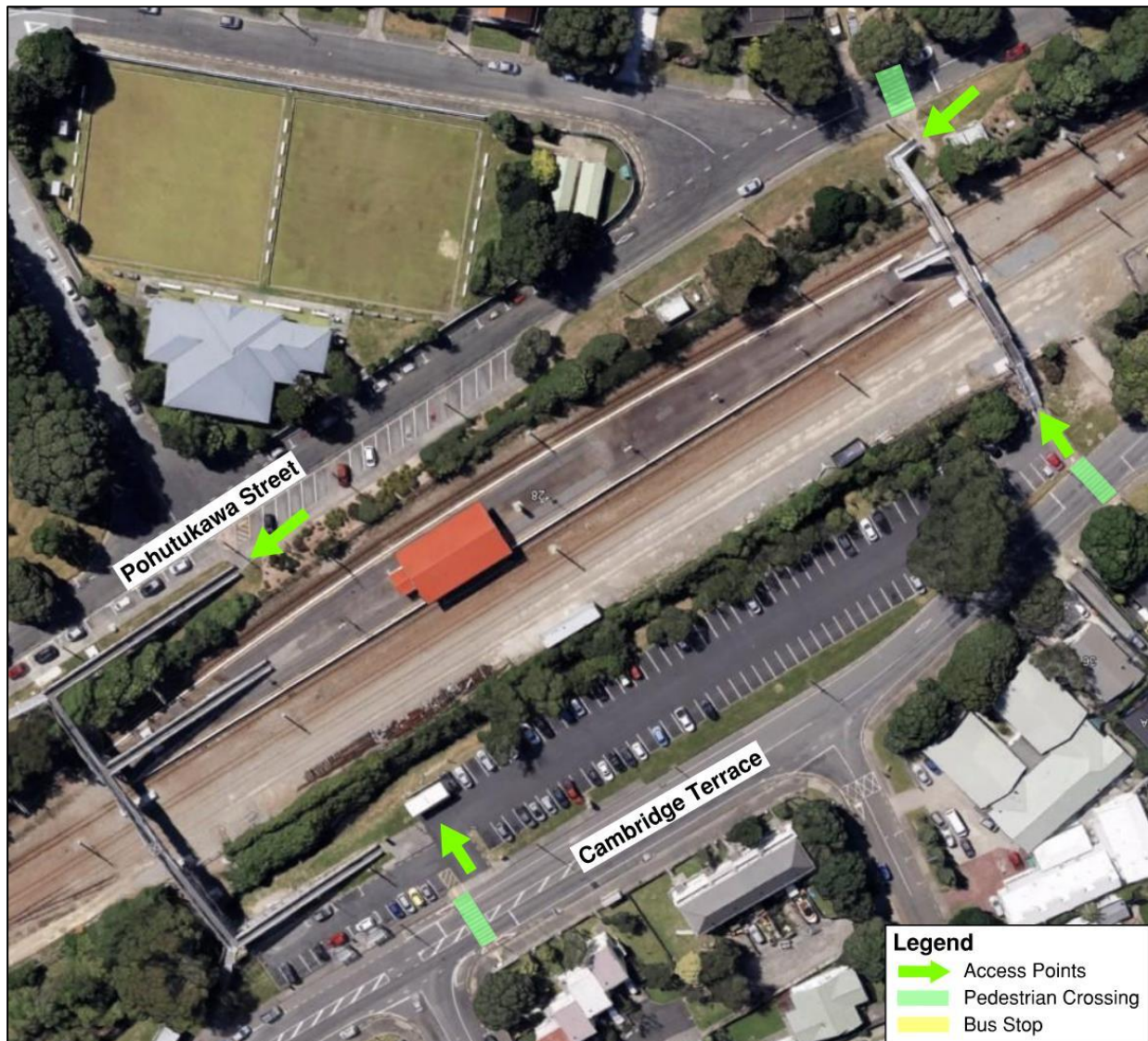
Johnsonville train station in Wellington also has a bus stop opposite the station on Moorefield Road. Pedestrians can use Moorefield Road to access the station from the north end, which has a pedestrian zebra crossing and is an arterial road carrying close to 13,000 vehicles daily.

Pedestrians can also access the station from the south end via Broderick Road, another arterial road, with approximately 9,600 ADT. Access to the station Park & Ride is via Gothic Street, a primary collector with 1,700 ADT.



7.2 Case Study: Woburn Station, Wellington

Woburn Train Station in Wellington can be accessed via Cambridge Terrace from the south and Pohutukawa Street from the North. This section of Cambridge Terrace carries more than 15,000 vehicles per day and has two pedestrian zebra crossings 150m apart, providing access to the station platforms through the Park & Ride. The section of Pohutukawa Street that provides station access carries less than 300 vehicles per day and has a pedestrian zebra crossing.

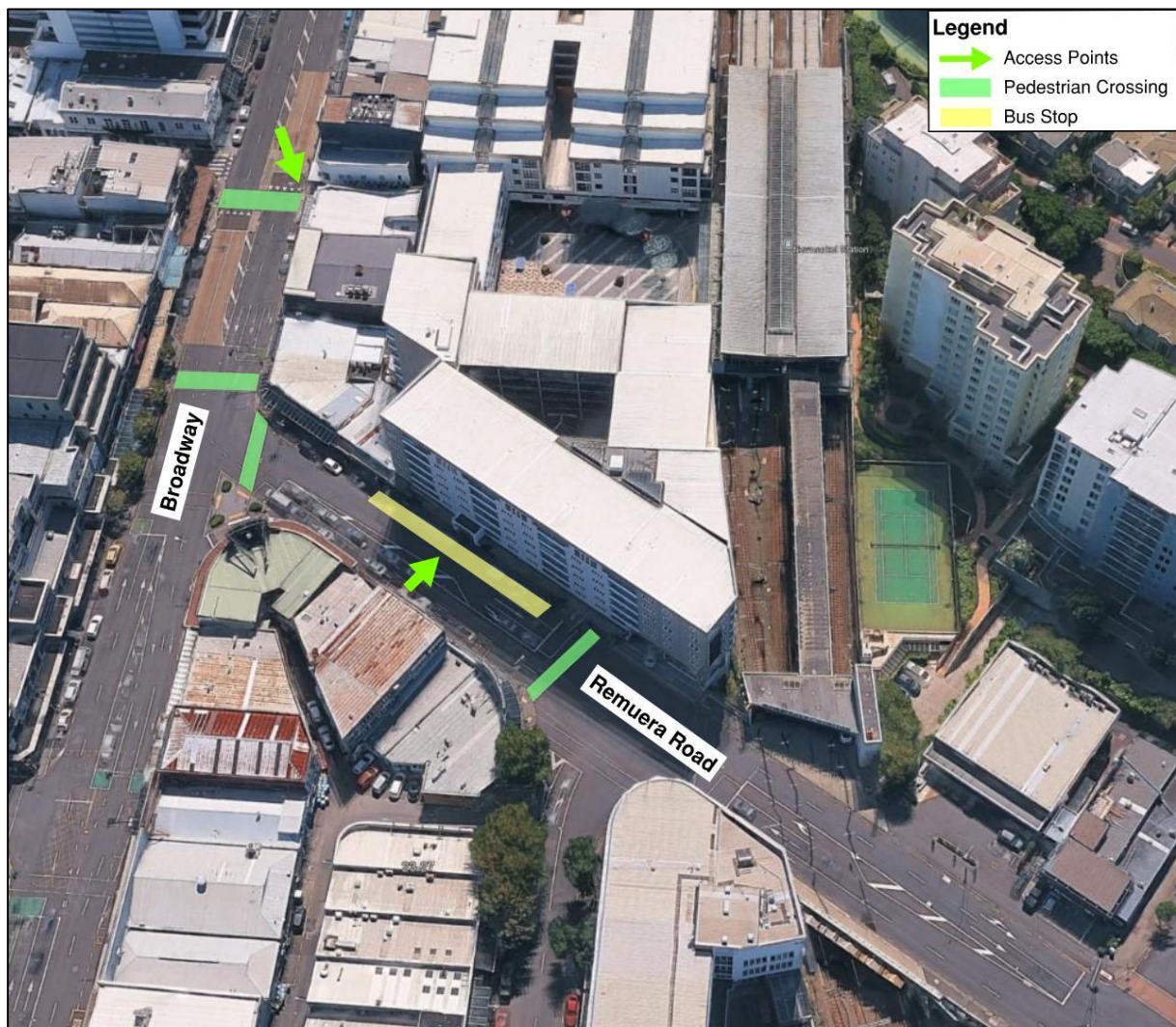


7.3 Case Study: Newmarket Station, Auckland

Newmarket Station has a signalised mid-block pedestrian crossing at station access from Broadway, which is an arterial road with 18,200 ADT.

The second access is on Remuera Road which is another arterial road with traffic volumes of 14,400 ADT that has signalised pedestrian crossings at the intersections with Broadway and Nuffield Street on either side of a rail bus stop.

Both access work without significant queues, delays or access impacts.



7.4 Case Study: Kingsland Station, Auckland

Kingsland Station has a signalised mid-block pedestrian crossing adjacent to a bus stop at the southern access from Sandringham Road. Sandringham road is a regional road carrying close to 16,000 vehicles per day.

There is another pedestrian access from New North Road to the North. This northern access from New North Road is adjacent to a signalised pedestrian crossing and a bus stop. New North Road is an arterial road with similar traffic volumes approximately 16,000 vehicles per day. Both pedestrian crossings provide station access without causing significant queues, delays or access impacts.



7.5 Case Study: Papatoetoe Station, Auckland

Papatoetoe Station can be accessed from Shirley Road to the east and Station Road to the West. Shirley Road is an arterial road carrying almost 7,000 vehicles per day. A pedestrian zebra crossing is located at the entrance to the station's foot overbridge, and adjacent to the Papatoetoe bus stop.

Station Road provides the western access to the station platform and Park & Ride. It is an arterial with approximately 22,000 vehicles per day. The western entrance to the station's foot overbridge is situated next to a signalised mid-block pedestrian crossing and a bus stop on Station Road. Both points of access operate efficiently, with no notable queues, delays, or adverse impacts on accessibility.



7.6 Case Study: Manukau Station, Auckland

Manukau has a train station and bus station on opposite sides of Davies Avenue which is an arterial road carrying around 6,500 ADT. The precinct is located in the urban centre and has similar characteristics to Waterloo station.

The bus traffic use Davies Avenue and it also contains signalised pedestrian crossings that allows transfers between rail and bus services. The station precinct can be accessed from the south via Manukau Station Road, which is a regional road carrying 10,000 ADT and has signalised pedestrian crossings. The station can also be accessed from the east via Osterley Way which has multiple pedestrian zebra crossings.



7.7 Case Study: Avondale Station, Auckland

Avondale station can be accessed via St. Jude Street, Layard Street and Crayford Street. St. Jude Street is an arterial road and has traffic volumes of approximately 12,000 ADT. St. Jude Street has a refuge island for pedestrians to cross at the station access, although it does not have modern safety infrastructure like a raised table, clearway markings, or signals.



8 Summary & Recommendations

This section responds to concerns related to traffic, access, and safety, by outlining elements that the Reference Design adopts and by offering further recommendations for mitigation strategies aimed at minimising potential future risks.

Although more pedestrians are expected to use the station in the future, this increase is likely to be minor. According to crash records and network performance indicators discussed earlier, current risks related to safety and congestion remain manageable and are unlikely to become significantly worse going forward.

This section further outlines recommended mitigation measures to reduce future risk, supplementing the elements included in the Reference Design. It also presents a comparison with other benchmarked train stations of comparable function, traffic volumes, and passenger demand.

8.1 Mitigation Measures

Mitigation measures in and around the station precinct have been highlighted along with potential interventions for the surrounding network recommended in the next phase of work to support safe and efficient station access while considering wider network movement needs.

Signals

While the Reference Design includes enhancements to the existing zebra crossing at Oxford Terrace, future consideration may be given to the installation of pedestrian crossing signals or even upgrading to a fully signalized intersection as a measure for further safety improvement.

Removal of Pedestrian Underpass

Pedestrian underpasses typically have lower levels of surveillance compared to at-grade or elevated crossings, which increases their CPTED-related risks and make them a less favourable option due to safety concerns. There are also maintenance and accessibility issues associated with them such as vandalism and constraints for people with mobility issues. Replacing the existing pedestrian underpass with a safer and more accessible signalised at-grade crossing for station access from Cambridge Terrace addresses these risks.

Speed Restrictions

Traffic calming measures and speed restrictions can be applied on the busier approach roads to the station that have high traffic volumes, to make at-grade crossings even safer.

Landscape Design Features

Landscaping and urban realm features have been incorporated to act as buffers between the station area and the external road network. These features being embedded as elements of the reference design deliver a functional, user-friendly and inclusive customer experience by making it safe and accessible for all.

Signage

Signage placement and language are key elements for consistent and intuitive wayfinding across the precinct. These are designed for clarity and ease of comprehension, reducing reliance on prior knowledge or staff assistance and making it easy to navigate across the precinct.

8.2 Comparison with other Stations

Estimates of passenger boarding and alighting volumes at stations are based on data from the Auckland Transport Official Information Act Rail Patronage Dataset (2024), the Metlink Rail Performance Report (2023), and the Johnsonville Line Access Report (2023). Annual boardings are converted to estimated average weekday daily boardings, assuming 250 weekdays per year. Daily boardings have been assumed to be roughly equal to daily alightings where data is unavailable. The values shown in Table 8-1 below include both directions of travel as well as boardings and alightings for transfers at stations that serve as interchanges.

Table 8-1: Passenger Boardings and Alighting at Stations (Weekday Average)

Station	Average Daily Passenger Volumes		
	Boarding	Alighting	Total
Waterloo (WLG)	2620	2480	5100
Johnsonville (WLG)	1210	1100	2310
Woburn (WLG)	1780	1690	3470
Newmarket (AKL)	6400	6300	12700
Manukau (AKL)	3800	3700	7500
Avondale (AKL)	1200	1150	2350
Kingsland (AKL)	1500	1450	2950
Papatoetoe (AKL)	2000	1950	3950

Average daily traffic (ADT) volume estimates for approach roads that provide access to stations have been sourced from Mobile Roads for the latest available month (October 2025). ADTs for the approach roads that have the highest traffic volumes and serve as the primary station access have been tabulated in Table 8-2 below.

Table 8-2: Average Daily Traffic Volumes at Busiest Station Approach Road

Station	Approach Road	Average Daily Traffic
		Vehicles per day
Waterloo (WLG)	Cambridge Terrace	12317
Johnsonville (WLG)	Moorefield Road	12923
Woburn (WLG)	Cambridge Terrace	15109
Newmarket (AKL)	Broadway	18210
Manukau (AKL)	Manukau Station Road	9935
Avondale (AKL)	St. Jude Street	11930
Kingsland (AKL)	Sandringham Road	15840

Papatoetoe (AKL)	Station Road	21520
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The relationship between average daily traffic volumes on the primary approach road for station access and passenger boarding/alighting volumes has been compared for different stations and is presented in the plot below.

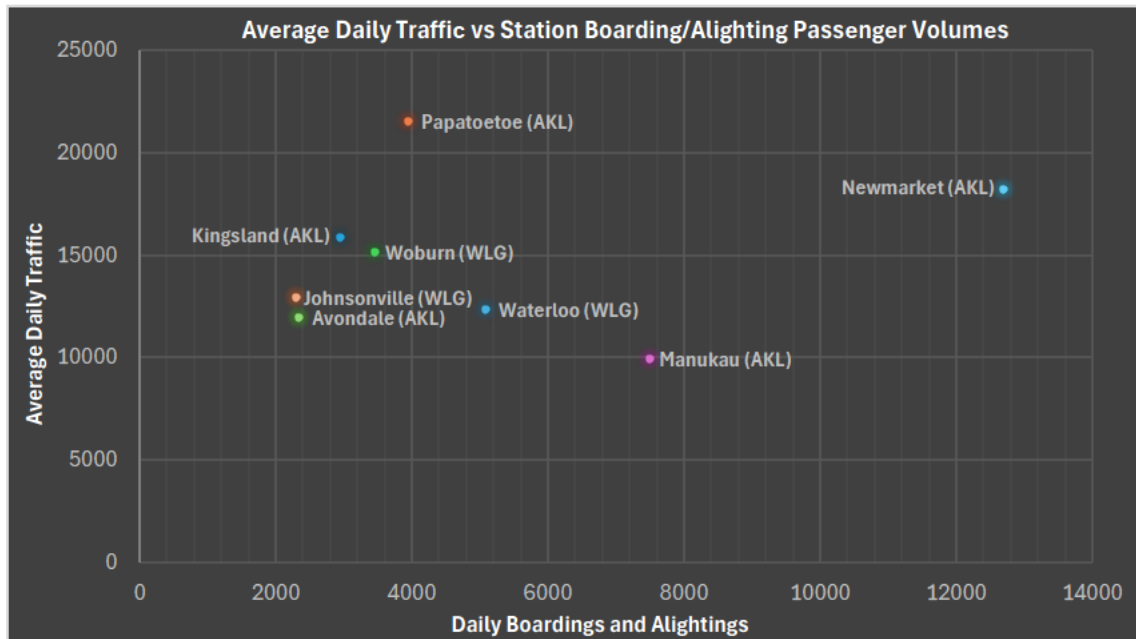


Figure 8-1: Comparison of Stations: Average Daily Traffic vs Passenger Boarding and Alighting

The comparison provided with other stations in Wellington and Auckland highlights that the provision of at grade crossings (either signalised or zebra crossings) proposed at Waterloo Station is consistent with other stations of similar scale located on relatively busy arterial or collector roads. These stations generally operate safely with acceptable impacts on through traffic.