



KNOX PRINCIPAL PEDESTRIAN NETWORK

JUNE 2017



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1. INTRODUCTION





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1.1 OVERVIEW

Walking and cycling are the healthiest modes of transportation. A form of active transport, walking offers a broad range of health and economic benefits. Best suited for shorter trips, many people walk to local destinations such as shops, cafes, parks or schools. Many public transport journeys include walking to a bus stop or train station and then walking to the final destination.

Encouraging greater levels of walking as a form of transport is a major objective of Knox City Council to build a healthier, more inclusive and safer city. To encourage more walking trips within the municipality, it is imperative that walking links are safe, convenient and attractive, and that guidance for walkers is clear.

Knox City Council has acknowledged the importance of walking in its 2005 Pedestrian Plan and wishes to build on the work from that strategy by developing a Principal Pedestrian Network (PPN) across the city to facilitate increased rates of walking, particularly as a mode of transport.

The PPN will be used by Council to prioritise its future investigations and infrastructure upgrades to those links that are key connections across the municipality.

1.2 PROJECT OBJECTIVES

The overarching objective of developing a PPN is to increase walking trips. This is achieved by providing pedestrians with a high level of service by making the shortest route also the highest quality route.

Other key aims of the PPN are:

- Promoting forms of transport and forms of energy with the lowest impact on the environment, health and wellbeing;
- Reducing the need for private motor vehicle transport and the extent of travel;
- Facilitating better access to, and greater mobility within local communities.

1.3 STUDY AREA

The project focuses on delineating a PPN across the Knox City Council municipality. The study area also includes key destinations adjacent to the municipality that may be more readily accessible to residents within Knox. This includes neighbouring shops, open space, schools or public transport stops that are more conveniently accessed by residents.

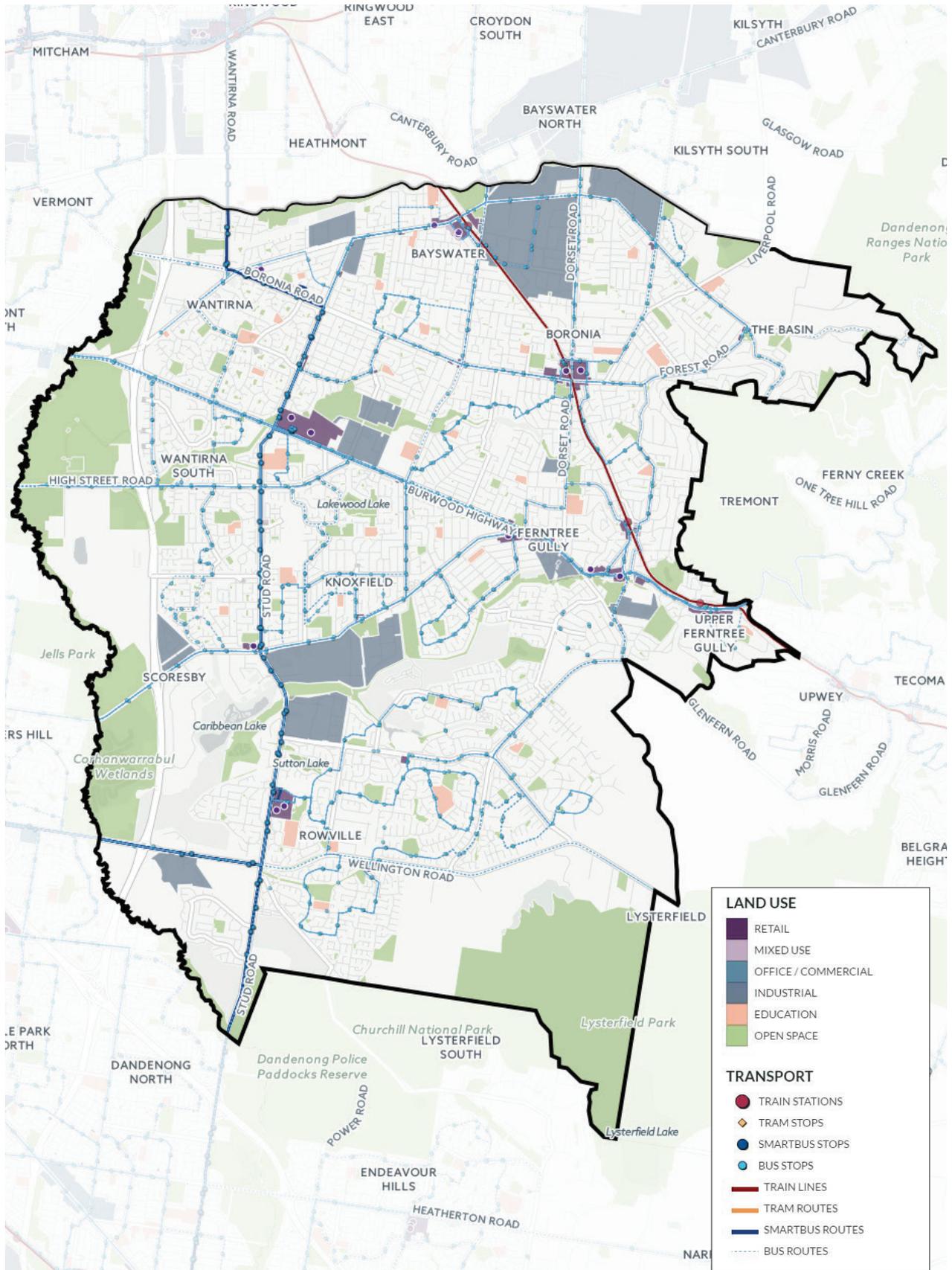


Figure 1 - Knox City Council Study Area, Land Use & Transport Plan

1.4 WHAT IS A PRINCIPAL PEDESTRIAN NETWORK?

A PPN is a strategic network of pedestrian routes to promote walking for transport. A walking route within the PPN will provide the highest level of service for pedestrians. Characteristics such as generous footpaths, shade and weather protection, seating and priority over other transport modes at intersections are all ways of providing a comfortable and enjoyable walking environment.

A PPN is a planning and policy tool for the prioritisation, development and promotion of walking as a mode of transport. A PPN will give Council a strategic tool to lobby State Government, particularly VicRoads, when negotiating transport mode priorities.

The methodology for delineating PPNs was developed by the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) and has been used to guide this project. The focus for the methodology is to provide a logical set of steps that could be consistently applied to Melbourne's Activities Centres.

A PPN provides local government with a tool to develop a framework and evidence base for the inclusion of pedestrian needs in transport and planning by:

- Mapping pedestrian movements in the municipality and identifying priority routes; and,
- Planning for and prioritising infrastructure improvement to encourage and support increased levels of walking.

The PPN will identify pedestrian routes that have the potential to connect a higher number of people to key destinations. Once key routes are identified, Council can prioritise improvements to the footpaths that are subject to high levels of pedestrian traffic. Having a prioritised implementation plan assists Council in the delivery of safe and accessible pedestrian facilities for the local community, and ultimately supports Council's vision to provide high quality, safe and accessible pedestrian facilities across the municipality .

1.5 PROJECT METHODOLOGY

The project largely adopted the PPN Methodology developed by the Department of Economic Development, Jobs, Transport and Resources (DEDJTR). The project was undertaken across three key stages.

STAGE 1 – PEDESTRIAN ACCESS MAPPING ANALYSIS

This stage involved mapping and determining the likely routes for pedestrian access within the study area through an analysis of the shortest routes between origins and destinations along the pedestrian network. The total potential trips were calculated to a variety of destinations including the core retail areas, the smart and regular bus service, the Belgrave Train Line, open space, community and health facilities, as well as schools and tertiary education facilities.

STAGE 2 – MAPPING VALIDATION AND VERIFICATION

This stage provided for the validation of the mapping analysis by factoring in future land use and population change within the study area using local Council officer knowledge, and undertaking pedestrian counts at a number of locations.

STAGE 3 – PRINCIPAL PEDESTRIAN NETWORK

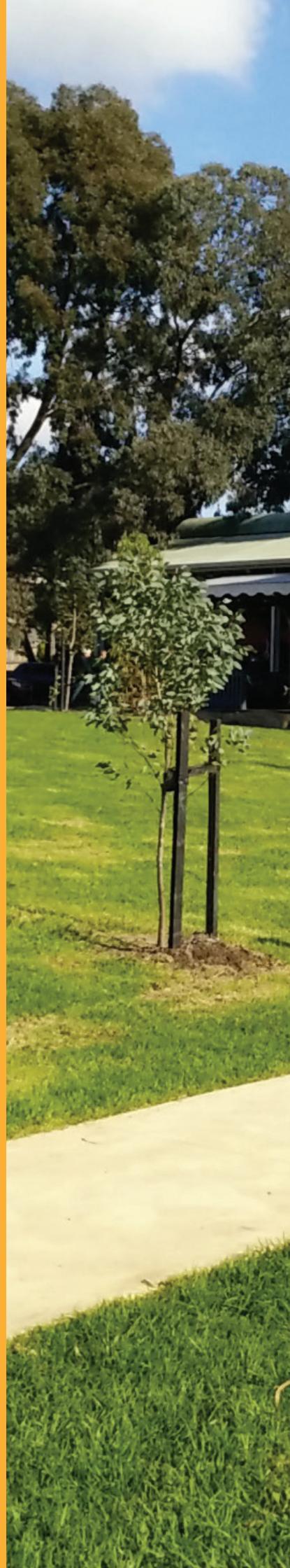
This stage involved the delineation of the PPN using the results from Stages 1 and 2 including verifying the alignment of the PPN with the local knowledge of Council officers.

1.6 DIVERGENCE FROM THE DEDJTR PPN METHODOLOGY

The project generally followed the key steps outlined in the DEDJTR PPN methodology however, some variations were applied, which were considered to enhance the methodology and provide more relevance to the conditions of the municipality. These include the use of multiple primary destinations.

The DEDJTR methodology recommended the use of a primary destination being a major transport hub or retail focus. This project used multiple primary destinations such as retail, public transport, open space, community facilities, schools, with a different weighting applied to each destination. This divergence was adopted because the municipality has significant population densities located within walking distance of a variety of key destinations. The primary destinations were allocated different weightings to reflect the relative proportion of residents likely to travel to each destination type. This creates a more comprehensive PPN for the Knox context which accounts for potential walking trips to a range of destinations.

2. STRATEGIC CONTEXT





2.1 EXISTING STUDIES & STRATEGIES

2.1.1 KNOX CITY COUNCIL PEDESTRIAN PLAN, 2005

Prepared for Council in September 2005, the Knox City Council Pedestrian Plan aims to enhance the walkability of Knox by providing residents, workers and visitors with viable and sustainable transport options. The plan examines walking conditions in Knox, as well as the critical challenges and barriers that deter the community from walking. To gain an understanding of the conditions that will encourage more people to walk, the plan compares the existing conditions and deterrents to the typical characteristics of walkable environments. The plan establishes a set of target areas, incorporating activity centers and key destinations and outlines recommendations for each. These destination target areas were determined to have the greatest potential to encourage walking, in conjunction with implementing marketing initiatives to influence the communities attitudes to walking. These target areas were considered as part of the development of the PPN.

The plan established a set of land use based principles that provide guidance around built responses. The implementation section of the plan outlines the priorities, rationale, factors and implementation priorities (outlined in area based tables) and were considered by the PPN project.

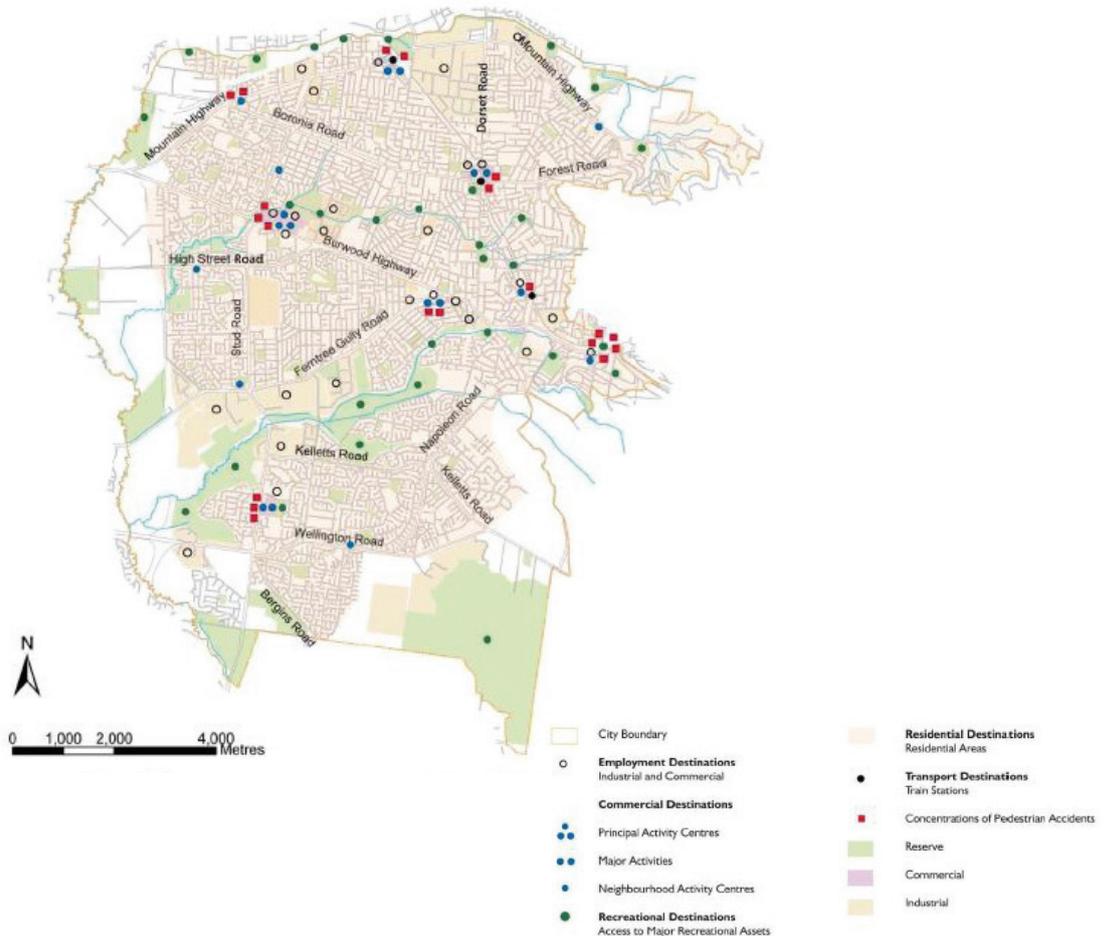


Figure 2 - Targeted Destination Areas Plan- Extract from the Knox City Pedestrian Plan, 2005

2.1.2 KNOX CITY COUNCIL MOBILITY STUDY, 2011

The purpose of the Knox City Council Mobility Study, 2011 was to identify where to prioritise improvements to the footpath and shared path network to make it easier, safer and more comfortable for people using mobility equipment to get around Knox.

The Mobility Study outlines the key physical and social opportunities and challenges likely to affect pedestrians using mobility equipment. By understanding these, as well as best practice path design, a set of recommendations was developed. Key recommendations included identifying;

- Council's role in collaborating with key stakeholders responsible for ensuring the pedestrian network is accessible
- The need for Council to prioritise pedestrian network improvements in order to have the greatest impact for people using mobility requirement
- The need to increase information dissemination, advocacy and collaboration to deal with the issues facing people using mobility equipment.



Figure 3 - Missing and Disconnected Footpaths Plan - Extract from the Knox City Mobility Study, 2005

2.1.3 KNOX INTEGRATED TRANSPORT PLAN, 2015

The 2015 Integrated Transport Plan recognises Knox is a significantly car dependent municipality (especially in the south), partly due to poor access to public transport services. To ensure future transport needs for the community are met, Knox seeks to increase its current level of transport options, primarily by developing a framework for the development of an integrated transport network.

The Knox Integrated Transport Plan, 2015 builds on the key priorities of the 2004 Integrated Transport Plan. These included upgrading local public transport services improving accessibility, encouraging sustainable travel, providing transport options in the growth areas, providing infrastructure for freight and commercial transport, improving transport links to regional Victoria and ensuring integrated planning for metro transport. With consideration of local demographics and future population forecasts, in conjunction with the strategic planning context, the plan sets out a transport vision for Knox. The vision aims to:

- Make the transport network accessible to all people who wish to use it;
- Establish efficient access for all people and goods;
- Protect the natural environment;
- Maximize access to homes, employment, recreational facilities and services;
- Support health and well being.

2.1.4 KNOX VISION: OUR CITY, OUR FUTURE, 2013 - 2017

The Knox Vision 'Our City, Our Future' was developed after extensive collaboration with the Knox community to outline the shared future aspirations for the municipality. Intended to be used as a shared planning document, the vision identifies features for Knox City Council in the future. The development and implementation of the PPN supports several key features of the future City including:

- Providing a range of high quality, affordable and accessible transport options;
- Promoting activity and involvement in community life for all members of the community;
- Members of the community feel safe and actively participate in public life;
- Transport options (including active modes of transport) to support local business attraction;
- Walking (and cycling and public transport) connections are readily available, safe and reliable;
- A connected transport infrastructure encourages physical activity.

2.2 VICROADS SMARTROADS NETWORK OPERATING PLANS

SmartRoads is an approach that manages competing interests for limited space and time in the road network by giving priority use of the road to different transport modes, both to different parts of the network and at different times of the day. Some parts of the road network will be managed to work better for pedestrians while others will be managed for public transport, cyclists, freight and cars.

VicRoads currently manages the development of the SmartRoads Network Operating Plans and have identified a road use hierarchy for the study area (refer to figure 4 below). The map shows pedestrian priority limited to a small area in Bayswater, Boronia and Wantirna South.

The development of a PPN will provide Council with a tool to negotiate further pedestrian priority across the study area particularly along streets connecting into the existing shopping strips and along key routes to major destinations. This will be particularly important at intersections and along streets where the PPN runs parallel to or intersects other transport priorities.

The implementation section of this report provides recommendations for the next steps in negotiating greater pedestrian priority in the SmartRoads Network Operating Plans.

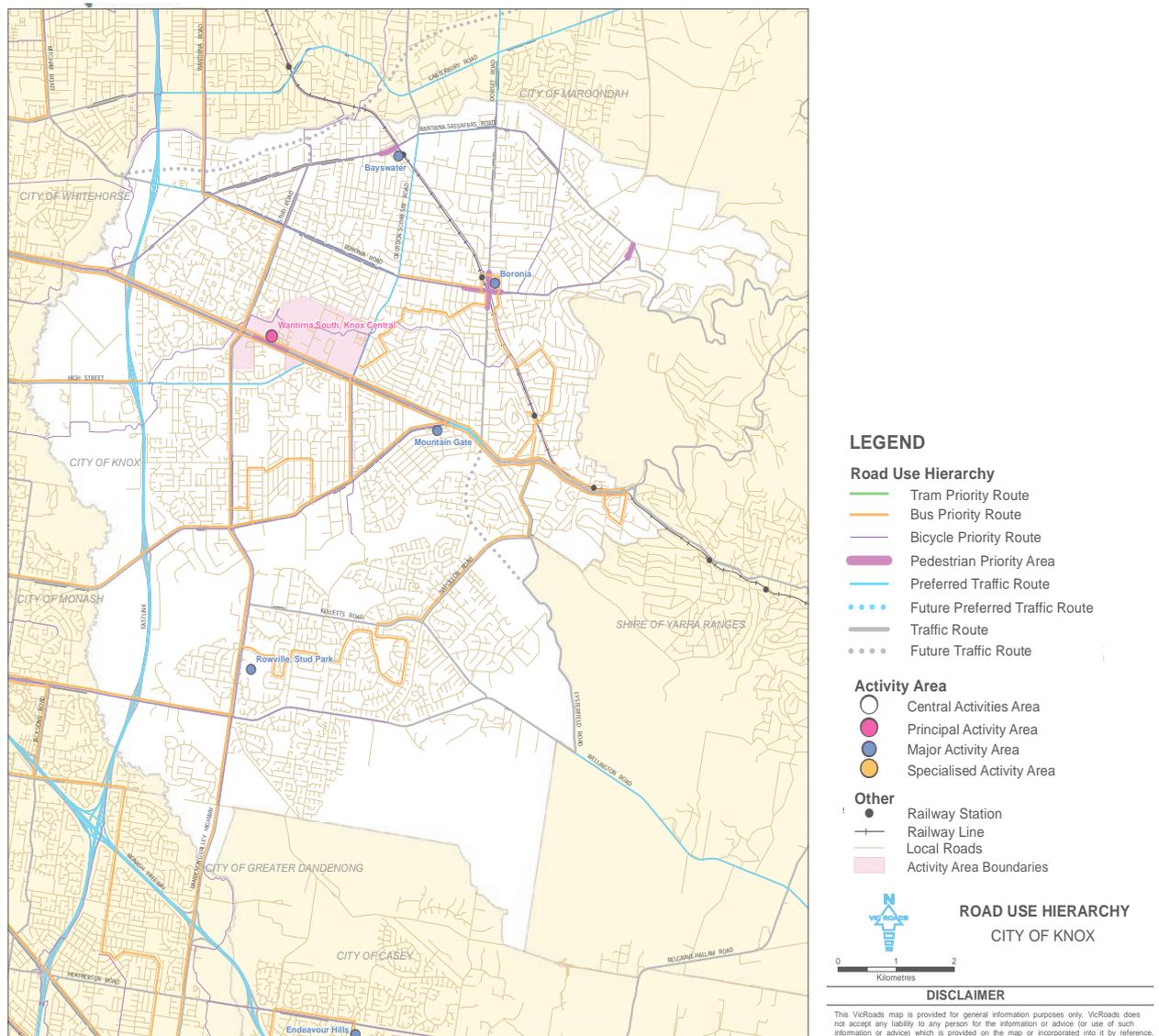


Figure 4 - VicRoads Smart Roads Map

3. PEDESTRIAN ACCESS MAPPING ANALYSIS





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3.1 MAPPING METHODOLOGY

3.2.1 KEY STEPS

Five steps have been followed to undertake pedestrian access mapping within the City of Knox:

Step 1 - Define the pedestrian network (refer to Figure 5)

Step 2 - Identify the residential origins (refer to Figure 7)

Step 3 - Identify the primary destinations (refer to Figure 8)

Step 4 - Shortest Route Analysis between origins and destinations (refer to Figures 9 -23)

Step 5 - Combine and weight the shortest routes (refer to Figure 24)

3.2.2 LIMITATIONS OF THE PEDESTRIAN ACCESS MAPPING

SHORTEST ROUTE ANALYSIS

A key focus for the PPN is to encourage a shift from transport trips that would typically be undertaken in a car to walking, i.e. travelling to the train station, to the shops or school.

In order to do this, the PPN needs to focus on the shortest possible route so that travelling from origins to destinations is as quick and as simple as possible. Once this route is identified, the highest level of service is provided to make walking an attractive, safe and logical option.

The pedestrian access mapping analysis therefore determines the shortest route between origins and destinations - it does not determine the most desirable or scenic route.

In addition, the mapping analysis identifies the shortest route to destination points i.e. park entry points, shopping strip entry points. It does not identify recreational routes i.e. walking along shopping strips.

MULTI-TRIPS

The analysis only determines the shortest routes to the nearest destination. As a result, the mapping does not account for multi-destination origins i.e. from home (origin) to retail shops and then to school (destinations).

EMPLOYMENT ORIGINS

The mapping of residential origins was undertaken for the Knox City Council. Employment origins have not been identified in the analysis due to the difficulty in accessing current employment data.

3.2.3 DEFINING THE PEDESTRIAN NETWORK



Figure 5 - Pedestrian Network Map

The first step in pedestrian analysis mapping is to define the pedestrian network. An existing street network was used as the basis and this was updated to more accurately reflect pedestrian access. This involved ensuring that all streets with footpaths, off-street trails and pedestrian crossings over major roads were calculated.

By creating the pedestrian network, we then proceeded with mapping and determining the likely routes for pedestrian access within the study area through an analysis of the shortest routes between origins and destinations along the pedestrian network.

3.2.4 IDENTIFYING POTENTIAL BARRIERS IN THE PEDESTRIAN NETWORK

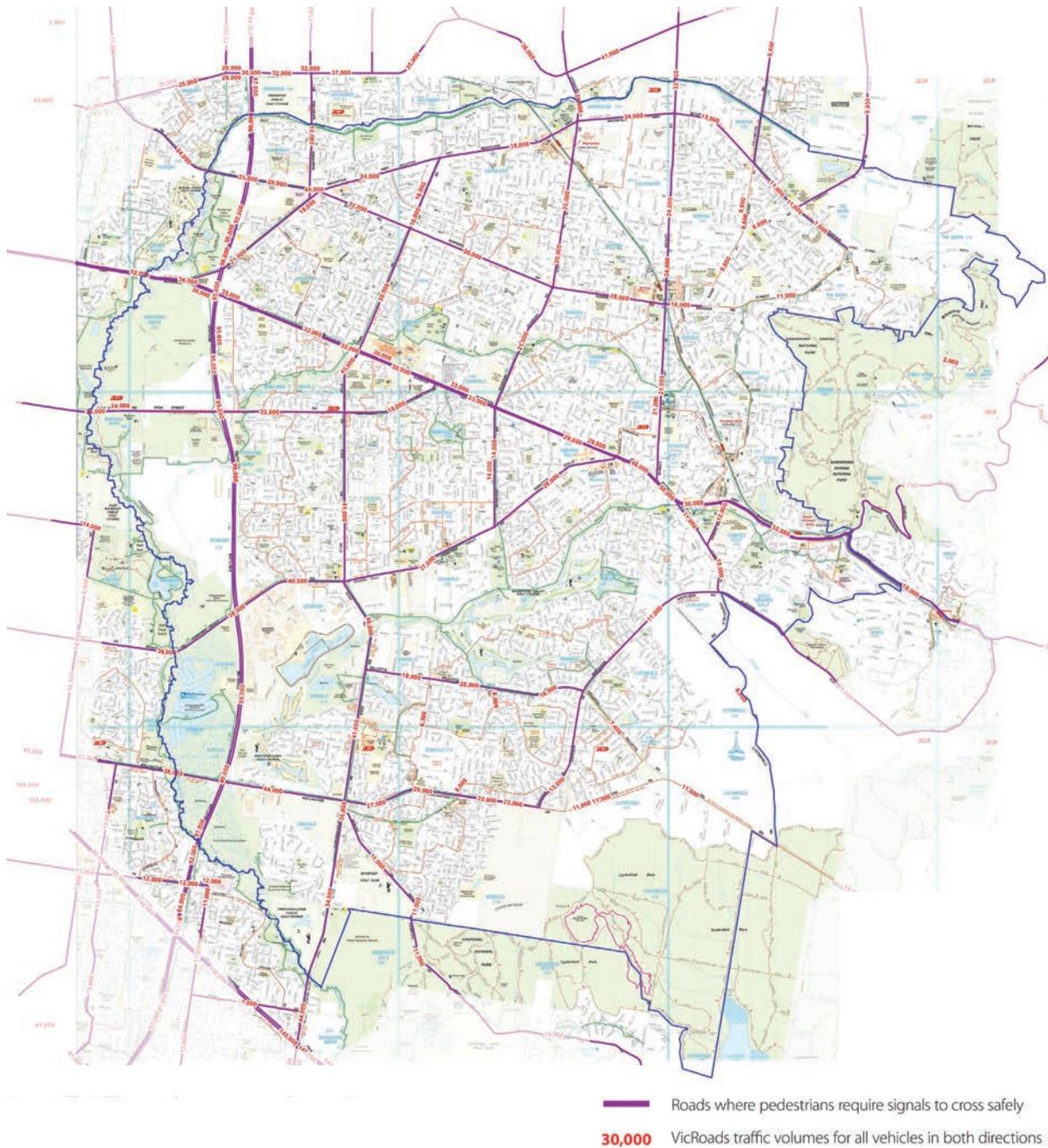


Figure 6 - Major Roads as Pedestrian Barriers

This map identifies the traffic volumes for vehicles travelling along the major roads within Knox. The plan reveals the roads that act as pedestrian barriers due to volumes of vehicles they carry.

Locating pedestrian barriers is important when developing a PPN as it gives an insight into the pedestrian routes that are unlikely to be used.

3.2.5 IDENTIFYING THE RESIDENTIAL ORIGINS

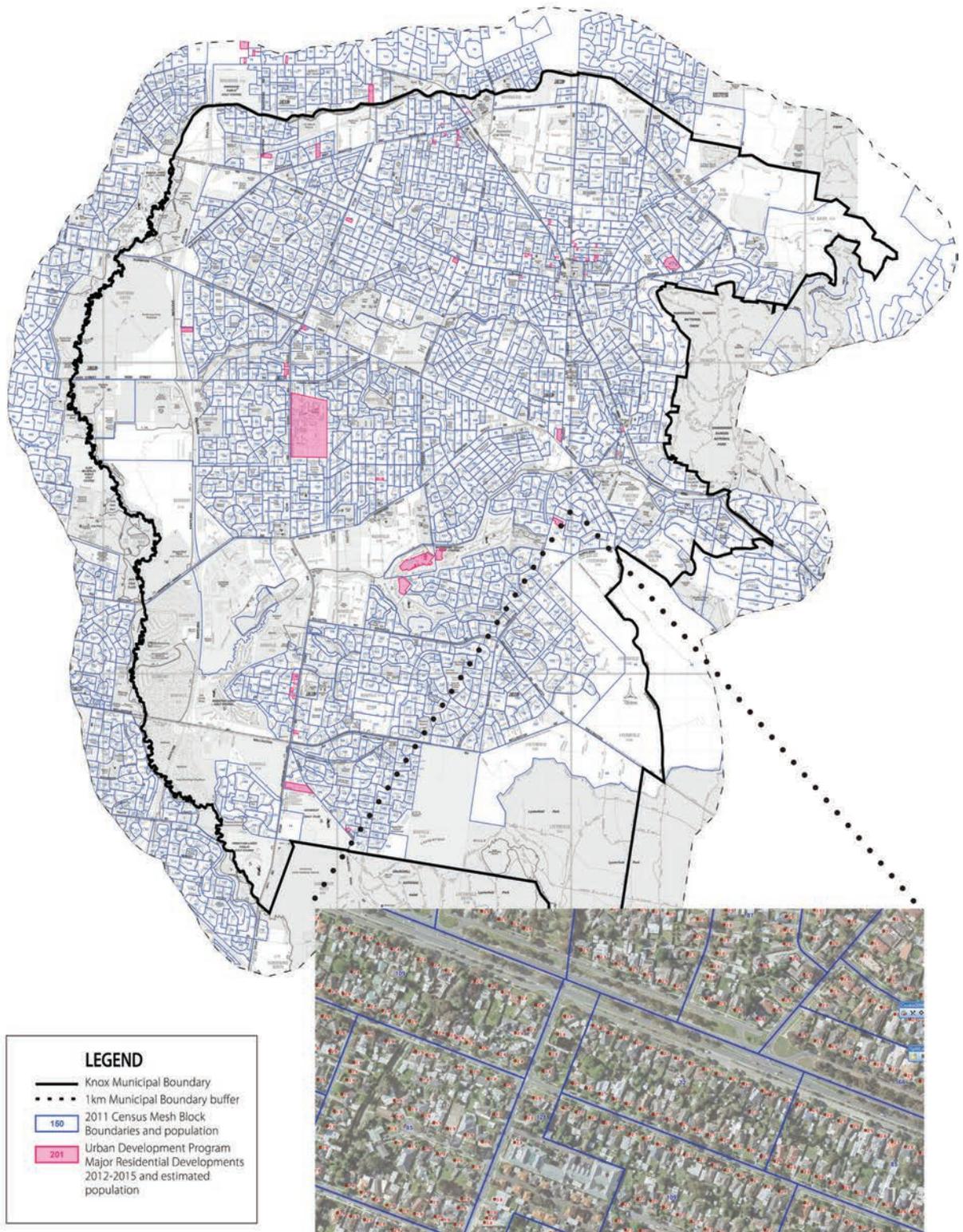


Figure 7 - Residential Origins Map

2011 Census Mesh Block data was used to accurately map each home located in Knox. Mesh blocks are the smallest geographic region in the Australian Statistical Geography Standard and the smallest geographical unit for which Census data is available.

Each mesh block contains information about how many people live within the mesh block boundary. A population value was assigned to each household based on the mesh block. Known developments that have occurred since 2011 were also included.

3.2.6 IDENTIFYING THE PRIMARY DESTINATIONS

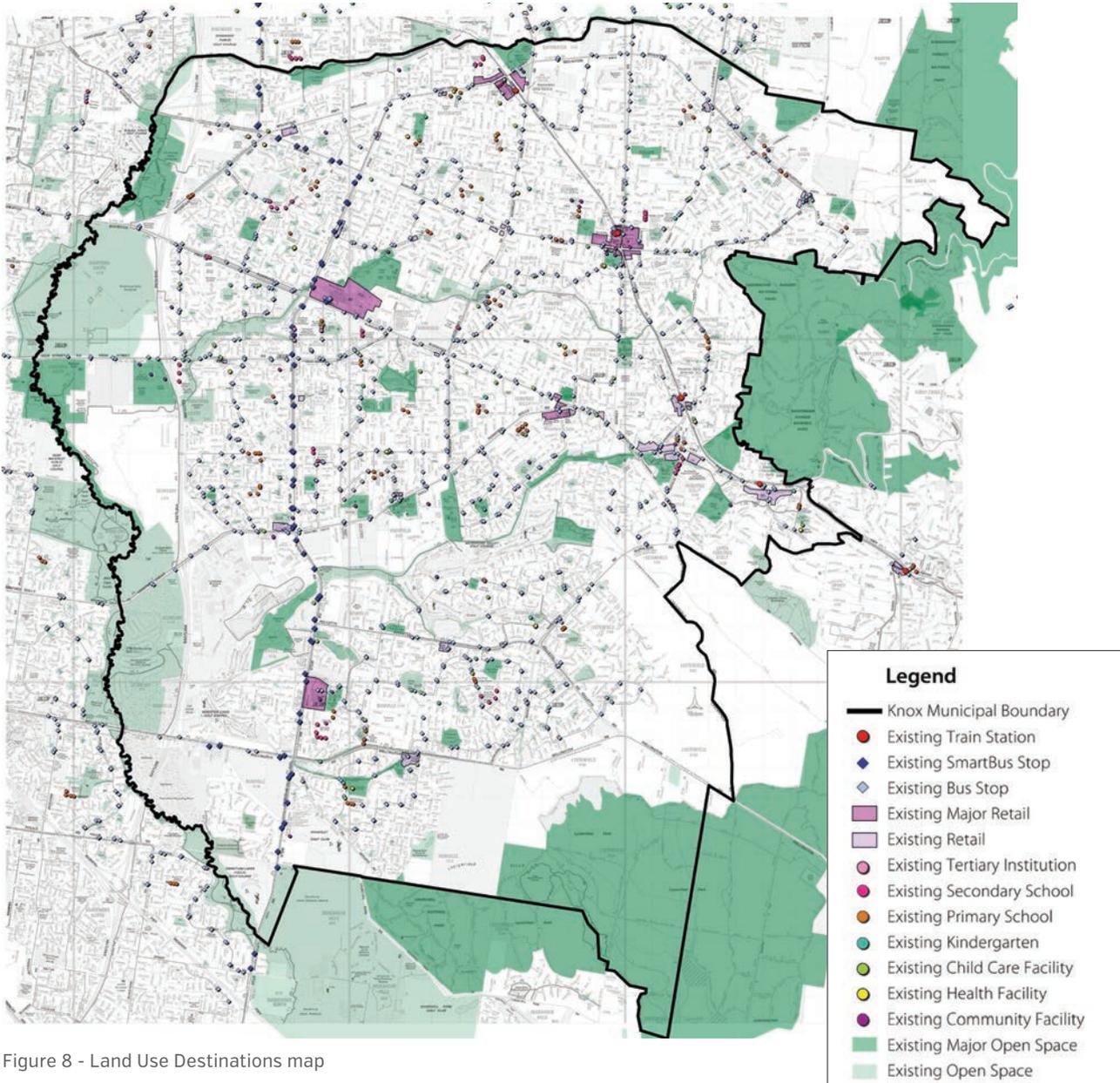


Figure 8 - Land Use Destinations map

Key destinations were delineated across the study area under the following categories;

- Train Stations
- SmartBus & Regular Bus Stops
- Retail (Major & All)
- Primary and Secondary Schools
- Tertiary Institutions
- Kindergartens
- Community and Health Facilities
- Open Space (Major & All).

A walking catchment was determined for each destination category reflecting the maximum distance people are likely to walk to access the destination. These walking catchments are identified in the discussion of each of the shortest route maps.

3.2 **SHORTEST ROUTE ANALYSIS**

Shortest route analysis of potential trips between residential origins and primary destinations was undertaken for the Knox City Council. The total potential trips are calculated to the 14 destinations listed below.

A walkable catchment was identified for each of the primary destination categories. This reflects the likely distance a user would walk to a specific destination. The catchment applied to the destination categories were:

- Train Stations - 1km
- Smartbus Stops - 1km
- Bus Stops - 400m
- Retail (Major) - 1km
- Retail (Minor) - 1km
- Kindergartens - 1km
- Primary Schools - 1km
- Secondary Schools - 1km
- Tertiary Institutions - 1.5km
- Childcare facilities - 1.km
- Community Facilities - 1km
- Health Facilities - 1km
- Major Open Space - 1km
- All Open Space - 1km

Figures 9-22 illustrate the shortest route for each of the above listed destinations. These maps reveal where potential trips made by Knox's residential population are likely to be the highest.

A Draft Principal Pedestrian Network is created from the shortest route analysis which delineates the routes likely to carry the greatest amount of pedestrian trips.

ACCESS TO TRAIN STATIONS

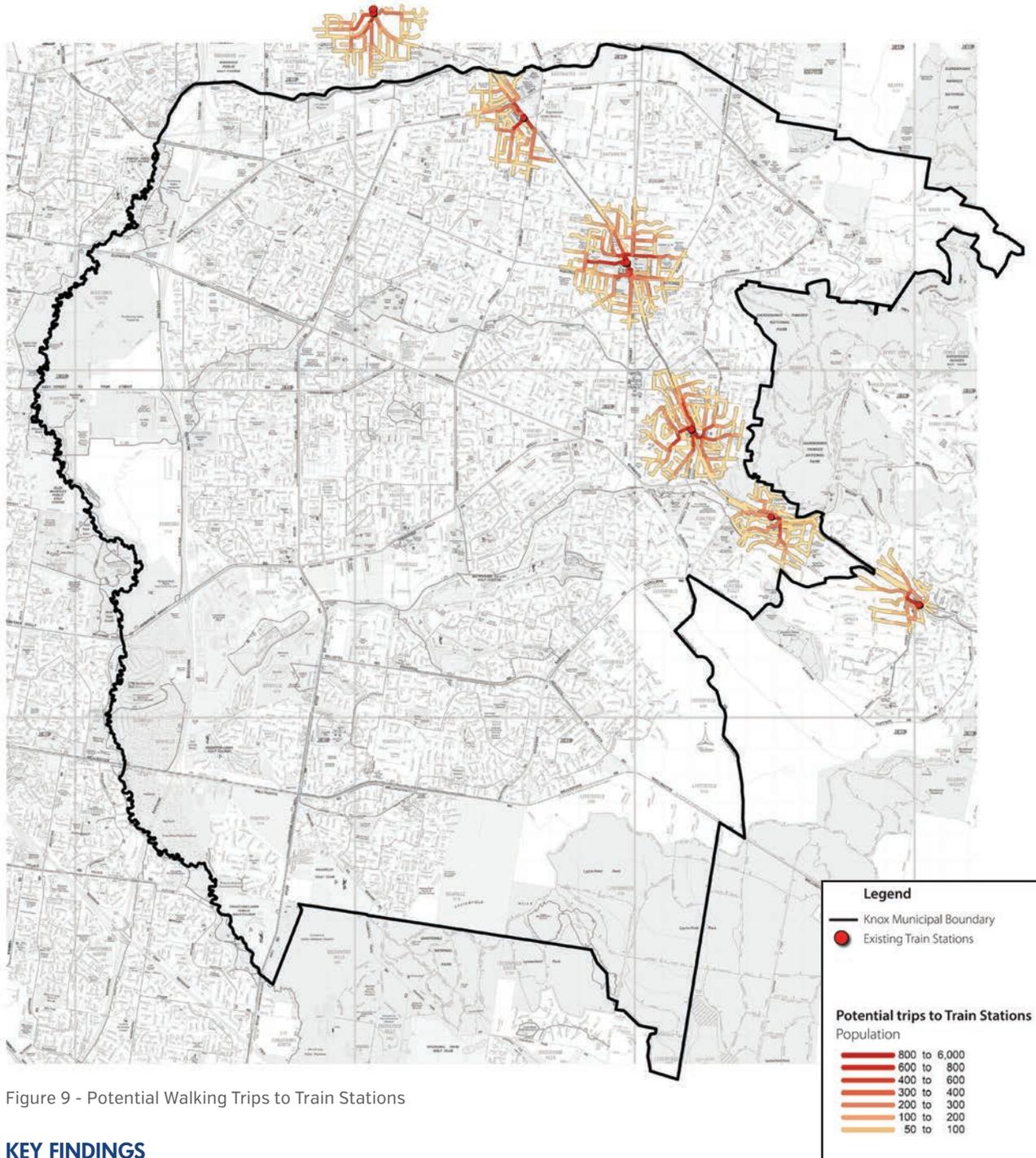


Figure 9 - Potential Walking Trips to Train Stations

KEY FINDINGS

Shortest routes were assessed for the train stations located within Knox (four in total), as well as Heathmont Train Station located immediately north of the municipality and Upwey Train Station to the east.

The walking catchment applied was 1km, however it is clear that the train service is limited to a small area running through the north east of Knox.

The results show a concentration of potential walking trips radiating out from train stations in the north eastern section of Knox. The streets surrounding Boronia Station appear to carry larger volumes of potential trips. This is due to more permeable streets and a higher residential population.

ACCESS TO SMART BUS STOPS

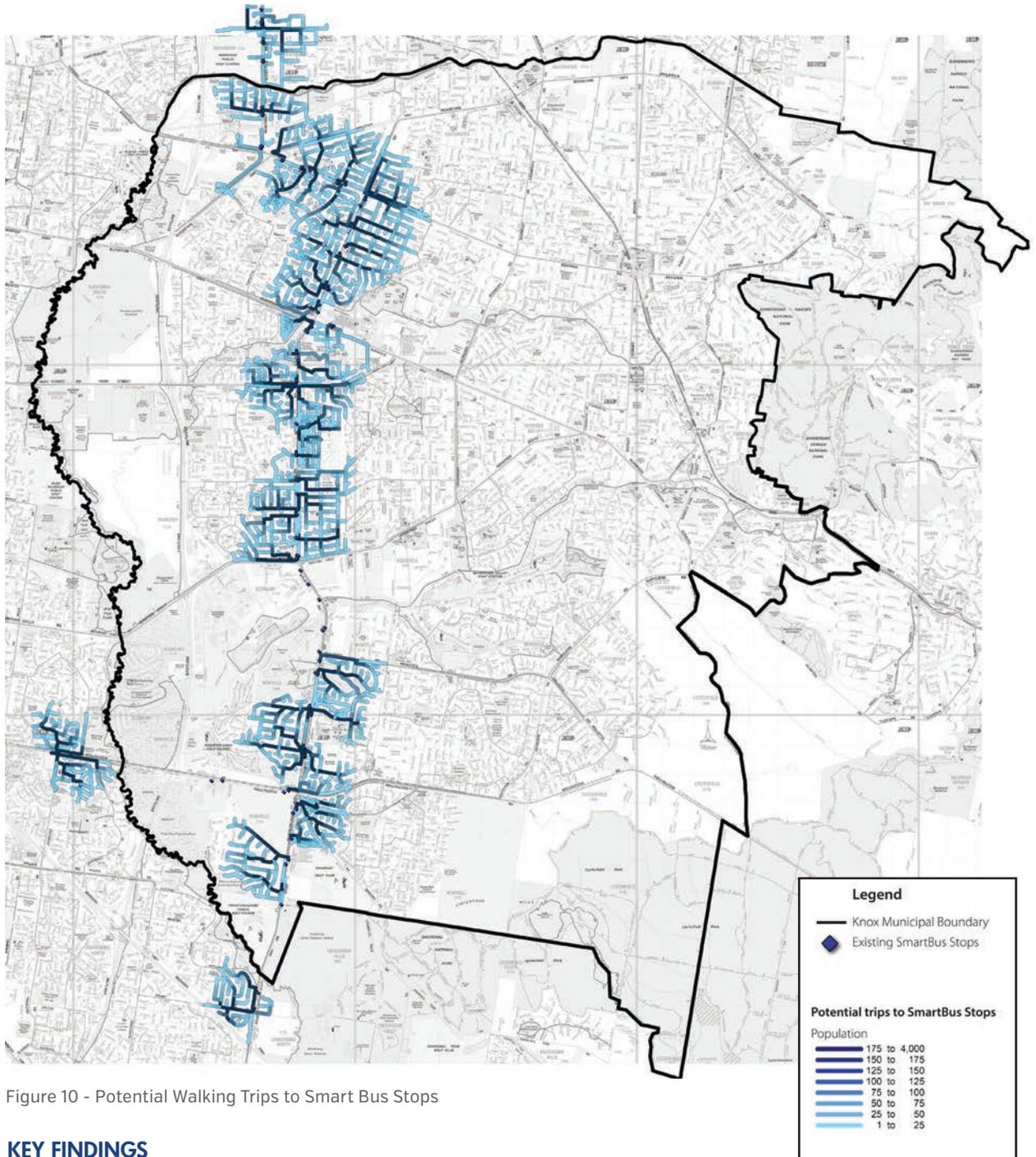


Figure 10 - Potential Walking Trips to Smart Bus Stops

KEY FINDINGS

The SmartBus service has been mapped separately to the standard metropolitan bus stops to reflect the greater frequency of the service.

Given the limited number of SmartBus routes located within the Knox City Council, accessibility is limited to catchments running along a north-south axis of Stud Road.

As a result of the higher level of service the SmartBus provides, people are more likely to walk further to use this service. To reflect this the walking catchment was increased from 400m to 1km.

ACCESS TO BUS STOPS

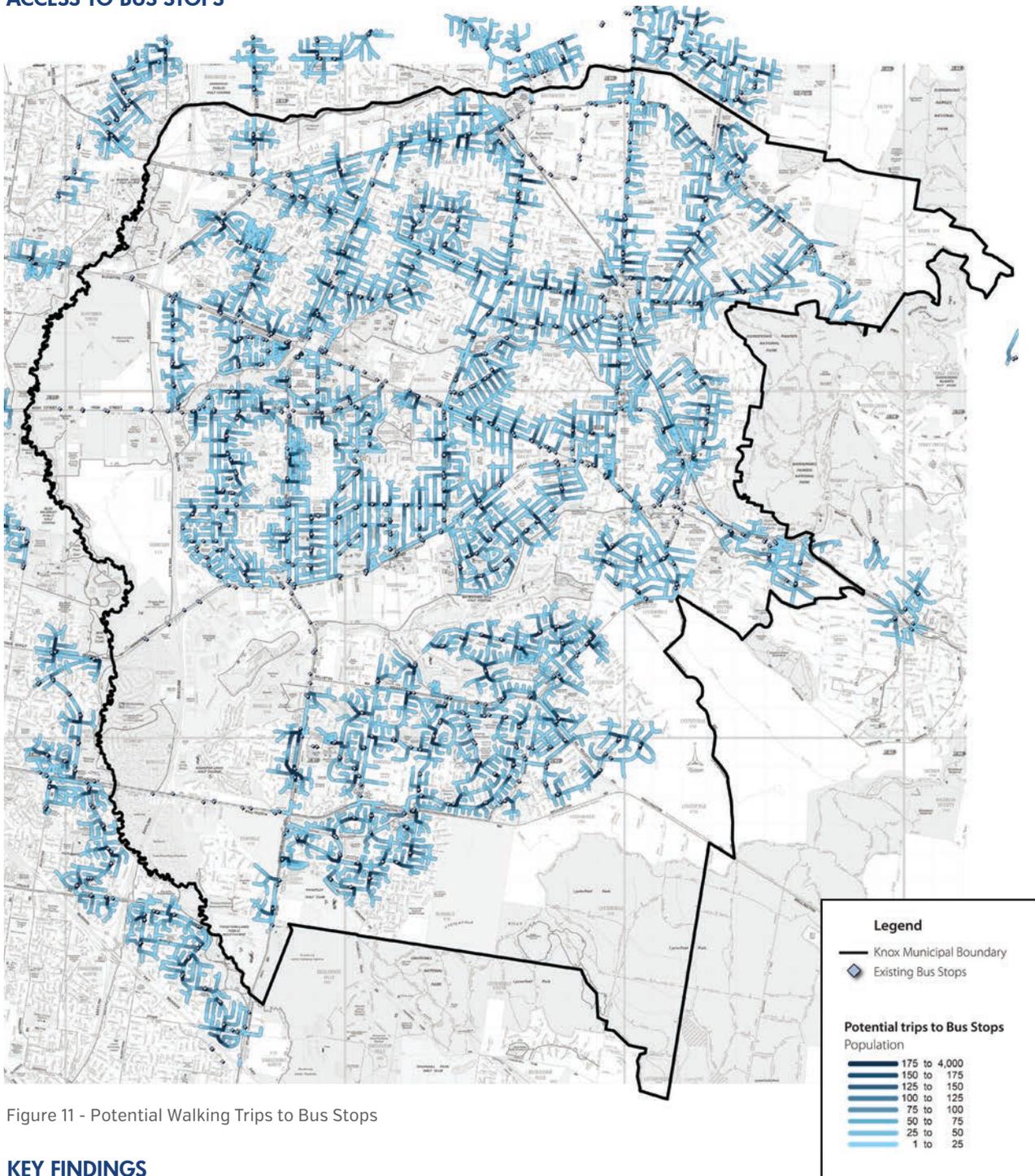


Figure 11 - Potential Walking Trips to Bus Stops

KEY FINDINGS

A walking catchment of 400m from all bus stops in Knox was analysed. This distance is based on the acknowledged standard that residents are less likely to walk beyond 400m to access a bus stops.

Given the high coverage of bus stops across the municipality, access appears to be evenly dispersed across the pedestrian network.

ACCESS TO MAJOR RETAIL CENTRES

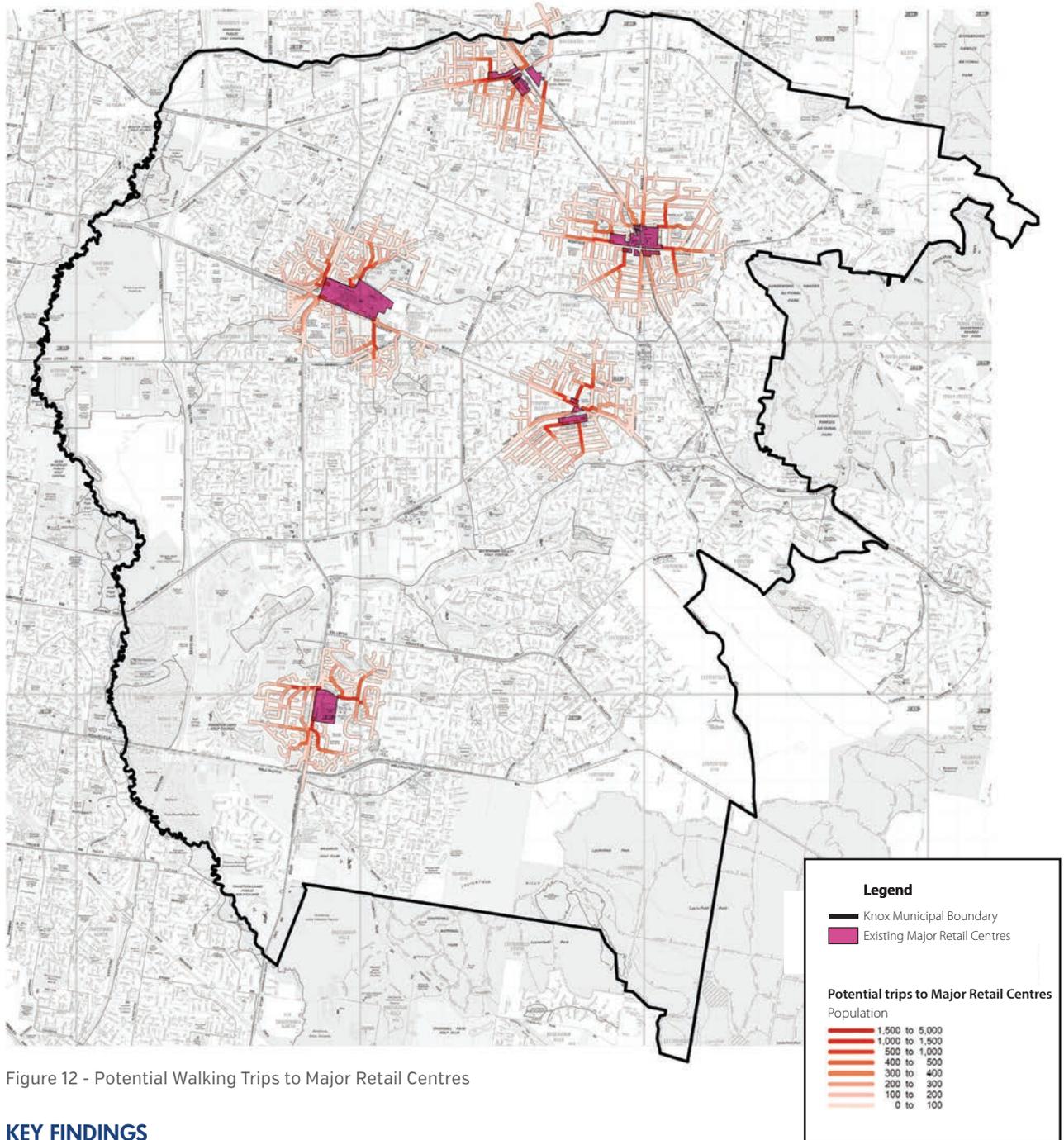


Figure 12 - Potential Walking Trips to Major Retail Centres

KEY FINDINGS

A walking catchment of 1km from major retail centres was analysed, based on the acknowledged standard that pedestrians are willing to walk up to 1km to visit a major shopping centre. There are five major retail centres in Knox.

The results clearly reveal the potential walking routes to these centres radiate out from the retail centre along all major roads leading these five areas. Boronia shows the greatest number of potential trips because of the higher population located around its centre.

ACCESS TO RETAIL CENTRES

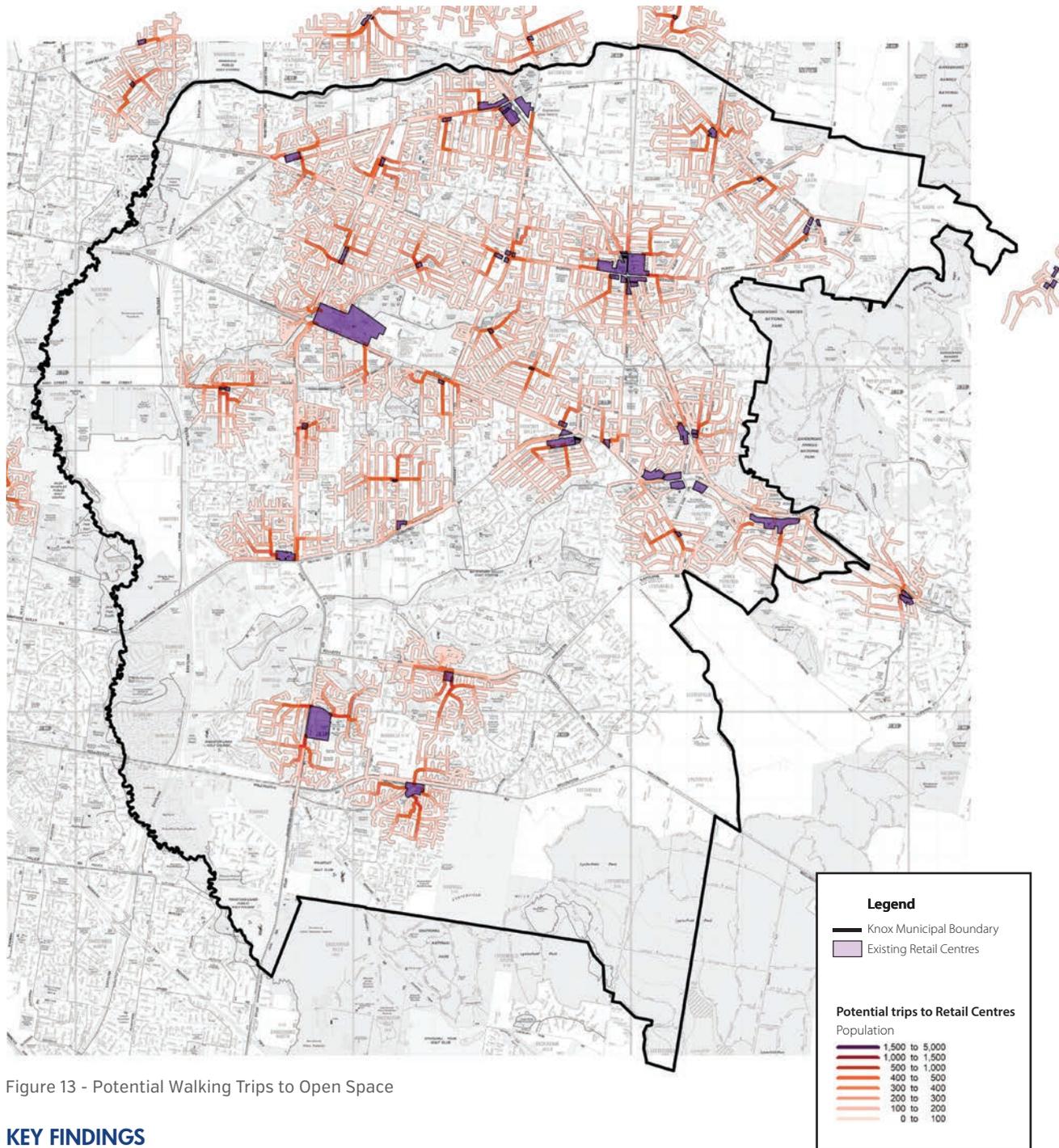


Figure 13 - Potential Walking Trips to Open Space

KEY FINDINGS

A walking catchment of 1km from all retail centres was analysed, based on the acknowledged standard that pedestrians are willing to walk up to 1km to visit a shopping centre. In line with the results of the major retail centres, potential walking routes to all centres radiate out from the centre along major and local roads.

ACCESS TO KINDERGARTENS

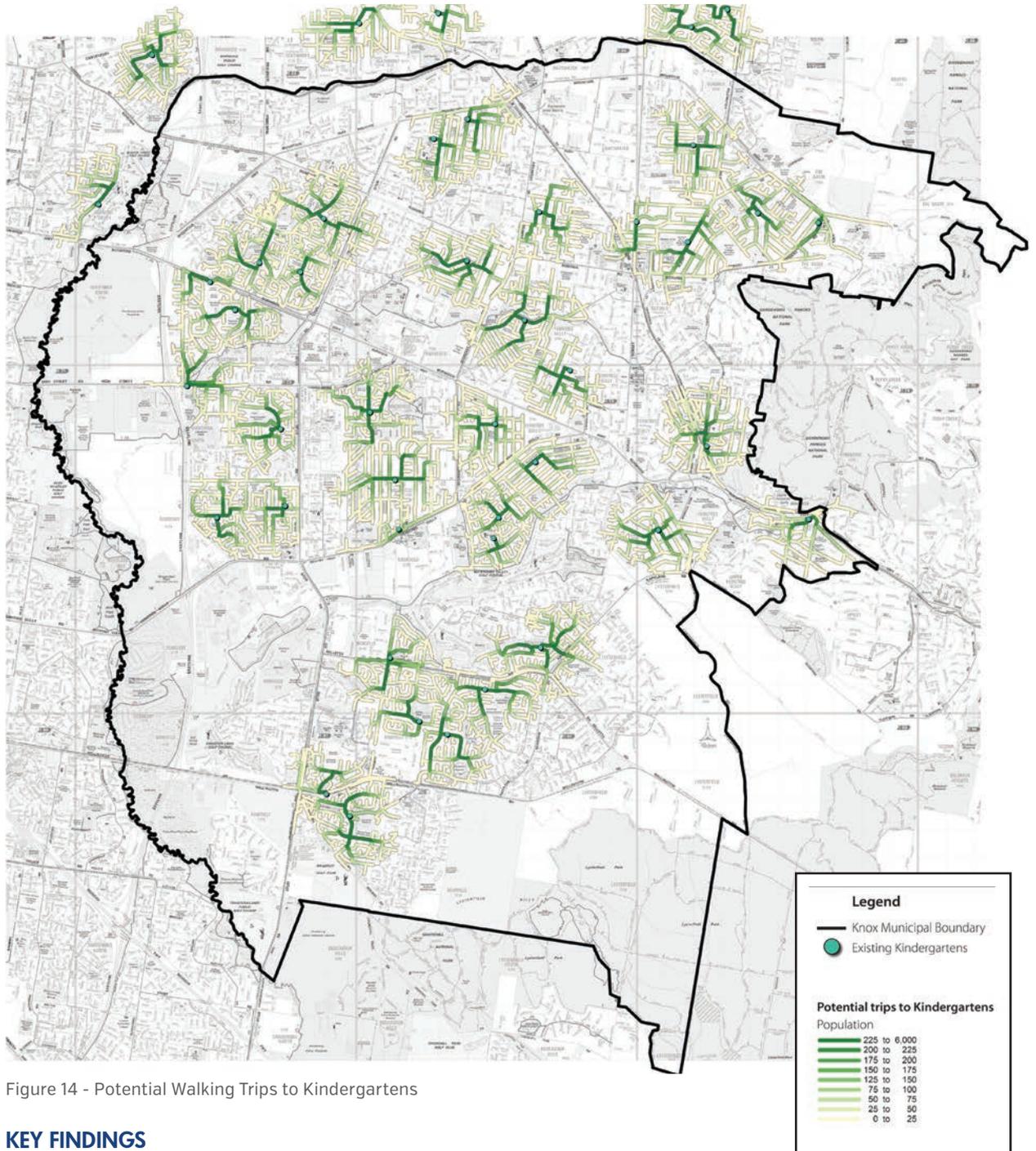


Figure 14 - Potential Walking Trips to Kindergartens

KEY FINDINGS

A walking catchment of 1km was used for the kindergartens located within Knox. The results reveal an even spread of access to kindergartens across residential areas, and a high level of access to the sites. There are a number of key pedestrian routes radiating out from each kindergarten site.

ACCESS TO PRIMARY SCHOOLS

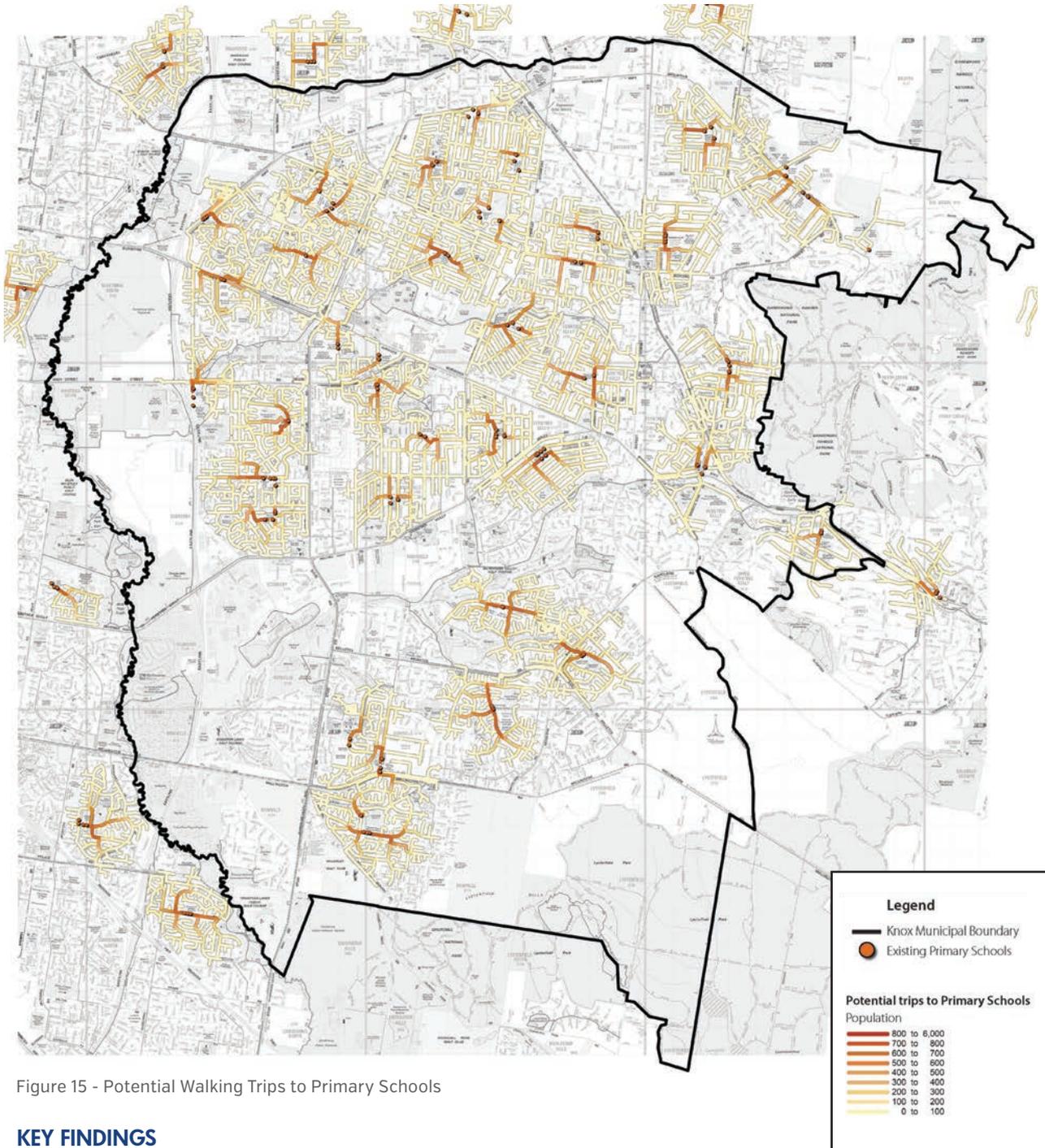


Figure 15 - Potential Walking Trips to Primary Schools

KEY FINDINGS

A walking catchment of 1km was used for the 38 primary schools located within Knox. There are more primary schools (almost double) than secondary schools with good distribution across the municipality. An additional seven primary schools were included in the analysis as they fall within a 1km walk of the study area.

Across the municipality there is high levels of accessibility, particularly in the north, along roads that connect to each school.

ACCESS TO SECONDARY SCHOOLS

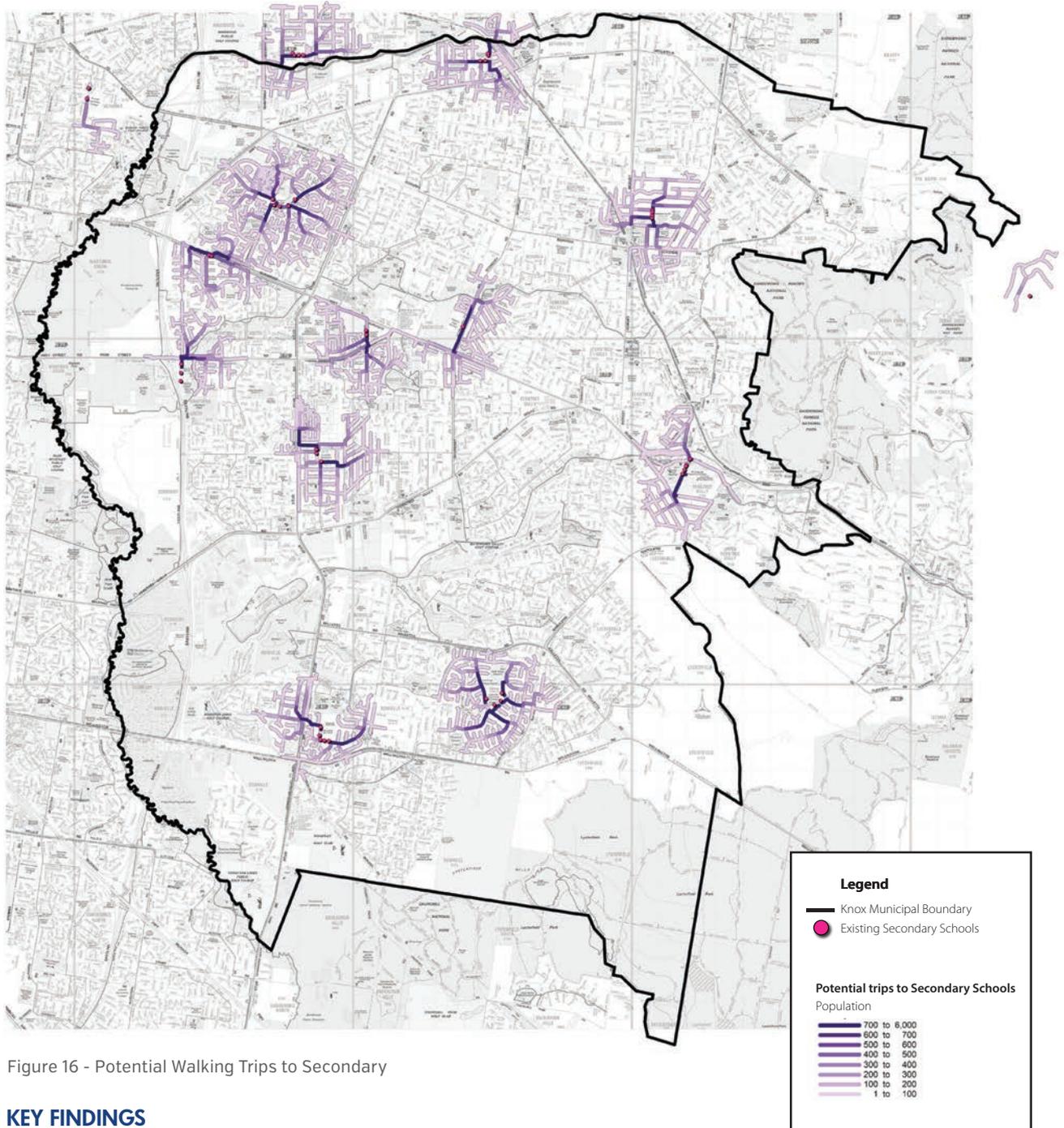


Figure 16 - Potential Walking Trips to Secondary

KEY FINDINGS

A walking catchment of 1km was used for the secondary schools located within Knox. Six secondary schools are located within the study area, and an additional two schools were included because they fell within a 1km catchment. In comparison to primary schools, there are significant gaps in the secondary school network.

There are large gaps in Boronia, east of Stud Road, as well as to the south of the Burwood Highway in Ferntree Gully and across Wantirna South. The analysis reveals localised access to the secondary schools along major roads and local streets.

ACCESS TO TERTIARY INSTITUTIONS

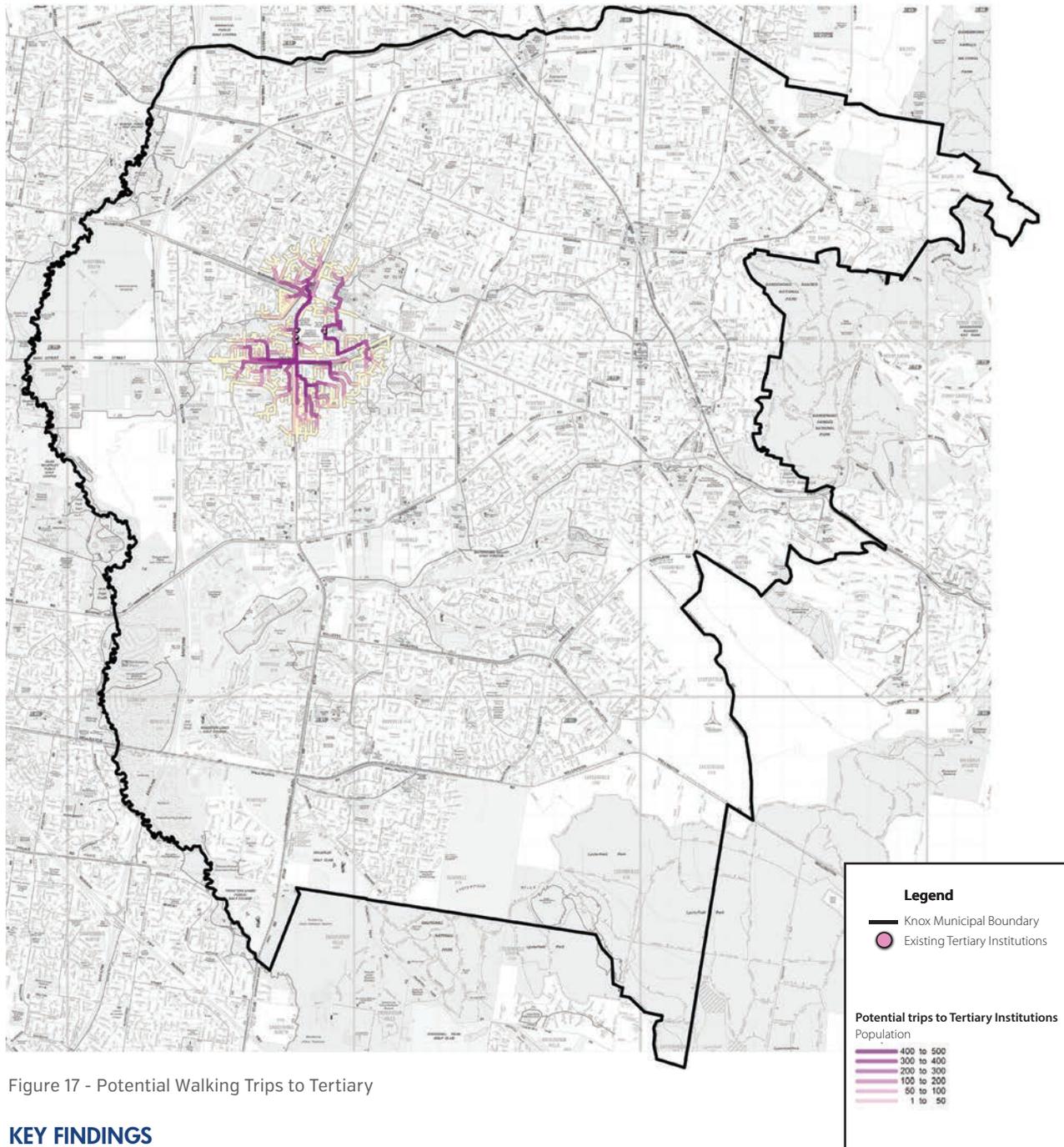


Figure 17 - Potential Walking Trips to Tertiary

KEY FINDINGS

As there is only one tertiary institution within Knox, the Wantirna campus of Swinburne University, the walking catchment for access to tertiary education facilities was increased to 1.5km to reflect the increased likely distance pedestrians would travel to the campus.

Located on Stud Road the large campus extends to Tyner Road. The Burwood Highway is a short walk to the north. With multiple entry and exit points to the campus the results show key pedestrian routes radiating from the campus.

ACCESS TO CHILDCARE FACILITIES

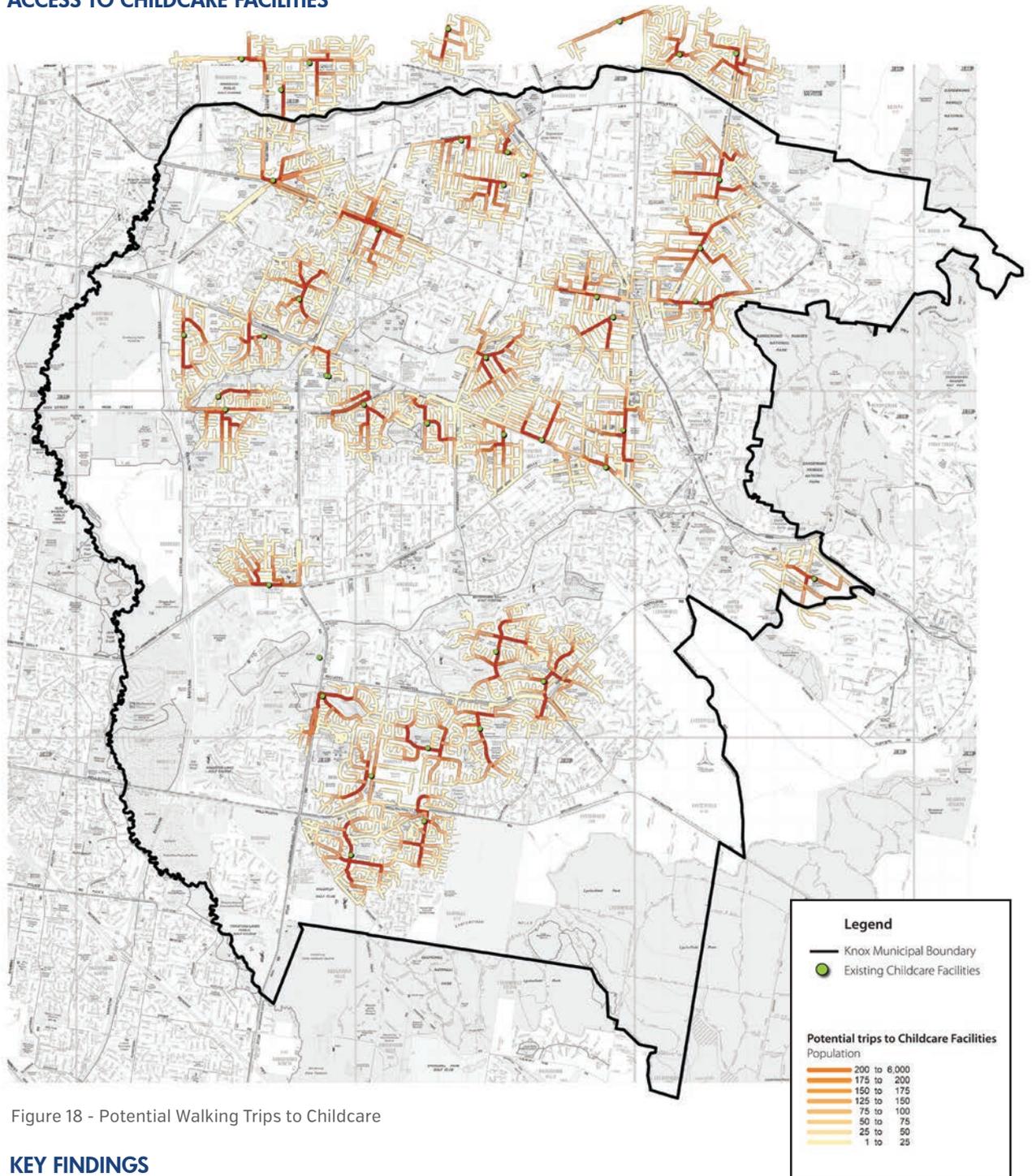


Figure 18 - Potential Walking Trips to Childcare

KEY FINDINGS

The majority of childcare facilities are located in the northern suburbs of Knox, with the southern facilities concentrated in Rowville. A walking catchment of 1km was used in the analysis.

ACCESS TO HEALTH FACILITIES

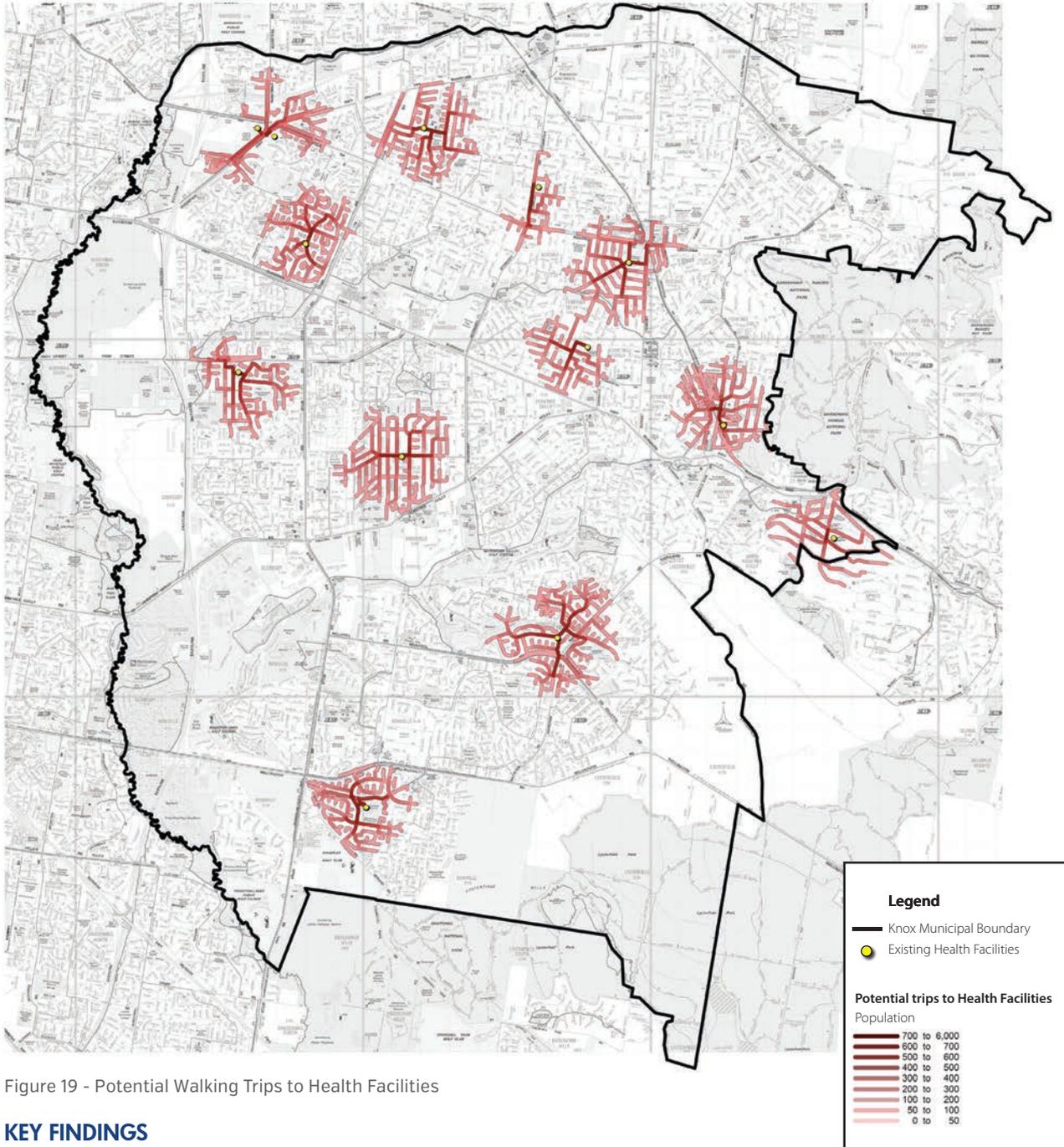


Figure 19 - Potential Walking Trips to Health Facilities

KEY FINDINGS

The distribution of 13 health facilities in Knox is concentrated in the core of the municipality, as well as clustering along Stud Road. Health facilities are usually located on key road intersections or in close proximity to a retail centre. As a result, the analysis shows there is high levels of access to health facilities. The walking catchment used in the analysis was 1km.

ACCESS TO COMMUNITY FACILITIES

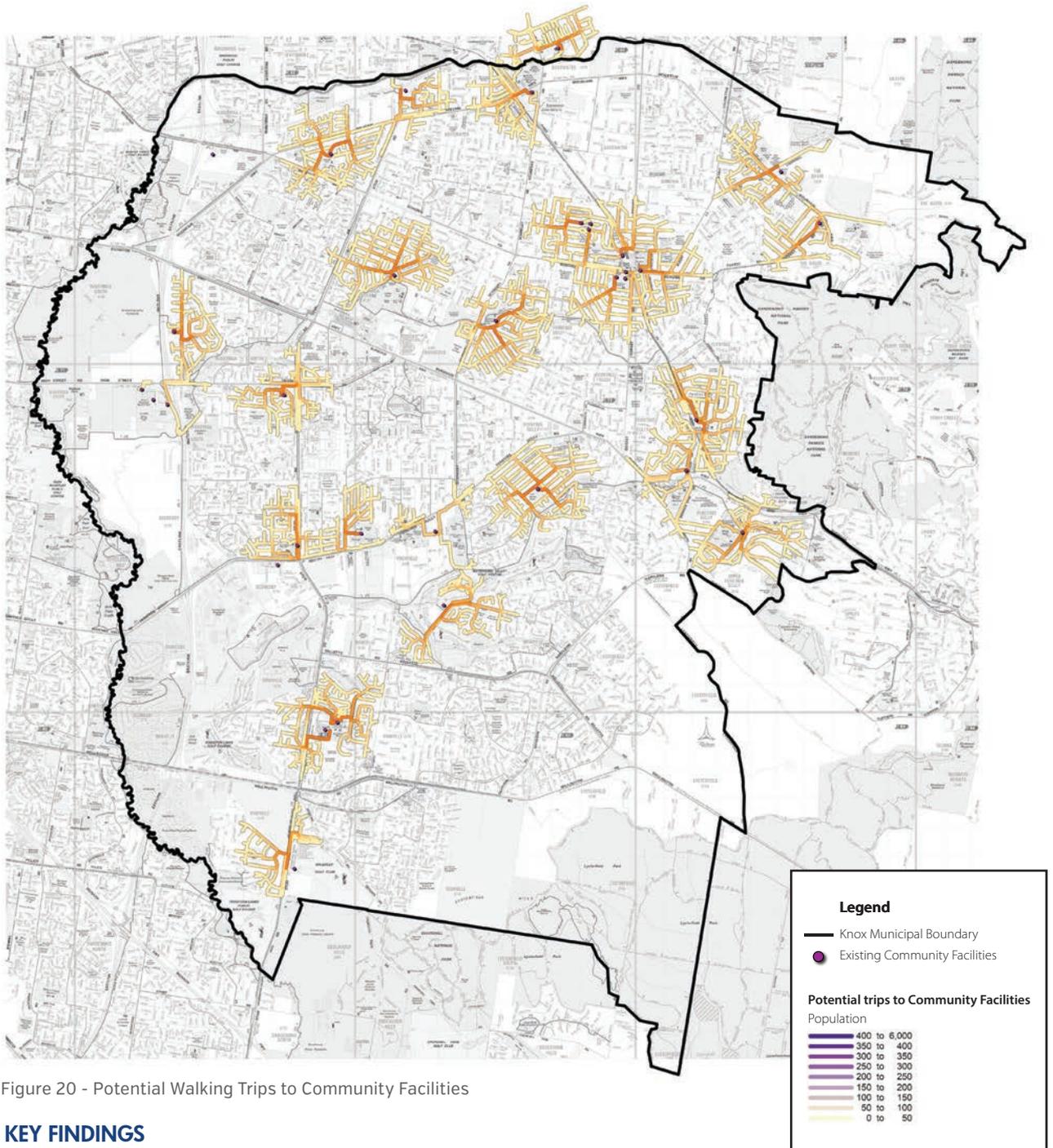


Figure 20 - Potential Walking Trips to Community Facilities

KEY FINDINGS

The results of health facilities are similar to the distribution of 28 community facilities in Knox is concentrated in the north of the municipality, as well as clustering along Stud Road. Interestingly, community facilities tend to be located alongside health facilities. As a result the analysis shows there is high levels of access to the community facilities across the municipality. The walking catchment used in the analysis was 1km.

ACCESS TO MAJOR OPEN SPACE

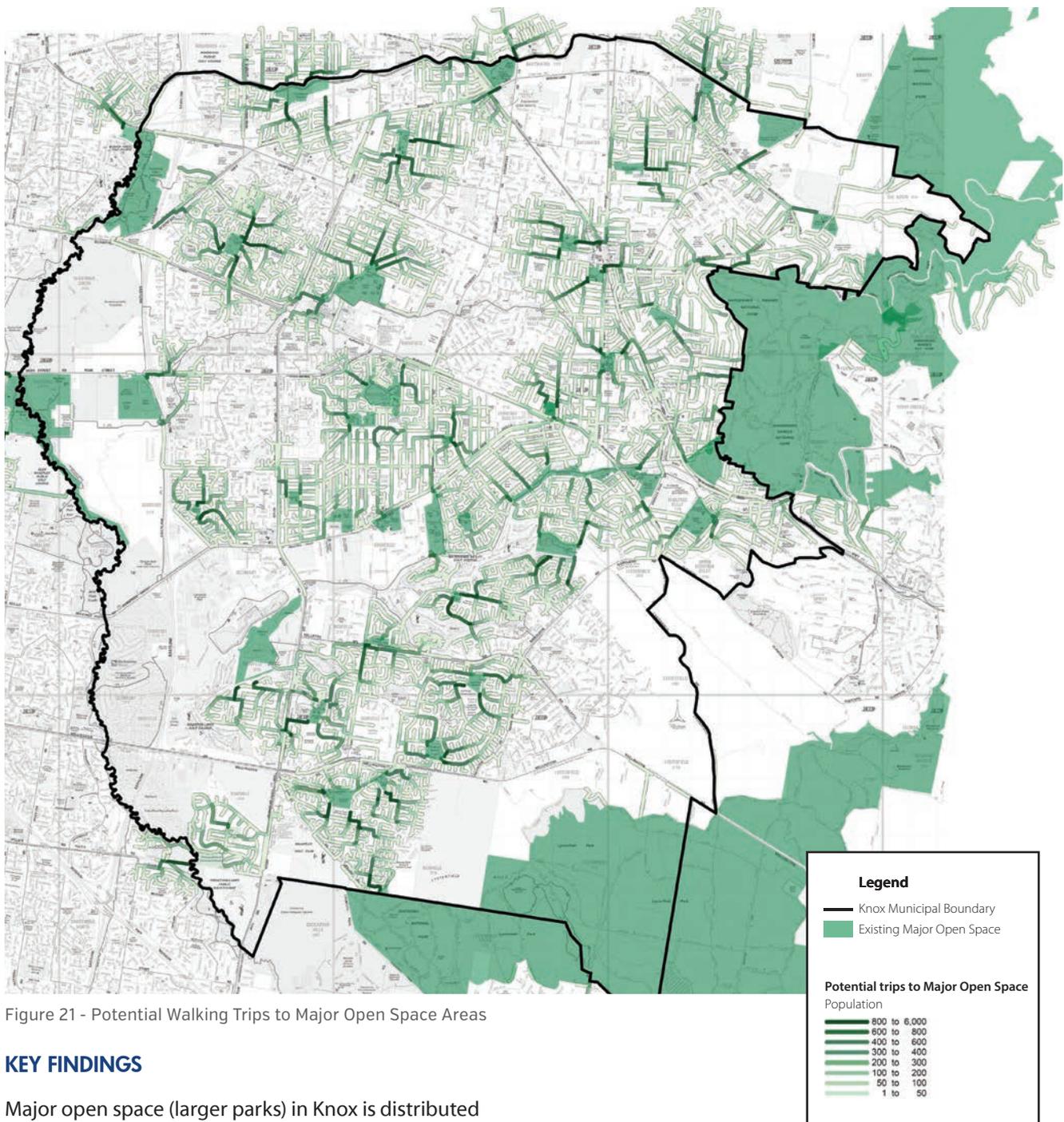


Figure 21 - Potential Walking Trips to Major Open Space Areas

KEY FINDINGS

Major open space (larger parks) in Knox is distributed evenly across the municipality. Major open space was separated out for analysis to reflect their importance as a key destination.

A 1km walking catchment was used. The results reveal a high level of access radiating from each of the major open space destinations.

ACCESS TO ALL OPEN SPACE

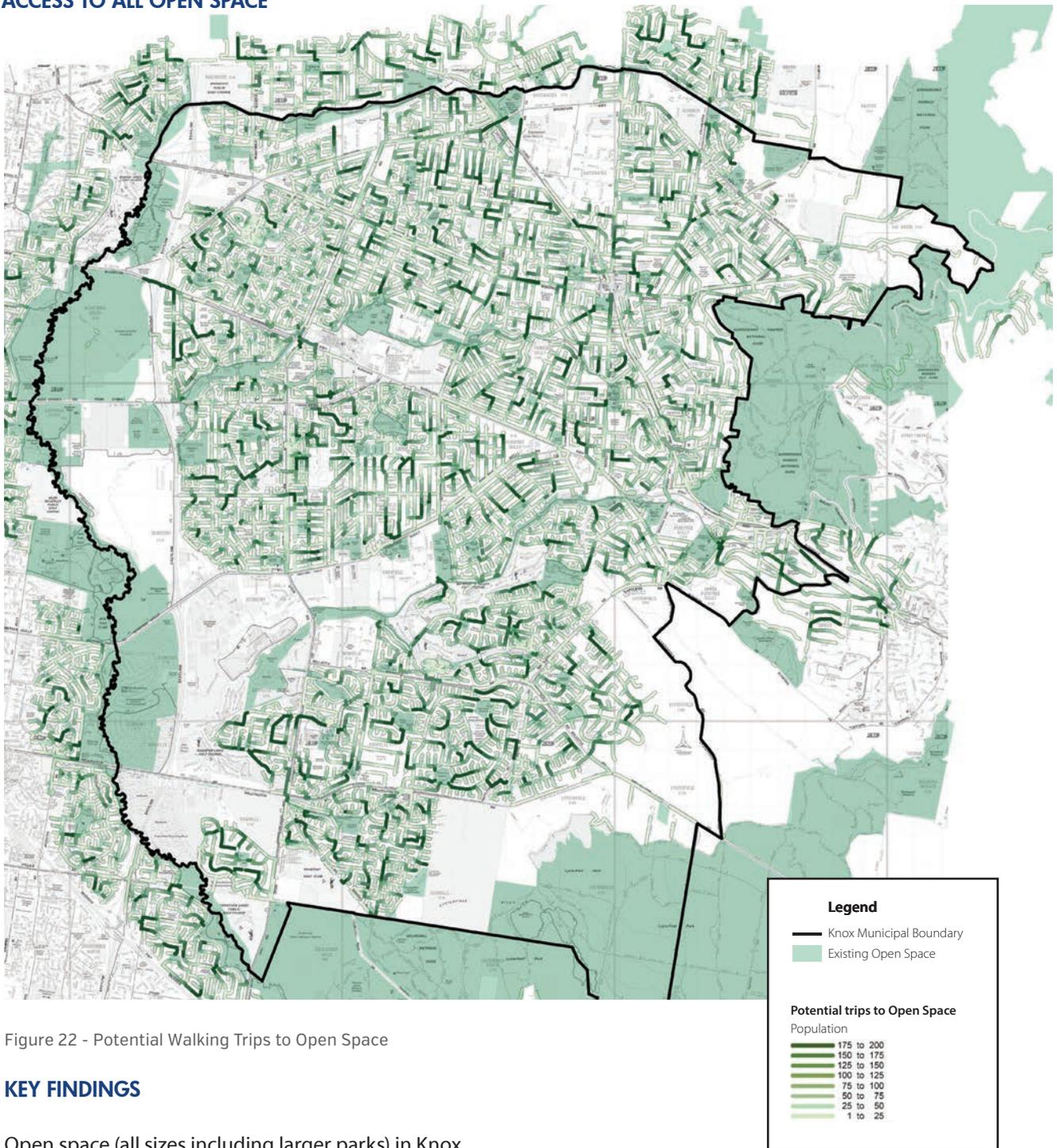


Figure 22 - Potential Walking Trips to Open Space

KEY FINDINGS

Open space (all sizes including larger parks) in Knox is distributed evenly across the municipality and compensate for the gaps in the major open space network.

These gap areas include along Scorseby Road between Bayswater and Boronia, as well as between Knoxfield and Ferntree Gully, in Wantirna South (radiating out from Knox Gardens), and to the east of Rowville.

3.2.1 COMBINED ACCESS MAPPING

To reveal the level of pedestrian accessibility within Knox, the shortest route analysis for the 12 destination types was combined into one map (see Figure 23 opposite).

A weighting to each of the destination types was applied to reflect the relative proportion of residents likely to travel to each destination type. The weighting applied to the destination categories were:

- Train Stations - 100%
- Smartbus Stops - 66%
- Bus Stops - 33%
- Retail (Major) - 100%
- Retail (All) - 66%
- Primary Schools - 33%
- Secondary Schools - 33%
- Tertiary Institutions - 66%
- Kindergartens - 33%
- Childcare Facilities
- Community Facilities - 33%
- Health Facilities - 16.5%

The Combined Access Map shows that potential pedestrian trips are generally concentrated adjacent areas where multiple destinations are located, such as transport stops, retail shops, and community facilities. This results in high levels of access being located in and around train stations located along the Belgrave Line, as well as Knox's main activity centres and retail strips.

Pedestrian activity generally dissipates further away from each activity centre, and areas where there are destinations located within close proximity of one another.

3.2.2 ACCESS TO KEY DESTINATIONS (COMBINED)

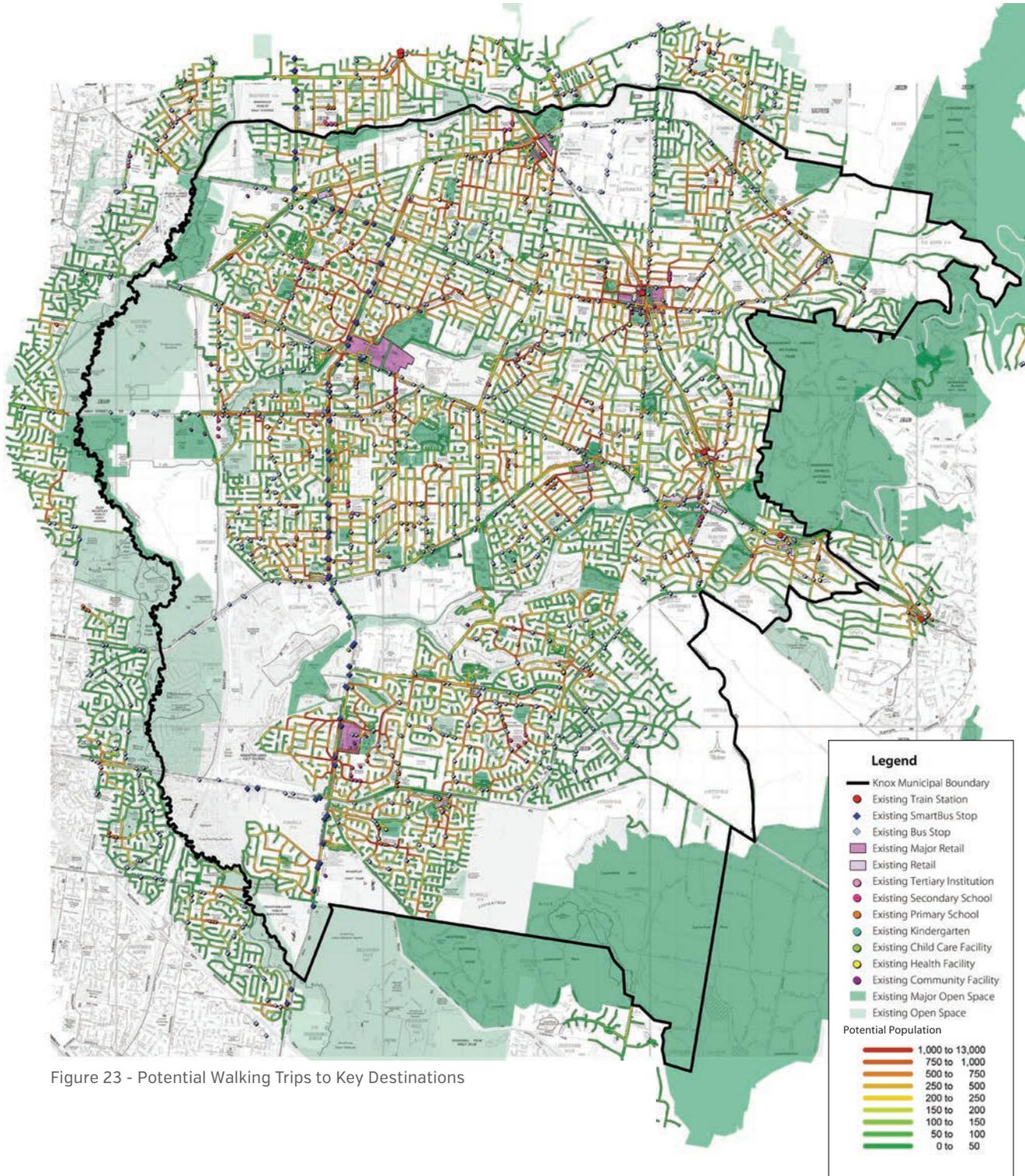


Figure 23 - Potential Walking Trips to Key Destinations

4. MAPPING VALIDATION & VERIFICATION





4.1 FUTURE POPULATION PROJECTIONS

4.1.1 PURPOSE

The consideration of future projections in the land use, population, and infrastructure forms an important part in ensuring the PPN remains applicable as the municipality changes. This requires the PPN to accommodate Council's future vision for its activity centres, any structure planning previously or currently being undertaken and projections of growth in Knox's residential populations.

4.1.2 FUTURE POPULATION PROJECTIONS

Statistics on the future population for the entire study area was sourced for the period between 2011 and 2036 from work undertaken by .id Consulting. These have been made publicly available on the Forecast.Id website.

The following steps were undertaken to determine future population projections within the Knox City Council:

- Centroids for known future residential development sites contained on the Forecast.Id website was mapped and a population value was attributed to each site. The population figure recorded for each development was based on the projected average number of residents per dwelling in 2036.
- Population growth projections for each suburb within the study area were sourced from the Forecast.Id website to capture population growth outside of known development. The projected population growth for each suburb was proportioned to each residential origin according to the level of change.
- In addition to the Forecast.Id data, several known broad hectare strategic sites were identified by Council and have been mapped as future origins. An indicative street network was also created for these future developments.

4.1.3 ACCESS TO KEY DESTINATIONS (COMBINED) - FUTURE SCENARIO

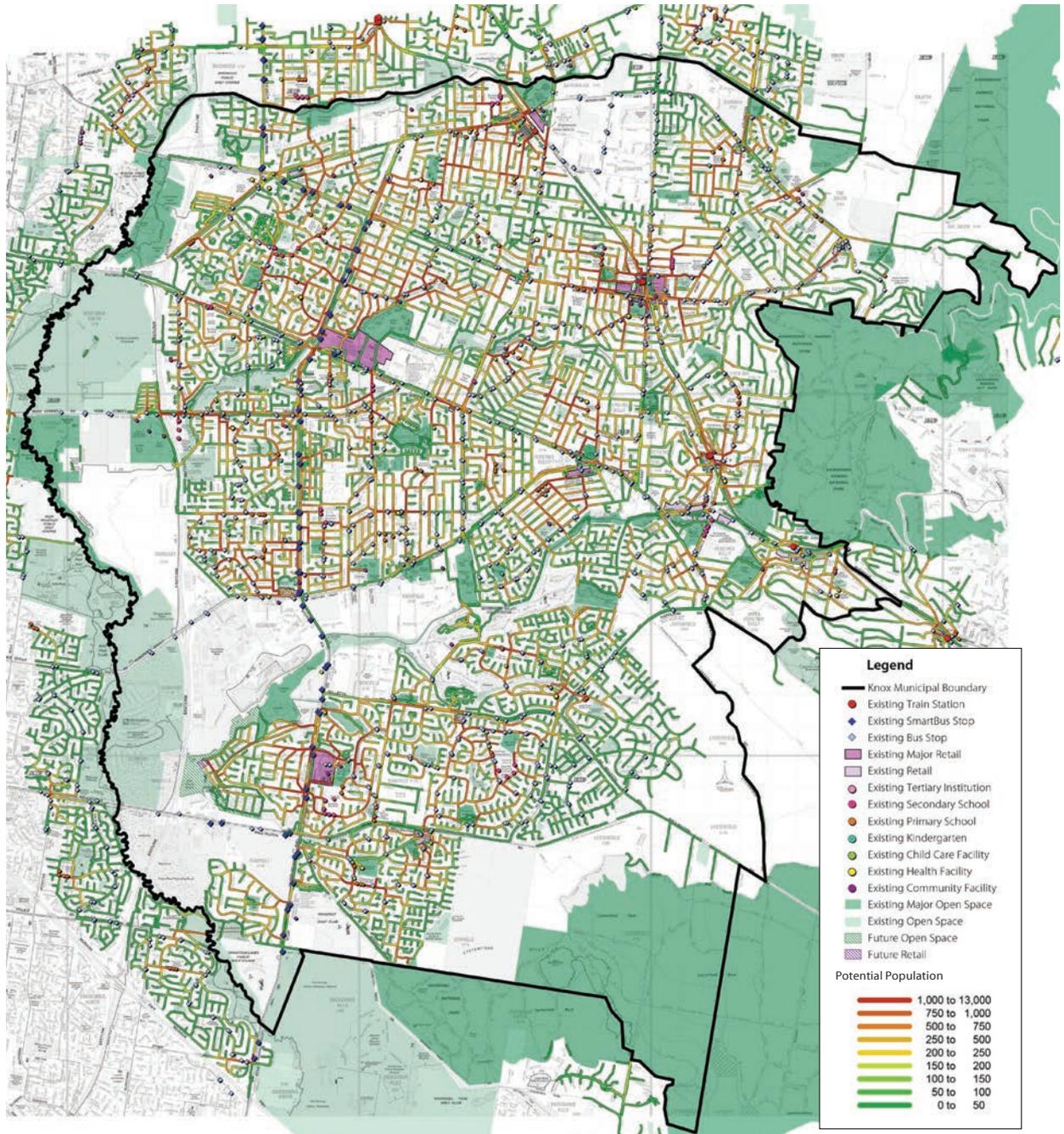


Figure 24 - Potential Walking Trips to Key Destinations [Future Scenario]

The combined access for the future population scenario has been generated using population values forecasted for the City of Knox in 2036.

Figures 24 and 25 overleaf, indicate a general increase across the entire pedestrian network, reflecting population growth across the whole municipality. In particular, the analysis indicates a high increase

in potential pedestrian trips along east west streets within the Rowville activity centre. Streets surrounding the Boronia activity centre also show a significant increase in potential pedestrian trips.

This plan also shows future open space and retail uses within the Kingston Links development in Rowville.

4.1.4 PROJECTED INCREASE TO COMBINED ACCESS MAP

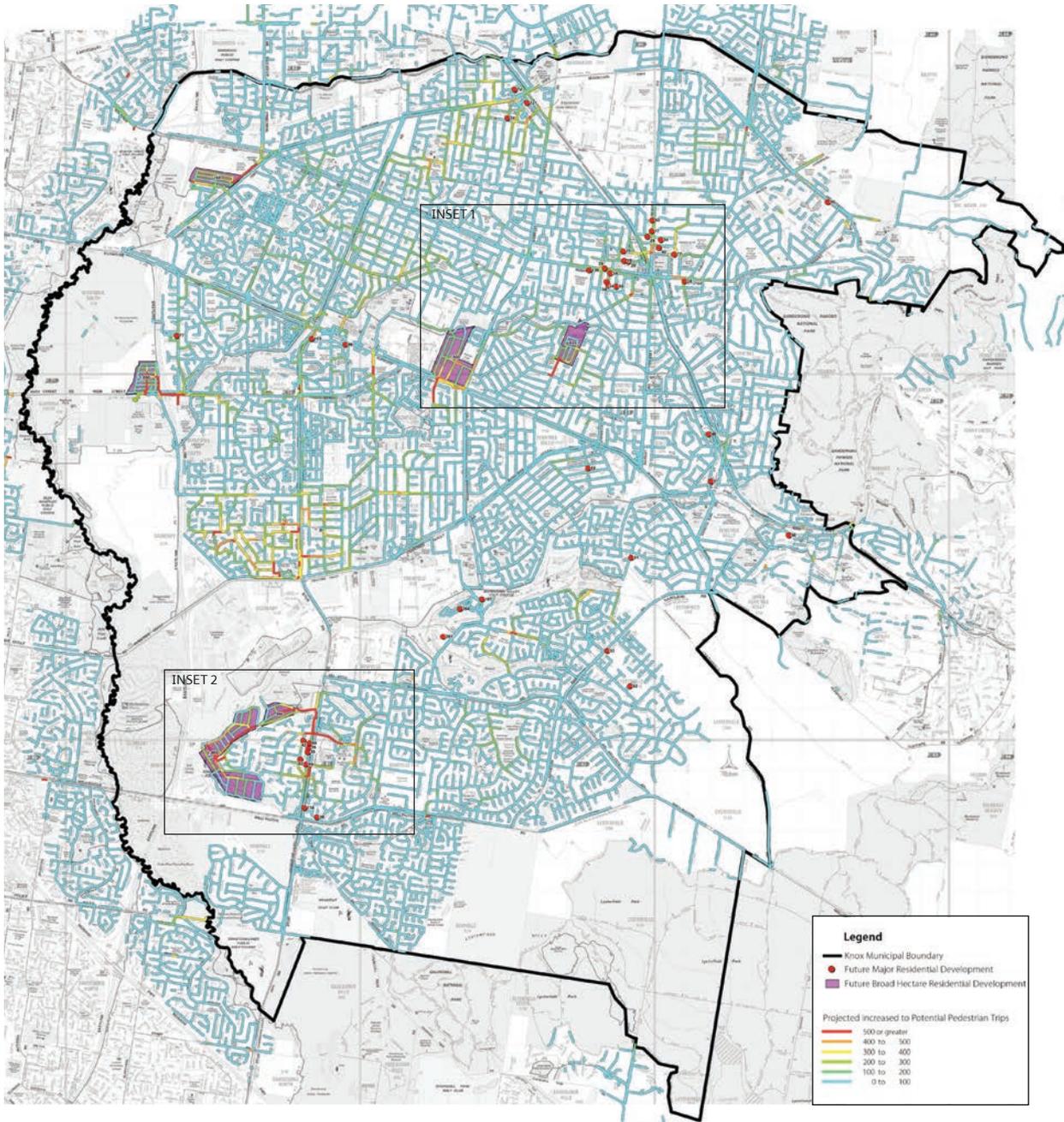
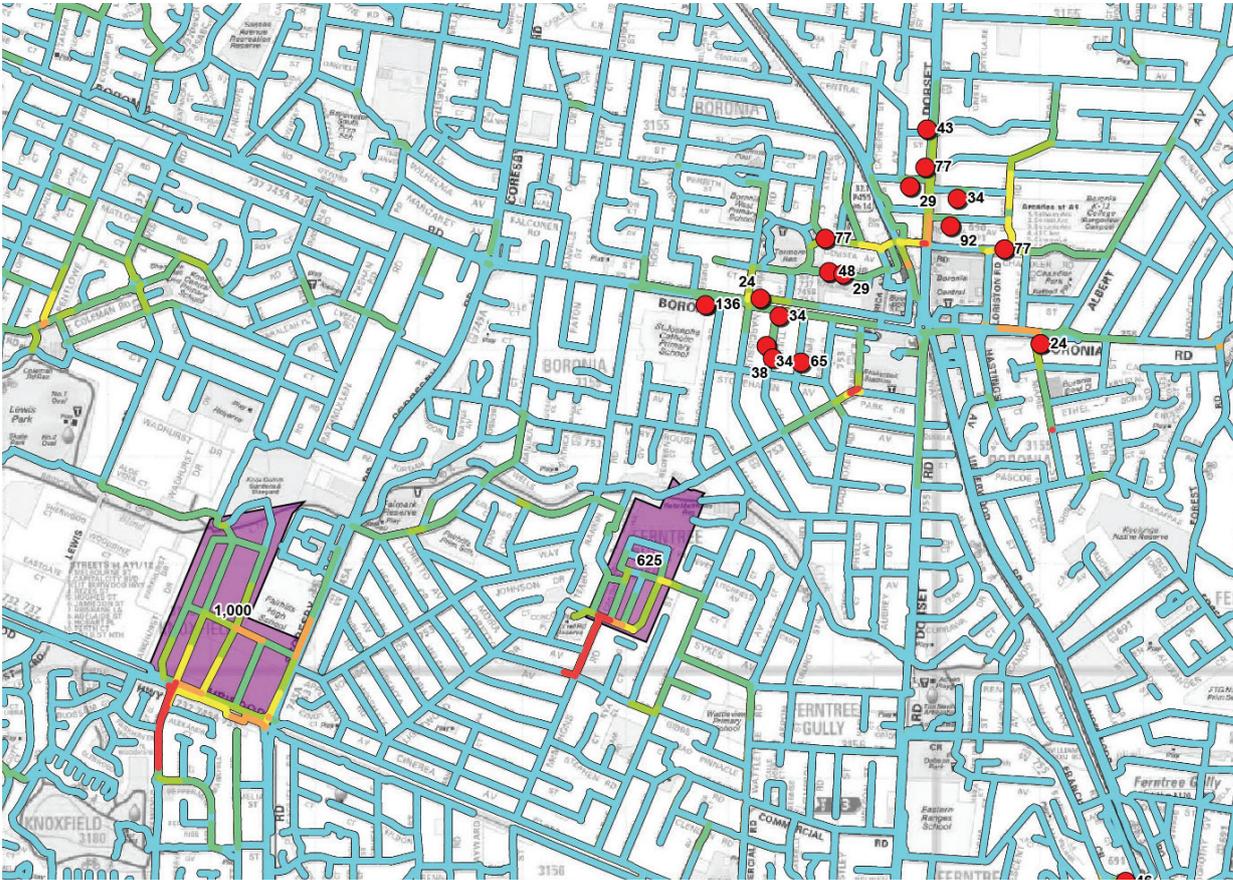


Figure 25 - Future Population Change across Knox and Surrounding Suburbs

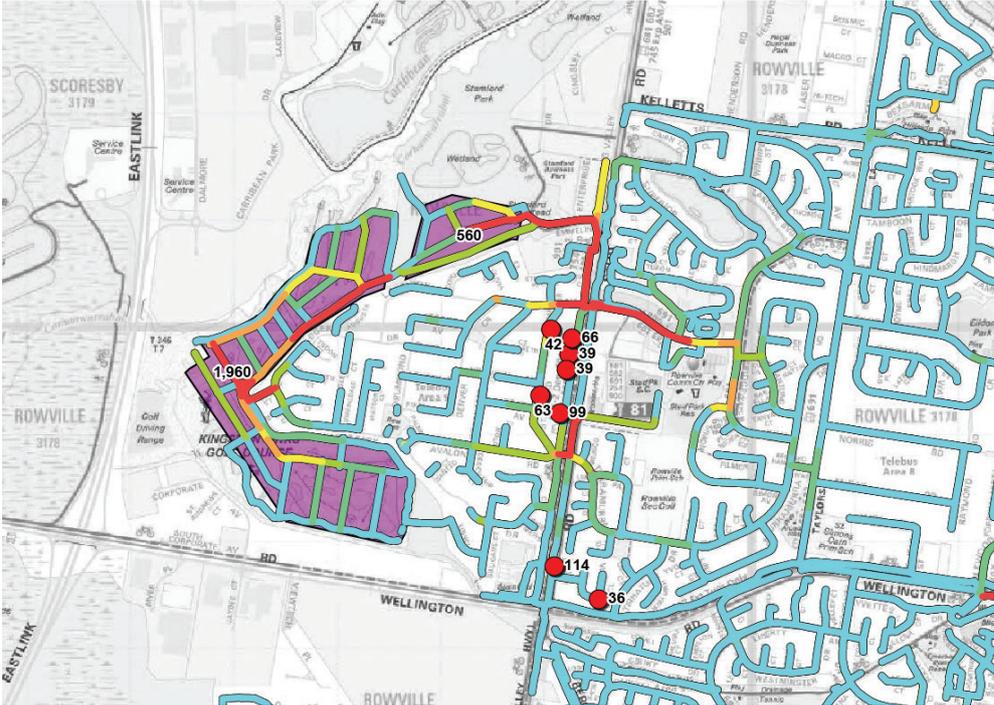
Figure 25 illustrates the difference between the potential pedestrian trips based on existing population and the potential pedestrian trips based on the projected 2036 population.

It verifies that change will be most significant around strategic sites across the municipality. These include areas around Rowville such as the proposed

Stamford Park and Kingston Links developments, and apartment development along Stud Road. There are also a number of apartment developments located around the Boronia activity centre resulting in a greater number of potential pedestrian trips.



Inset 1 - Boronia



Inset 2 - Rowville

4.2 PEDESTRIAN COUNTS

Pedestrian counts are an important part of the verification process of the shortest route analysis. Counts are undertaken primarily to compare the shortest route mapping with actual usage of Knox's pedestrian routes. Counts were undertaken at key intersections across the municipality, however an emphasis was placed on intersections where it was considered that the predictions of the shortest route analysis may have been too high.

Counts were undertaken at 24 locations within Knox. These locations provided a broad sample across the geographic area of the municipality. The data captured the direction in which pedestrians were travelling at each count location, enabling a fine-grain analysis of movement at key intersections.

The pedestrian counts were undertaken over two days:

- 26 February 2016, between 7am and 7pm (in Bayswater and Boronia)
- 16 December 2016, between 7am and 7pm (balance of the municipality in Figure 26).

Counts were undertaken mid week and during good weather conditions to ensure results are representative of a typical day. While this produces some insight to the movement of pedestrians along pedestrian count locations, additional counts across different days of the week would result in a more accurate understanding of pedestrian movement.

4.2.1 PEDESTRIAN COUNT RESULTS

Figure 26 shows the locations where the pedestrian counts were undertaken and the count results, overlaid on the shortest route analysis. The arrows show the direction in which pedestrians were travelling, and are coloured according to the proportion of pedestrians recorded. Where the colours of the shortest route mapping are similar to those of the pedestrian counts, the results of the counts align with the prediction of the shortest route analysis.

4.2.2 PEDESTRIAN COUNT LOCATIONS

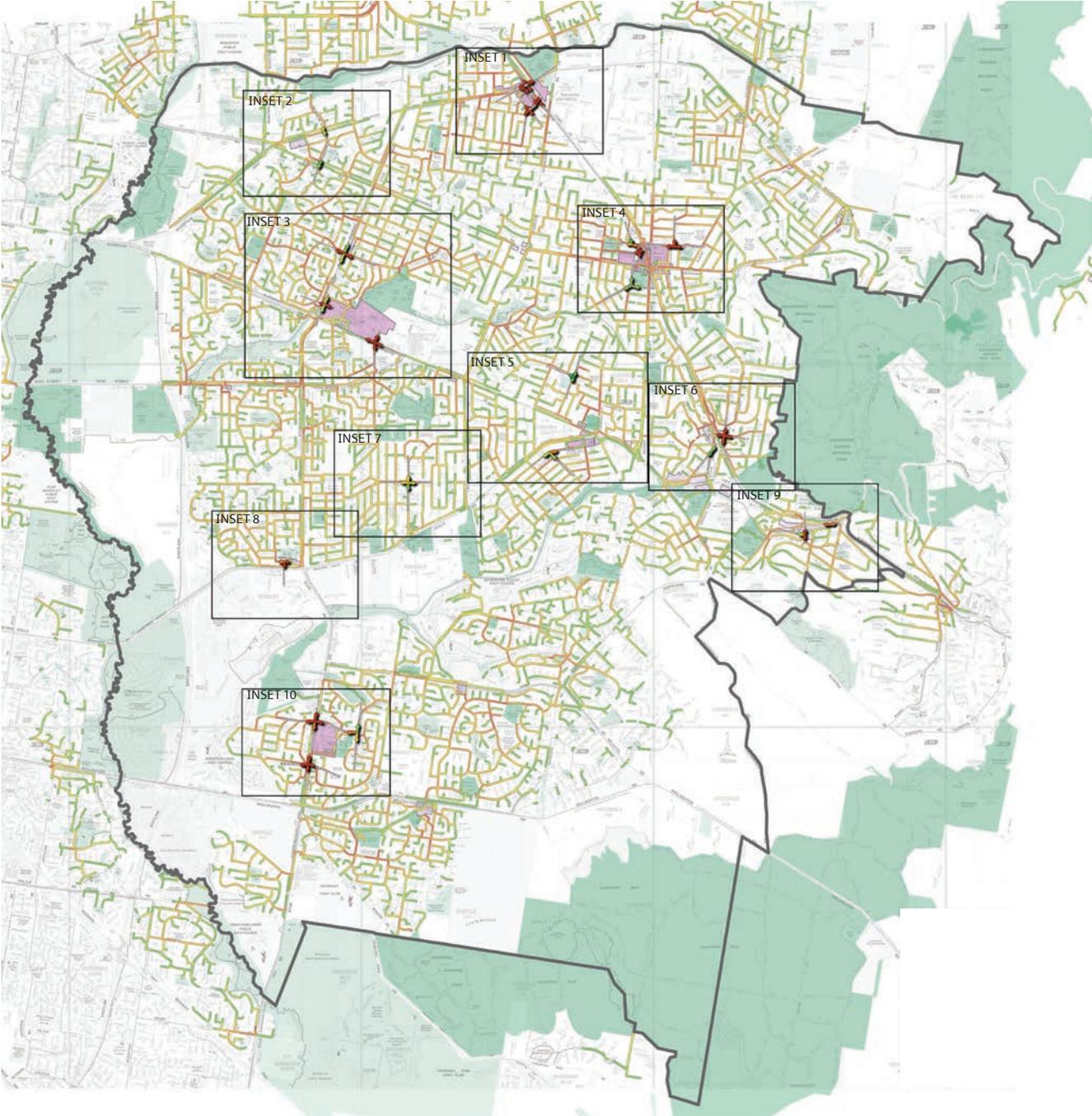


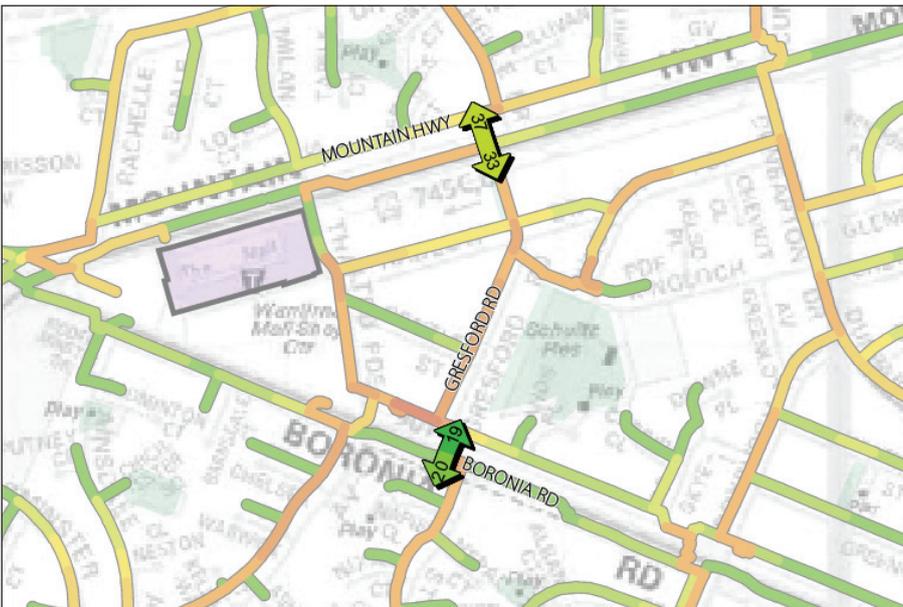
Figure 26 - Comparison of Pedestrian Count Results and Combined Shortest Route Analysis

4.2.3 PEDESTRIAN COUNT FINDINGS



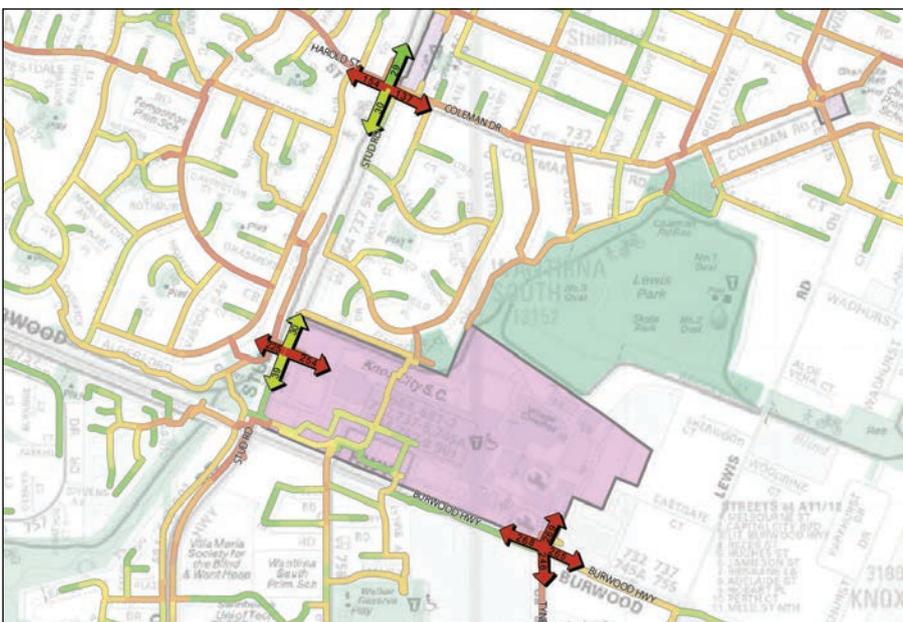
Inset 1 - Bayswater

The highest counts were recorded at this intersection in Bayswater, due to its proximity to key destinations such as the train station, shopping centre, schools and open space.



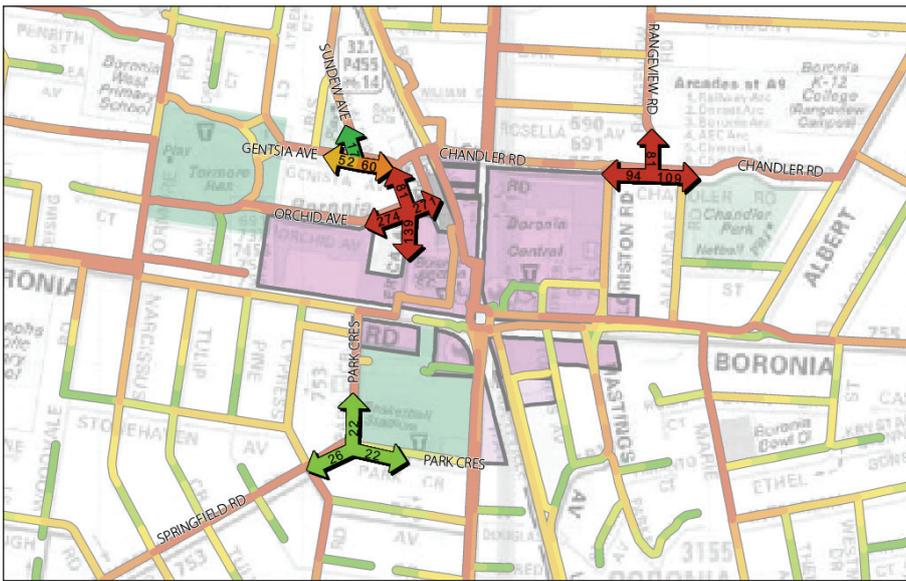
Inset 2 - Wantirna

Pedestrian activity around Gresford Road was the lowest recorded in the municipality. Count results were lower than predicted possibly due to the difficulty in crossing Boronia Road (wide crossing with no signals).



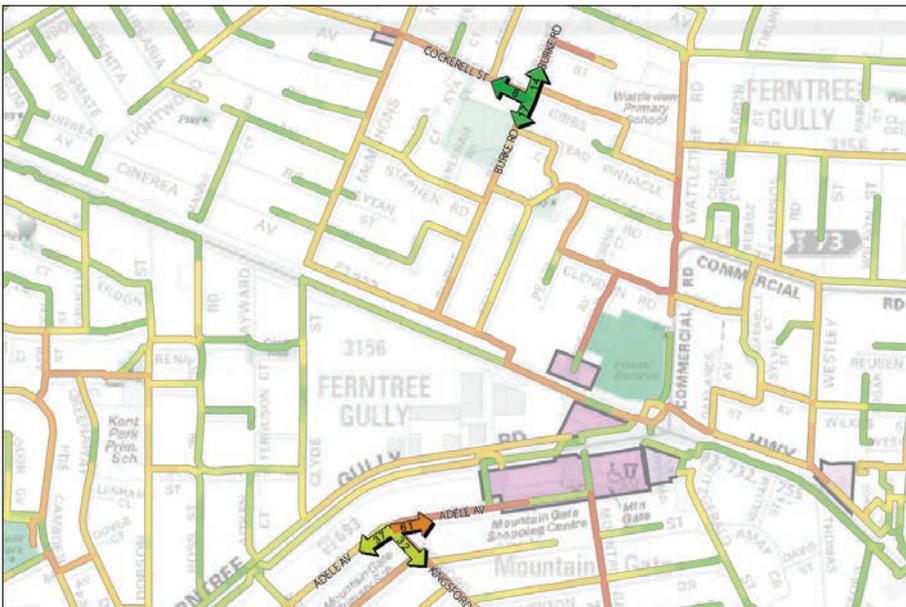
Inset 3 - Wantirna South

High count results were recorded around Knox Central (identified as a hot spot in the 2005 Pedestrian Plan), particularly at the shopping centre entrance off Burwood Highway. Although these are wide intersections, they have signalised pedestrian crossings and connect to multiple pedestrian paths.



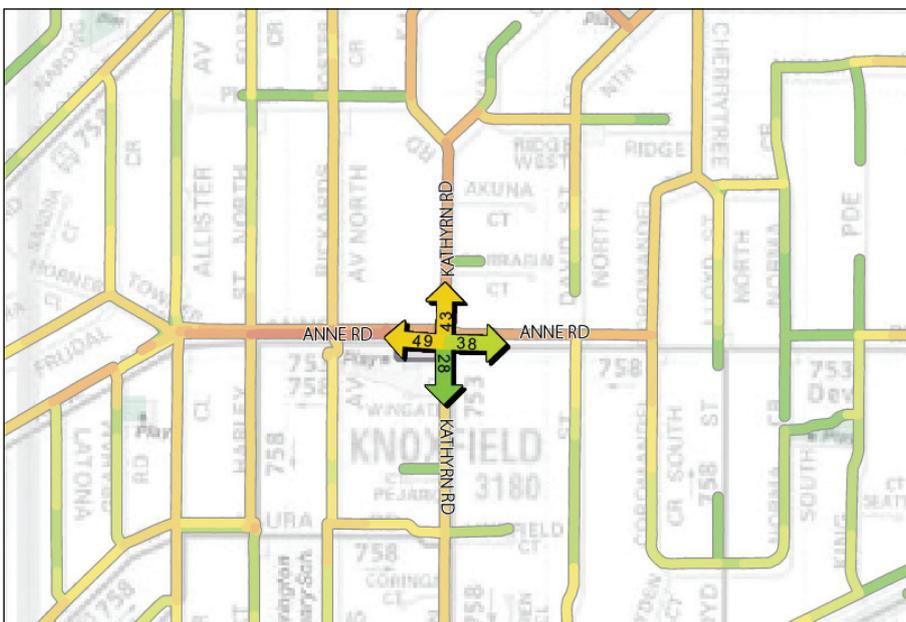
Inset 4 - Boronia

Whilst the counts recorded the intersections on the northern side of Boronia Road were high, the intersection south of Boronia Road recorded one of the lowest counts in the municipality. Difficulty in crossing Boronia Road, as well as missing sections of footpath along Springfield Road discourages pedestrian activity.



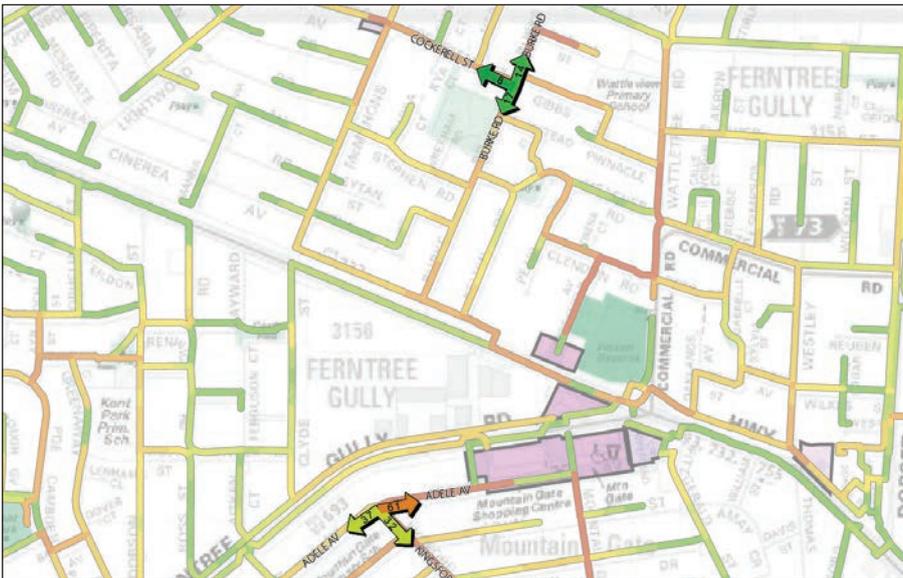
Inset 5 - Mountain Gate

Although a low pedestrian count was recorded at the Adele Avenue and Lydford Road intersection, this is an important pedestrian route because it provides a connection between the Mountain Gate Primary School and the local retail centre (and was identified in the 2005 Pedestrian Plan).



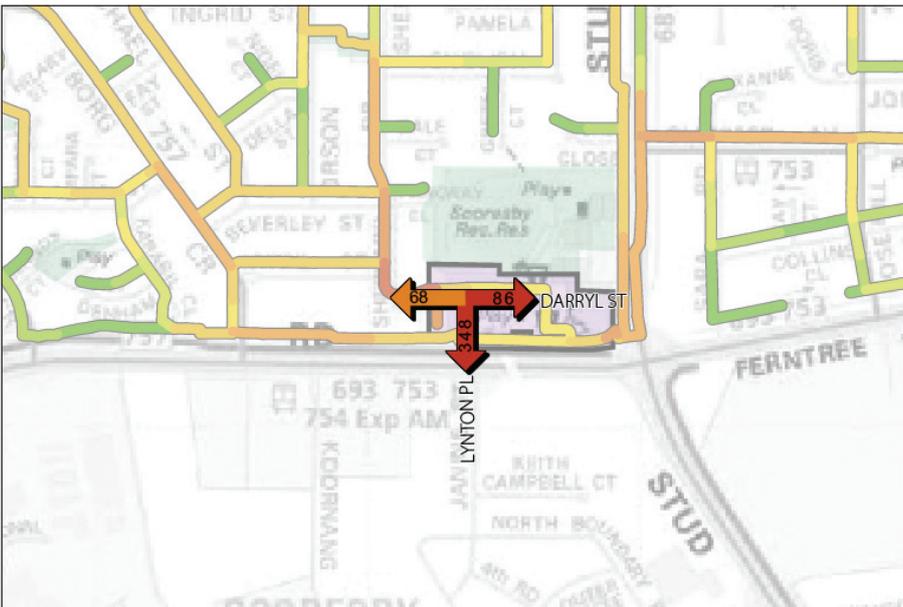
Inset 6 - Knoxfield

The shortest route analysis had predicted higher activity than what actually occurs. In reality there may not be a lot of pedestrian activity that occurs between the local shopping centre and the preschool.



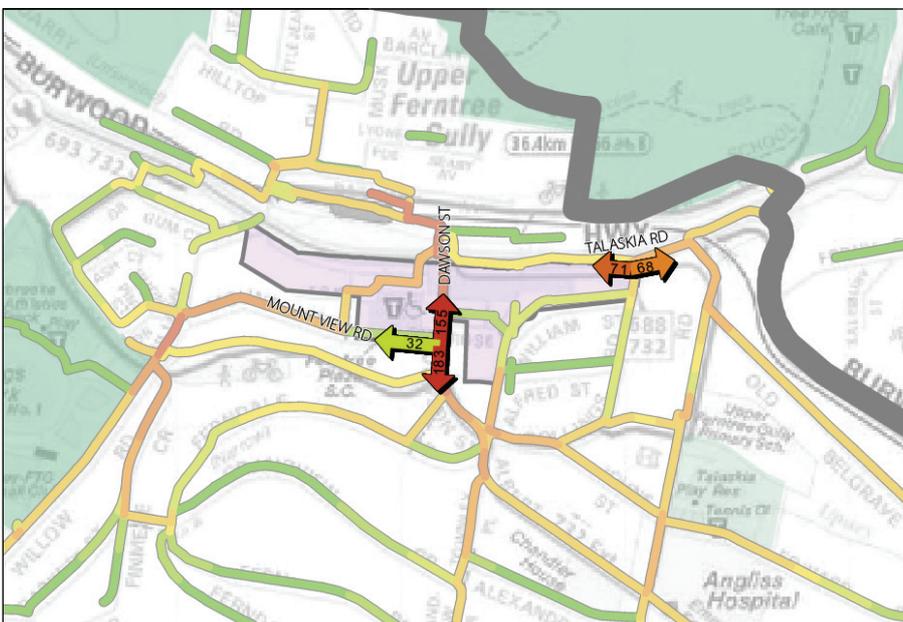
Inset 7 - Ferntree Gully

A very low pedestrian count was recorded at the Station Street and Selman Avenue intersection, in comparison to very high count recorded at the Forest Road and Alpine Street intersection. The count reveals limited pedestrian activity occurs between the train station and St Johns School.



Inset 8 - Scoresby

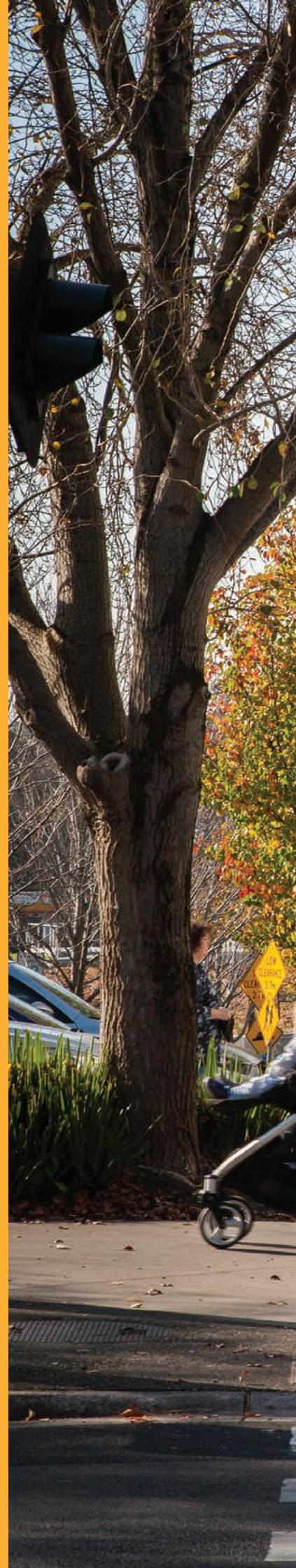
The pedestrian counts revealed that the Darryl Street and Lynton Place intersection in Scoresby as the second highest area of pedestrian activity. Pedestrian activity primarily occurred along Lynton Place which connects Ferntree Gully Road to the local retail centre.



Inset 9 - Upper Ferntree Gully

The counts undertaken at the Mountain View Road and Dawson Street intersection was very high. Dawson Street is one of the key north south connections into the local retail centre and the safest, central crossing point to the train station.

5. THE PRINCIPAL PEDESTRIAN NETWORK





BAYZIE CAFE

LEE LEE
HOT BREAD

5.1 DELINEATING THE PPN

The pedestrian access mapping analysis and validation undertaken in Stages 1 and 2 provided the major input for delineating the PPN.

The shortest route mapping provided an estimate of the potential volumes of pedestrian trips along key streets in the municipality. The pedestrian counts provided validation of the shortest route mapping. Local knowledge from Council officers also provided another level of validation and identification of additional routes.

The PPN is delineated in two categories:

- **Primary Routes** - These routes form the foundation of the PPN where a high level of pedestrian priority is assigned. These routes will be a major focus for the implementation of future walking infrastructure improvements.
- **Existing Trails** - Existing trails provide a high level of priority for pedestrian access and are included as part of the PPN.

5.1.1 CONSIDERATIONS FOR DELINEATING THE PPN

The following principles provided the key considerations for delineating the PPN:

- Links that were shown to **carry a significant number of potential pedestrian trips in the shortest route mapping** were included.
- **Links that recorded significant numbers of pedestrians** through the pedestrian counts were included.
- **Key shopping strips** were included. The shopping strips did not always appear as popular routes in the shortest route mapping because of the locations of the destinations points. These streets however, are known to be a focus for pedestrian activity and therefore, should be incorporated as part of the PPN.
- **Links between key related destinations** were included. Connections between a shopping strip and a major nearby park, or the link between a shopping strip and a major transport node are examples of related destinations.
- **Existing major off-street links** i.e. Ferny Creek and EastLink trails included. These links provide ready-made priority pedestrian infrastructure and will form an important part the PPN.
- **Ensuring a connected network of streets.** The PPN should provide continuous pedestrian priority between key origins and destinations therefore all streets within the PPN should be connected. This may mean that some streets are included in the PPN even when the mapping shows that they have a low number of potential pedestrian trips.

5.1.2 VALIDATING WITH LOCAL KNOWLEDGE

A number of workshops were held to provide Council officers the opportunity to provide feedback on the draft PPN. This step was important in validating the PPN routes given the limitations of the shortest route mapping, and utilised local knowledge and their understanding of the municipality.

5.2 THE PRINCIPAL PEDESTRIAN NETWORK

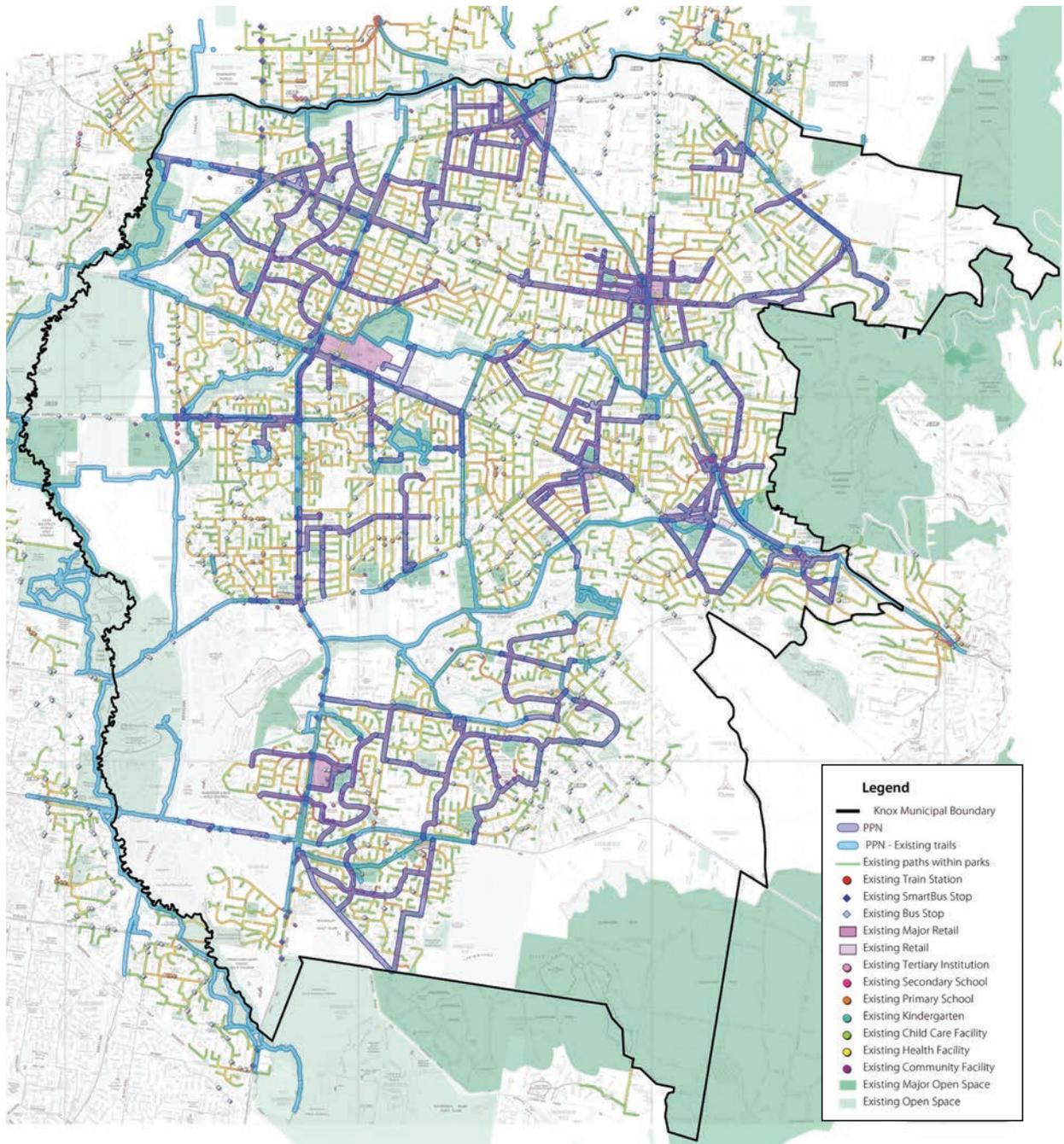


Figure 27 - The Principal Pedestrian Network

The PPN identified in figure 27 is the result of the process of testing and refining key routes against pedestrian counts, future projections and local knowledge.

The PPN includes a network of primary routes in and around activity centres within the study area.

These are the key routes which connect people to transport, shops, education, community facilities and open space.

Existing trails have also been identified as part of the PPN and provide important connections between activity centres.

6. IMPLEMENTATION





6.1 OVERVIEW

The final stage in the PPN project is implementing the network. This section of the report provides a guiding framework for the implementation of the PPN. It identifies missing links between key destinations in the pedestrian network, and the pedestrian improvement projects, as well as outlining the delivery priorities.

To further support the successful delivery of the PPN, integration with the Vic Roads Smart Roads strategy is recommended, and outlined below.

6.2 VICROADS SMART ROADS OPERATING PLAN

The PPN is a valuable tool to promote the need for pedestrian priority on roads in the City of Knox. To ensure the operation of the Knox road network supports pedestrian priority areas, the PPN should be incorporated into the VicRoads SmartRoads Network Operating Plan. (See section 2.2 for detail about the SmartRoads Plan).

Figure 28 identifies how the PPN integrates with the current VicRoads SmartRoads Network Operating Plan for Knox.

It is recommended that Knox City Council initiate amendments and the updating of the Network Operating Plan through discussions with VicRoads. The key steps in the integration process are:

- **Update the Road Use Hierarchy Plan**
This involves advising VicRoads on the findings of the PPN project and working with VicRoads to update the road use hierarchy plan.
- **Develop the Network Operating Plan**
Work with VicRoads to recommend changes to signalised intersections and provision of pedestrian infrastructure along the PPN to reflect the level of service previously assigned.

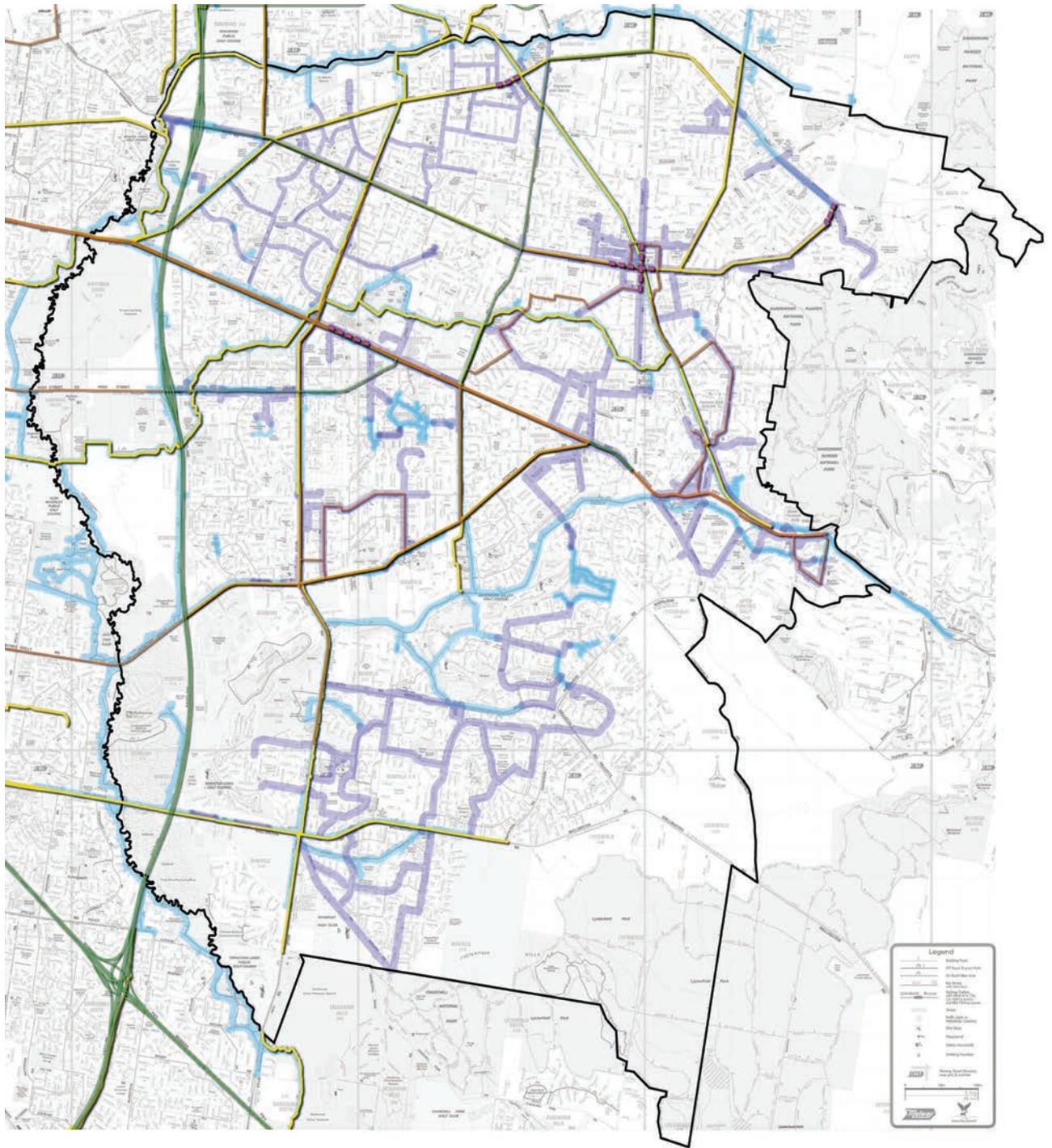
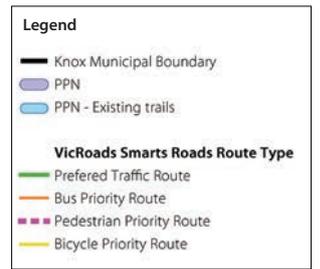


Figure 28 - VicRoads Smart Roads Plan with PPN Overlay



6.3 PEDESTRIAN IMPROVEMENT PROJECTS

Analysis of the PPN was undertaken to identify any gaps in the existing pedestrian network. The audit process identified missing or inadequate pedestrian infrastructure throughout the municipality. The proposed intersection improvements are listed and mapped in section 6.3.1 and the missing links in the pedestrian network are outlined in section 6.3.2.

6.3.1 PROPOSED INTERSECTION IMPROVEMENTS

TRAFFIC SIGNALS LOCATED AT:

- Burwood Highway, Clyde Street intersection (INT-1)
- Stud Road, Police Road intersection (INT-2)
- Mountain Highway, Albert Avenue, Colchester Road intersection (INT-10)
- Burwood Highway, Cathies Lane (INT-13)

PEDESTRIAN SIGNALS LOCATED AT:

- Kelletts Road at Karoo Road intersection (INT-3)
- Napoleon Road at Sovereign Crest Boulevard (INT-4)
- Croydon Scorseby Road at Cambden Park Parade (INT-8)
- High Street, Mowbray Street intersection (INT-14)
- Stud Road, Rosa Street intersection (INT-15)
- Boronia Road, Lewis Road intersection (INT-16)

PEDESTRIAN REFUGE ISLAND LOCATED AT:

- Arcacia Road (INT-6)
- Brenock Park Drive (INT-7)
- Barry Street and Jersey Road intersection (INT-11)

ROUNDBABOUT IMPROVEMENTS LOCATED AT:

- Liverpool Road, Mountain Highway (INT-9)

PEDESTRIAN CROSSING LOCATED AT:

- Napoleon Road at Allora Avenue (INT-5)

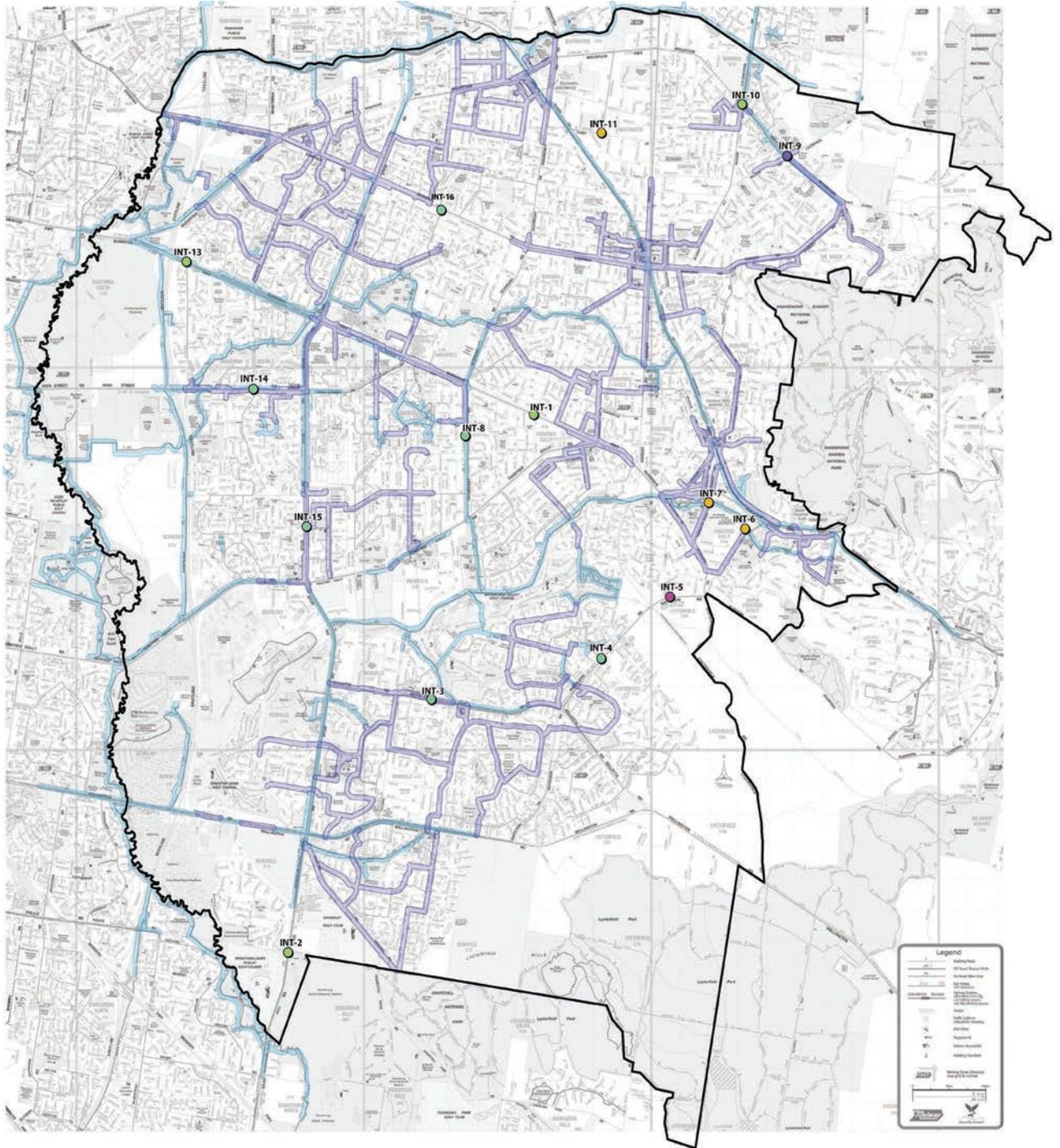


Figure 29 - Proposed Intersection Improvements to support the PPN Network



6.3.2 MISSING LINKS IN THE PEDESTRIAN NETWORK

In order to allocate a delivery priority to each of the identified missing pedestrian links, each link was assessed according to a set of assessment criteria. The criteria included rating the link according to its connectivity, customer request, mobility user requirements and significant biodiversity values. This resulted in a ranking of priority for each path. The Implementation Table opposite lists the results.

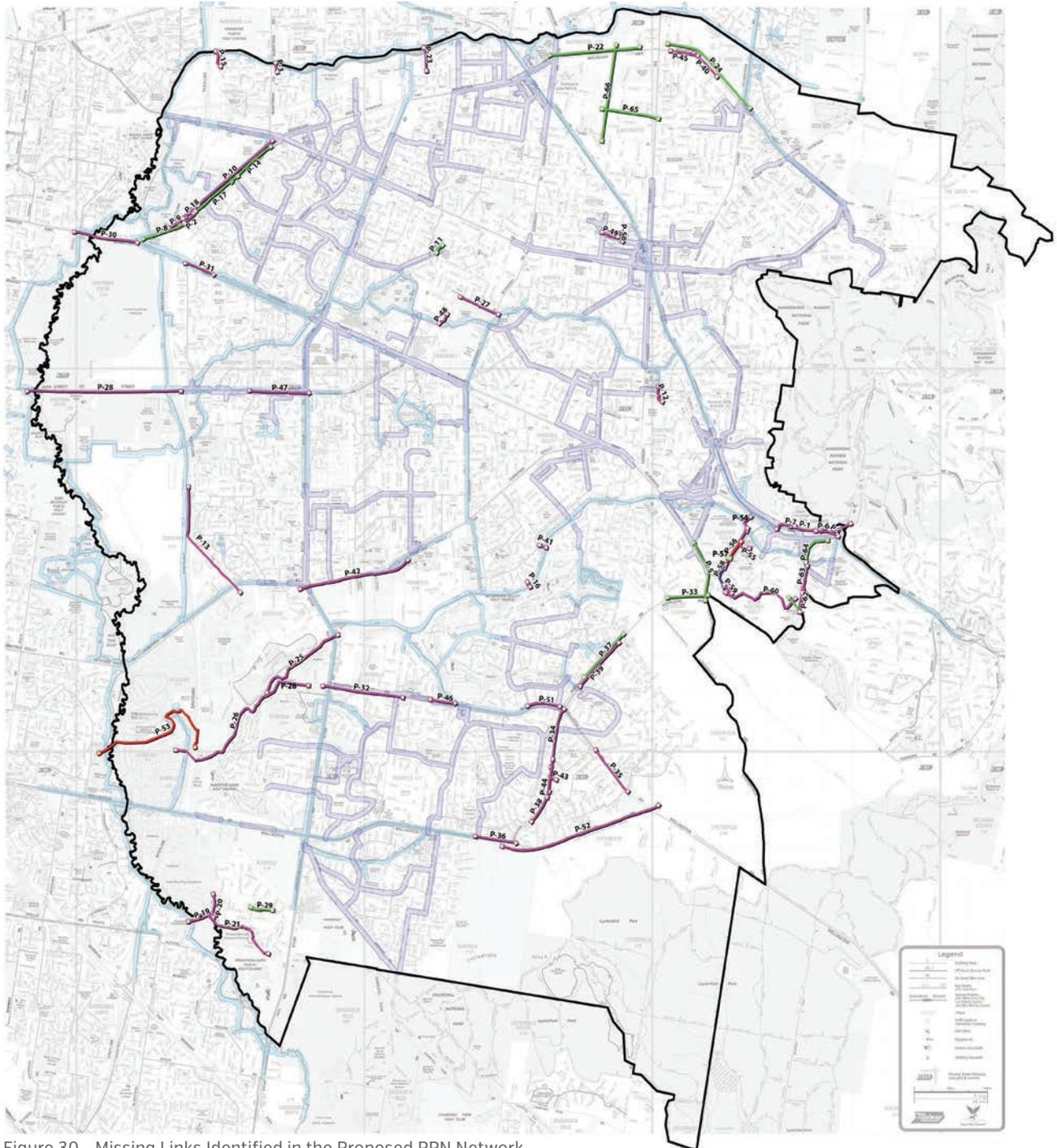


Figure 30 - Missing Links Identified in the Proposed PPN Network



6.4 IMPLEMENTATION TABLE

PRIORITY RATING	LINK ID	LINK NAME	LINK TYPE	ON or OFF ROAD	LENGTH (m)
1	P-1	Upper Gully - CFA to Railway Station	Shared Path	Off-Road	349
2	P-13	Scoresby Link - George Street to Ferntree Gully Road	Shared Path	Off-Road	1370
3	P-31	Burwood Hwy - Traydal Close to Pedestrian Lights outside Knox School	Shared Path	Off-Road	345
4	P-4	Upper Gully - Railway Bridge to UFTG Railway Station	Shared Path	Off-Road	120
5	P-30	Burwood Highway - Eastlink Cycle Bridge to Morack Road	Shared Path	Off-Road	724
6	P-47	High Street Road- Mowbray Drive to Stud Road	Shared Path	Off-Road	677
7	P-39	Napoleon Road - Rathgar Road to Lakesfield Drive	Shared Path	Off-Road	636
8	P-9	Mountain Highway - Eastlink Underpass North	Shared Path	Off-Road	226
9	P-37	Napoleon Road - Karoo Road to Blackwood Park Road (West Side)	Footpath	Off-Road	637
10	P-52	Wellington Road - Napoleon Road to Kelletts Road	Shared Path	Off-Road	1851
12	P-14	Mountain Hwy- Barmah Drive to Knox Private Hospital (South)	Footpath	Off-Road	579
13	P-17	Mountain Highway - Ped Lights to Harold Street (south side)	Footpath	Off-Road	614
14	P-10	Mountain Highway - Barmah Drive to Boronia Road	Shared Path	Off-Road	1196
15	P-36	Wellington Road - Pinehill Drive to Napoleon Road	Shared Path	Off-Road	468
16	P-7	Railway Ave - Upper Ferntree Gully Railway Station to Burwood Highway	Shared Path	Off-Road	241
17	P-18	Mountain Hwy - Pedestrian Signals at 177 Mt Hwy to Eastlink Bridge	Shared Path	Off-Road	221
18	P-42	Ferntree Gully Road - Stud Road to Henderson Road (South Side)	Shared Path	Off-Road	1275
19	P-46	Kelletts Road - Karoo Road to Waterford Valley	Shared Path	Off-Road	287
20	P-40	Mountain Hwy - Army Road to Baldwin Ave	Shared Path	Off-Road	361
21	P-22	Mountain Hwy - Bayswater Rd to Withers Rd	Footpath	Off-Road	1027
22	P-24	Mountain Hwy - Macquarie Pl to Colchester Rd	Footpath	Off-Road	1197
23	P-38	Napoleon Road - Teofilo Drive to Park Rd (East Side)	Shared Path	Off-Road	379
24	P-45	Mountain Hwy - Bushview to Army Road (South Side)	Shared Path	Off-Road	314
25	P-49	Tomore Reserve -Conway Court to Genista Ave Section 2	Shared Path	Off-Road	277
26	P-50	Tomore Reserve - Warbler Court Link to Genista Ave Section 1	Shared Path	Off-Road	41
27	P-32	Kelletts Road - Stud Road to Taylors Lane	Shared Path	Off-Road	913
28	P-11	Chandella Reserve - Coleman Road to Darwin Road	Footpath	Off-Road	110
29	P-28	High Street Road - Monash Boundary to the Orchards Estate	Shared Path	Off-Road	1739
30	P-35	Kelletts Road - Greenbank Ct to Rosewood Blvd (East Side)	Shared Path	Off-Road	574
31	P-34	Napoleon Road - Anthony Drive - Kelletts Road (East Side)	Shared Path	Off-Road	644
32	P-51	Kelletts Road - Jacob Road to Napoleon Road	Shared Path	Off-Road	372
33	P-66	Jersey Road (east side) - Mountain Highway to Barry Street	Footpath	Off-Road	1030
34	P-6	Upper Gully - Thousand Steps to CFA	Shared Path	Off-Road	415
35	P-20	Dandenong Creek - Illawarra Ave to George Knox Drive	Shared Path	Off-Road	251
36	P-33	Napoleon Road - Glenfern Road to Allora Ave	Footpath	Off-Road	460
37	P-44	Napoleon Road - Park Road to Anthony Drive (East Side)	Shared Path	Off-Road	410
38	P-59	Acacia Road - (Ferry Trail) to Waters Ave	Shared Path	Off-Road	123
39	P-57	Kings Park connection to Mason Street	Footpath	Off-Road	27
40	P-58	Beilby Close - Clow Avenue to Acacia Road	Shared Zone	On-Road	266
41	P-65	London Drive (southern side) - Dorset Road to Jersey Road	Footpath	Off-Road	645
42	P-27	Rathmullen Reserve - Rathmullen Road to Scoresby Road	Shared Path	Off-Road	469
43	P-55	Acacia Road - (Ferry Trail) to Kings Park	Shared Path	Off-Road	338
44	P-12	Dobson Park Sealed access road	Shared Path	Off-Road	199
45	P-54	Acacia Road - (Ferry Creek Trail) to Burwood Hwy	Shared Path	Off-Road	195
46	P-41	Exton Close connection - Exton Close to Ferry Creek Trail	Shared Path	Off-Road	80
47	P-56	Kings Park Footpath	Upgrade	Off-Road	335
48	P-21	Dandenong Creek - Illawarra Ave to Police Road	Shared Path	Off-Road	925
49	P-19	Dandenong Creek Trail to Illawarra Ave	Shared Path	Off-Road	321
50	P-23	Dandenong Creek Trail - Suffern Ave to The Greenway	Shared Path	Off-Road	252
51	P-26	Corhanwarrabul Creek Stud Road to Dandenong Creek	Shared Path	Off-Road	2019
52	P-25	Corhanwarrabul Creek - Stud Road to Dandenong Creek	Shared Path	Off-Road	1086
53	P-43	Napoleon Road Link - Napoleon Road to Regency Tce	Shared Path	Off-Road	79
54	P-16	Bryden Drive - Bryden Drive to Ferry Creek Trail	Shared Path	Off-Road	60
55	P-64	William Street	Footpath	Off-Road	400
56	P-29	Starlight Reserve Rowville - Canter Street to Tetragona Qd	Footpath	Off-Road	252
57	P-48	Blind Creek Trail - Blind Creek Trail to Wadhurst Drive	Shared Path	Off-Road	143
58	P-61	Ferndale Road - Gilmour Park to Gilmour Lane	Footpath	Off-Road	203
59	P-60	Gilmour Park - Waters Ave to Ferndale Road	Shared Path	Off-Road	1003
60	P-63	Gilmour Park - Victoria Ridge to Albert Street	Shared Path	Off-Road	293
61	P-62	Gilmour Lane - Ferndale Road to Victoria Ridge	Shared Path	Off-Road	246
	P-5	Glenfern Road - Napoleon Road to Norman Street	Footpath	Off-Road	659



Tract

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