Guidelines for developing Principal Pedestrian Networks

May 2015

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Executive summary

Walking makes up a significant number of all the trips taken across Victoria. For example, two-thirds of all trips in the city of Melbourne are on foot, and a third of these are business trips.

As Victoria grows we need to look to new ways of meeting our transport needs.

Getting more people walking, particularly around key destinations such as local activity centres, schools and connecting with other forms of transport will help meet our transport needs as Victoria grows.

The identification and delineation of Principal Pedestrian Networks (PPNs) enables effective, scale appropriate strategic network planning for pedestrians in the broader context of transport and land use planning.

A PPN is a designated mapped network of routes which support walking trips into and around key destinations such as activity centres, schools and transport nodes.

A PPN is an important planning and policy tool for the development and promotion of walking as a mode of transport, recognising that walking has a valuable role to play in creating a more effective and resilient transport system. PPNs can reinforce the strengths of existing land use and transport patterns by encouraging pedestrian movement in desired areas.

The development of PPNs according to a consistent methodology state-wide provides a similar process for planning and providing for pedestrians to that used for other modes, such as the Principal Public Transport Network and the Principal Bike Network.

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

- mapping pedestrian movements in their municipalities and identifying priority routes;

- planning for and prioritising infrastructure improvements, to encourage and support more walking; and

- working with the Victorian Government to ensure pedestrians are appropriately prioritised in Victoria's transport planning and investment.

PPNs offer the opportunity to support and encourage pedestrian movement around activity centres and key destinations, taking a significant step in the realisation of state and local government objectives to create a more sustainable transport system.

Part 1 - Principal Pedestrian Network overview

1. Introduction

People walk for many reasons. Many people walk as part of a transport trip, such as to the station, some walk to local destinations such as shops while many more still walk for recreation, such as walking their dog around their neighbourhood. Principal Pedestrian Networks aim to support and encourage walking as part of the transport system; walking which is to meet a transport purpose rather than a recreational purpose.

Principal Pedestrian Networks aim to identify routes within the built environment that are likely and have the potential to carry more pedestrians walking to key destinations and improve the quality of these routes to encourage more walking.

A PPN is a designated mapped network of routes which support walking trips into and around key destinations such as activity centres, schools and transport nodes.

A PPN is an important planning and policy tool for the development and promotion of walking as a mode of transport, recognising that walking has a valuable role to play in creating a more effective and resilient transport system. PPNs can reinforce the strengths of existing land use and transport patterns by encouraging pedestrian movement in desired areas.

Creating and implementing a PPN involves facilitating and encouraging pedestrian friendly urban environments. Encouraging walking as a transport mode requires attention to a number of elements that contribute to attractive walking environments. These elements include creating high quality public spaces and streetscapes, street lighting and seating, pedestrian crossings and signage. This can be achieved through a variety of measures including adjustments to signalised intersections, installation of increased priority crossing opportunities such as zebra crossings, increases to pavement width or quality, installation of trees and vegetation or the provision of street furniture.

Key destinations such as activity centres or transport hubs typically form the primary focus for the development of a PPN. Activity centres and employment clusters across Victoria vary significantly in the density and complexity of destinations. The PPN methodology allows for the identification of single or multiple destinations, as well as categories of destinations. The mapping of multiple destinations can be layered to provide a comprehensive picture of potential pedestrian movements.

An existing pedestrian route

A Principal Pedestrian Network route

Method of travel to work (Melbourne metropolitan area)

Method of travel	2001	%	2006	%	2011	%
Car as driver only	953,025	73.8%	1,025,681	72.5%	1,145,102	70.8%
Car as passenger only	79,097	6.1%	78,685	5.6%	82,163	5.1%
Public transport (any mention)	168,514	13.1%	199,886	14.1%	265,716	16.4%
Walked only	37,560	2.9%	51,369	3.6%	56,286	3.5%
Bicycle only	12,866	1.0%	18,879	1.3%	25,600	1.6%
Motorbike/scooter only	5,389	0.4%	7,483	0.5%	7,868	0.5%
Taxi only	3,737	0.3%	3,877	0.3%	4,027	0.2%
Other methods and modal combinations	30,461	2.4%	28,310	2.0%	30,237	1.9%
Travelled on Census day	1,290,649		1,414,170		1,616,999	
Worked at home	60,861		61,551		69,310	
Did not go to work	157,879		170,272		176,757	
Not stated	35,041		31,885		29,434	
Total	1,544,430		1,677,878		1,892,500	

PPNs provides the tool for the higher order consideration of pedestrian needs in context of other competing demands. As PPNs are mapped within a walking catchment of key destinations, it is likely that there will be other competing demands for space and time in the built environment.

Importantly, as a PPN identifies a higher order pedestrian network it is important to also provide and plan for the basic walking network such as minimum footpath provision on all streets in accordance with Victorian planning provisions.

1.1 Why do we need PPNs?

The overarching objective of developing a PPN is to provide pedestrians with a higher level of service by making the shortest route also the highest quality route, and thereby encouraging walking trips.

Other transport modes in Victoria such as cars, trucks, trains, buses and bicycles already have identified networks on which their movement is encouraged. There are established methods and approaches for how these networks are planned and incorporated into our transport planning. Principal Pedestrian Networks provide an equivalent process and framework for pedestrians.

This methodology provides a consistent approach for local governments to plan strategic networks for pedestrians within their municipality. As walking trips tend to be shorter than other modes, walking networks need to be smaller than other strategic networks, or in other words scale appropriate. This means that most municipalities will have more than one Principal Pedestrian Network and over time many will be identified and mapped across Victoria.

These guidelines are intended to provide a mechanism for coordinated pedestrian planning and investment in activity centres across both the jurisdictions of state and local government. Local government agencies that have completed the mapping and planning of a PPN have found that the process assisted in:

- planning for all modes of transport including of pedestrians, particularly around conflict areas;

- planning for pedestrian projects across a municipality within a constrained budget;

- awareness of pedestrian issues and needs;

- negotiation for resources for pedestrian provision; and

- improving negotiation and integrated planning with VicRoads.

1.2 Applying PPNs to our transport planning

Developing PPNs assists governments to meet the obligations for all agencies under the *Transport Integration Act 2010*, as well as objectives outlined in policies such as Plan Melbourne, Regional Growth Plans and VicRoads' SmartRoads and local government walking strategies.

The *Transport Integration Act 2010* articulates important integrated transport and land use objectives including environmental sustainability, integration of transport and land use and safety health and well-being. These are designed to improve accessibility and transport efficiency, with a focus on elements where pedestrian networks can play a key role, including:

- promoting forms of transport and the use of forms of energy and transport technologies that have the least impact on the natural environment

- reducing the need for private motor vehicle transport and the extent of travel (in terms of number of trips and distances travelled);

- facilitating better access to, and greater mobility within, local communities; and

- promote forms of transport and the use of forms of energy which have the greatest benefit for, and least negative impact on health and well-being.

1.2.1 SmartRoads

SmartRoads is an approach used by VicRoads that manages competing interests for limited space and time in the road network by giving priority use of the road to particular transport modes, both in different parts of the network and at different times of the day. Some routes or 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.

SmartRoads uses a set of guiding principles to establish the priority use of roads by transport mode, time, and place of activity. The priority movements (by mode) are then assigned to arterial roads across the network forming SmartRoads network operating plans.

Broadly these principals are:

- Pedestrians will be encouraged by facilitating good pedestrian access into and within activity centres.

- Trams and buses are given priority on key public transport routes that link activity centres during morning and afternoon peak periods.

- Cars will be encouraged to use alternative routes around activity centres to reduce the level of 'through' traffic.

- Bicycles will be encouraged through further developing the bicycle network.

- While trucks will have full access to the arterial road network, they will be given priority on important transport routes that link freight hubs and at times that reduce conflict with other transport modes.

Principal Pedestrian Networks are critical to ensuring that pedestrian movement receives the same recognition as other modes and pedestrian priority is reflected in transport and land use planning.

Pedestrians are provided for under SmartRoads in two ways:

1) within pedestrian priority areas, which are typically within and around arterial based shopping strips and activity centres where there is high demand for crossing movements such as on a high street, and

2) on and along a principal pedestrian network, leading into an activity centre or transport hub

1.3 Who are these guidelines for?

These guidelines have been developed for use by local governments across Victoria. It is recommended that a group of staff from different areas within local government collaborate to develop a PPN. Local governments

who have developed a PPN have had teams that included a sustainable transport planner, planners, urban designers, civil engineers and GIS mapping staff. These guidelines provide in depth detailed GIS steps to map a PPN.

1.4 Limitations of the approach in these guidelines

The modelling and mapping technique used in this methodology maps the shortest route from a series of origin points to a key destination. This approach and mapping technique allows the identification of pedestrian routes that are strategically significant in their potential to connect the community. The technique cannot and does not predict actual numbers of pedestrian trips likely to be made within the catchment identified. The strength and usefulness of this approach lies in that the mapping and model provide a base set of information from which comparisons and verifications can be made using pedestrian counts, interview questionnaire surveys, site audits, and local government knowledge.

1.5 How these guidelines work

This document is divided into two key sections.

Part 1 provides an overview of PPNs, including:

- an introduction to PPNs;

- considerations for a PPN; and

- the stages for developing a PPN.

Part 2 sets out the steps for developing a PPN, at each of the following key stages:

- delineation;

- validation; and

- implementation.

It explains the purpose of the stage, what tasks need to be undertaken to complete the stage, approximately how long each stage will take to complete, what you should achieve at the end of each stage, and the resources required to carry out the tasks.

2. Developing a principal pedestrian network

2.1 Elements

There are a number of key elements that frame and guide the development of a PPN. These are:

- definition of a catchment

- prioritisation of pedestrian links

- current and future land use

- the quality of the pedestrian environment and pedestrian priority.

Each of these is outlined and defined in greater detail below.

2.2 Definition of a catchment

The first step in the development of a PPN is the identification of a destination (or multiple destinations) and its catchment.

Victorian Government research has revealed that 40 per cent of trips less than 2 kilometres in metropolitan Melbourne and 26 percent of trips less than 2 kilometres in regional centres are made on foot. The overall participation rate for distances up to 2 kilometres is broken down as follows:

- 75 percent of all trips less than 400 metres in Melbourne are walked. In Victoria's regional centres, walking accounts for 64 percent of these trips.

- 22 per cent of trips between 1 kilometre and 2 kilometres are made on foot.

An analysis of Victorian Integrated Survey of Travel and Activity (VISTA) data reveals that the median walk trip (travel time and distance) has remained consistent in recent years. The median walk-only travel time and distance for journeys from home to work is 15 minutes or around 1.4 kilometres. An analysis of 2007 VISTA data showed the average walk trip was approximately 1 kilometre and that 23 percent of walk trips were over 1.6 kilometres.

The 2009 Walking and Cycling International Literature Review, prepared for the former Department of Transport, found that walk trips in the United States are 'mostly up to a mile (1.6 kilometres) in length. The average trip in the U.S. is 1.2 miles (1.93 kilometres); and between 47 percent and 60 percent of walking trips are lessthan 0.5 miles (0.8 kilometres). Recreation/work trips tend to be longer' (Krizek 2009:11).

A market intelligence review undertaken by Public Transport Victoria for April to June 2012 found that 44 percent of people using train service walk to the station from their homes and 77 percent of people walk from their destination train station to their final destination.

 Over half of the respondents walk 1.2 kilometres to a station and many walk much further.

Based on this evidence, a 2 kilometre catchment area for the purposes of developing a PPN for a large activities centres such as a large employment cluster is recommended. Lesser catchment areas have been adopted in instances where the total local government area is small with a high density residential and employment population.

It is important to note that the mapping technique begins to find confluences at about half the distance of the catchment. Therefore if you aim to develop a PPN covering a walkable catchment of 800 metres from your destination your mappable catchment will need to be 1600 metres.

Confluences indicate where you could expect to find a higher number of pedestrians accessing a particular destination and where you could consider making improvements to the pedestrian environment. The image below illustrates confluences. These can be seen where the red lines begin to overlap and become denser in colour.

Topography can be considered in the development of a PPN. An option to consider is that where steep topography falls within the catchment of the planned PPN, the catchment is reduced in distance to reflect a more difficult walking environment.

2.3 Prioritisation of pedestrian links

Within a PPN, different levels of prioritisation are possible – primary and secondary.

This categorisation allows councils to prioritise pedestrian infrastructure projects on parts of the pedestrian network that will benefit the greatest number of pedestrians.

Primary routes are those that generate regular and high levels of travel demand on a daily basis, such as to residential, retail, educational and commercial destinations.

The primary network should be evenly spaced, provide comprehensive coverage to major destinations and enable access to all workers, residents and visitors within two minutes of commencing their walking trip.

The two minute travel time is roughly equivalent to 200 metres of walking, which means the spacing of parallel primary routes should not be denser than 400 metres.

Exceptions to this, to be considered on a case by case basis, might include:

- high density, high diversity activity centres spread out over a large area may warrant denser spacing of primary routes

- single 'main street' small activity centres may only warrant one or two primary routes – possibly the main streets and another perpendicular route leading to the main street.

The PPN will be located principally within road reserves but may in some instances use off-road paths, where it is logical and efficient to do so.

Whether those parts of the pedestrian network that are located on road reserves are classified as primary or secondary will depend on the role of the route in the network and the adjacent land use. For example, a key connection between a school and a train station might be designated as primary.

Primary routes will typically be the focus of improvement actions and capital expenditure and collectively, over time, they should provide a high quality network to service pedestrians throughout the activity centre or to and around the selected destinations.

2.4 Current and future land uses

PPNs are intended to be able to accommodate change, and guide investment in and development of pedestrian infrastructure over 5-10 years. For this reason the recognition and identification of current and future land use forms an important part of a PNNs development.

The PPN can respond to both current and future land uses. Future scenarios will be typically sourced from the most appropriate documentation available, including municipal city plans, structure plans, urban design frameworks, and master plans.

The mapping processes described in Part 2 use current Census data to identify potential trip origins within the PPN catchment. Once the Census data is established in the mapping process, higher densities can be fed into the finest grain of census data, known as a mesh block, reflecting a scenario of future increase in density and its impact on a draft or established PPN.

As the primary data source for this methodology and mapping technique is Census data, the technique reflects potential home-based local trips.

While Census data provides good information on residential density, employment and education density information is not sufficiently detailed without further analysis to enable meaningful categorisation of streets and mapping pedestrian desire lines.

Education and employment contribute significantly to the overall number of local pedestrian trips. A local council may wish to obtain, use and categorise employment or education density data to create a dataset of origins and potential destinations. If this step is undertaken then a similar methodology to that described in Part 2 could be used.

2.5 Assessment of the quality of the pedestrian environment and pedestrian priority

The primary aim of developing a PPN is to increase pedestrian priority on identified parts of our road networks and to improve the quality of the pedestrian environment.

Increasing pedestrian priority might include increased crossing time in signalised crossings, new signalised crossing opportunities, reallocation of road space, and widening space available to pedestrians, for example widening footpaths and removing pedestrian fencing or other barriers that force pedestrians to walk further than necessary to assist another mode. Another example might be the provision of a zebra crossing.

PPNs are intended to assist and guide investment in and development of pedestrian infrastructure in the public realm over a number of years.

In many instances improvements to pedestrian priority will require councils and VicRoads to discuss the evidence and negotiate an agreeable outcome.

Examples or ways to improve the quality of the pedestrian environment include ensuring the pavement is smooth and comfortable to walk on, improving shelter and providing shade, the provision of seating or rest spots, provision of other landscaping and increasing natural surveillance. In some instances there may be no pedestrian infrastructure, in which case retrofitting a footpath may be the improvement required.

In many instances councils will be able to schedule improvements to their network according to their capital works programs and make changes to the quality of the pedestrian environment over time. Many local governments have guidelines on municipal image and urban design which often define a range of preferred materials, furniture and soft landscape. In order to increase priority for pedestrians or to improve the quality of the pedestrian environment, an assessment of the existing conditions needs to be made. This can be done in a number of ways and according to a variety of criteria. It could be as simple as referring to working knowledge of the council or walking around the network and identifying the need for new discreet projects such as a new signalised crossing, or as complex as a complete inventory of the pedestrian network. It is recommended that each council developing a PPN determine the appropriate method and scope assessing their existing conditions. These guidelines do not provide a specific way to make this assessment. However a range of guidance and information is provided in the appendices.

3. The key stages

The development of a PPN can be divided into the following key stages:

- mapping and delineating the PPN

- verifying the draft PPN

- implementation plan for the PPN.

3.1 Mapping and delineating the PPN

The first stage in the preparation of a PPN is determining the tools and analysis required to suit the activity centre or destination under consideration.

PPNs for small activity centres or single destinations may be able to be manually mapped, however most PPNs will require the use of software packages that enable the automation of mapping, as well as the ability to overlay multiple destinations and land uses.

Development of a PPN requires an initial collection of desktop data and mapping. This includes:

- maps of key destinations and attractors, including schools, offices, shops transactions and popular entertainment destinations

- map all existing planning scheme land use zonings and measures of future activity development

- population density information for a 2 kilometre walkable catchment around any significant pedestrian attractor within the activity centre. The use of Census data is recommended here

- maps of all designated crossing points of major and minor roads

- current maps of VicRoads SmartRoads network operating plans

- maps of off-road pedestrian paths and access ways

- locations of pedestrian access points, for example to a station

- identification of significant physical barriers, including topography, creek crossings and transport infrastructure, such as a railway line or freeway.

The first stage in the preparation of a PPN is determining the tools and analysis required to suit the activity centre or destination under consideration.

All information should be assembled in a manner that allows multiple layers to be viewed independently and/or concurrently. This stage involves the production of the base mapping to inform the rest of the PPN process. At the end of this stage you would expect to have a map that looks similar to the image below, with all of the key information outlined above shown for reference.

3.2 Verifying the draft PPN

Once a draft PPN has been developed, a process of verifying the mapping is recommended. This includes:

- testing the draft PPN with local knowledge

- undertaking pedestrian counts on parts of the proposed PPN

- refining the PPN.

3.2.1 Test draft PPN with local knowledge

The process of testing the draft PPN with local knowledge usually takes place in consultation with local council members in a forum such as a workshop, which allows draft PPN to be presented and questioned. Useful insights that can arise in a workshop include knowledge of short cuts, heavily used streets, and differing pedestrian patterns at different times of the day or week. This knowledge can assist and be tested and verified in the next step of undertaking pedestrian counts.

3.2.2 Pedestrian counts

Undertaking pedestrian counts has many benefits. These include the ability to verify the draft PPN mapping, particularly areas where high pedestrian numbers are expected, as well as the development of evidence to use in decisions, discussions and negotiations around resource investment and infrastructure provision for pedestrians.

Pedestrian counts give greater knowledge of pedestrian flows across different times of day.

This information is important, as SmartRoads allocates priority by time of day as well as by mode and network segments. By understanding the times of day of higher levels of pedestrian movement it is possible to develop the most effective actions in the context of SmartRoads network operating plans.

Pedestrian counts can be undertaken in a variety of ways. For more information on ways to collect data on pedestrians see Appendix D.

3.2.3 Refining the PPN

Assessment of the pedestrian environment on the draft PNN

At this stage, consider undertaking an assessment of the pedestrian environment on the identified draft PPN. This may cover the existing level of priority for pedestrians, the quality of the existing environment and identifying potential improvement projects. For more information refer to Appendix D.

Agreement and adoption of the PPN

Following the development of a draft PPN, collection of pedestrian data and an assessment of the pedestrian environment, a second workshop is recommended to review the data and information collected. In this workshop the pedestrian movement data can be compared to the areas of the draft PPN mapping where the greatest densities were predicted. This allows parts of the network which may not have showed up strongly in the mapping to be included; if the data indicates that this should be the case. The data also assists in deciding which parts of the network to address in the first instance (typically those areas with the highest number of pedestrians). For example, the mapping may suggest high numbers on two parallel routes; pedestrian counts can assist in deciding between these, if both cannot be addressed in the first PPN development.

It is recommended that all of the people involved in the development of the PPN in the process to date be included as well as any people who may need to understand the project development to assist in the implementation of processes or projects as part of the ongoing PPN development. For example for a local government, it may be valuable to include someone from the capital works or infrastructure.

Key outcomes from this workshop include agreement on particular routes and adoption of an agreed PPN. The development and adoption of a PPN is recommended for a period of time, such as for 5-10 years. This does not exclude the development of further PPNs or the revision of a PPN during its proposed duration.

3.3 Implementation plan for a PPN

Once a PPN has been agreed to it is recommended that an implementation plan be developed. This plan should cover and outline stakeholder engagement, project scope, project costs and timelines for each of the individual projects identified as part of the PPN development.

A PPN is likely to consist of a suite of projects ranging from timing changes to an existing signalised intersection, to re-surfacing or construction of a footpath. Each of these different types of projects will require agreement and cooperation from differing stakeholders and will likely have varying lead timeframes for approvals and project planning.

The implementation plan should include:

- any outstanding information required to progress a project

- a clear statement of the problem to be addressed by the projects included (for example, safety issues, or people demonstrating frustration with delays by disregarding signals or crossing at locations beyond designated crossings)

- a clear identification of agencies responsible for implementation of each project

- clear recognition of funding status and sources

- clear integration with SmartRoads network operating plans

- clear timeframes and project phases, especially where there are interdependencies with other programs or policies.

The suite of actions can be prioritised to address the most urgent projects. Each local government is well placed to determine selection criteria for the prioritisation of their identified PPN projects. Criteria might include:

- existing pedestrian congestion and relief potential

- documented community concerns

- ability to complete a project in a given timeframe

- input from key stakeholders

- urban development and density changes

- funding availability

- local crash statistics.

An implementation plan is useful in cases where the timeframe for the PPN development is 5-10 years, as it provides a long-term record and reference for the organisation.

Part 2 - Making a principal pedestrian network

1. Delineating the PPN

Overview
Delineating the PPN involves mapping the existing pedestrian network, existing land uses, the walking catchment and key origins and destinations within the centre. This stage mainly involves desktop analysis and mapping, and has been designed so that it can be implemented by people with varying areas and levels of expertise.

 There are nine key steps within the delineation phase.

Step 1
Collate background data (2-3 hours)
Step 2
Determine the primary destination(s) (1-2 hours)
Step 3
Map the pedestrian network and walking constraints (5-6 hours)
Step 4
Map the walkable catchment (1-3 hours)
Step 5
Map existing residential population densities (2 hours)
Step 6
Map secondary destinations and likely populations (5-6 hours)
Step 7
Determine shortest distance routes between origins and destination(s)
(3-8 hours)
Step 8
Assess the intensity of pedestrian routes (1-2 hours)
Step 9
Delineate the draft PPN (5-8 hours)

As mapping is a key component of this stage, it is important to decide on a preferred mapping approach for the steps. Appendix A outlines two broad mapping approaches – Geographic Information Systems, or GIS (through MapInfo or ArcGIS), Google Maps used in combination with Google Earth. Appendix B outlines in greater detail the steps to map a network using MapInfo or ArcGIS.

There may be other mapping techniques and software available to achieve the purpose, tasks and outputs.

The following sections provide a detailed description of each step including the purpose, the tasks, outputs and resources.

Step 1 Collate background Data

Purpose
This step will provide the necessary base information to determine the PPN for the selected activity centre. It involves undertaking background research to gain an understanding around the parameters of the pedestrian network and any future changes that will potentially affect pedestrian routes or population. Then, the pedestrian network an key land uses can be mapped, taking into account the knowledge from the background research and also utilising the available mapping data.

Tasks

Undertake background research
- Determine activity area classification

- Liaise with relevant council or state government staff or to determine whether there are any structure plans or other relevant policies or development controls that apply to the activity area, or approved development proposals within the centre.

- The plans, policies and controls should relate to:

-- transport – proposed pedestrian links, pedestrian environment upgrades, public transport hubs and new roads –

--future land uses (destinations/origins) – new areas of residential, mixed use, employment, shopping, community and civic uses, key public spaces

-- population density – proposed building heights and densities.

Collate mapping data
- Collate mapping data that will help determine the pedestrian network. This includes:

-- road centre lines

-- off-street pedestrian paths (if available)

-- rail network

-- cadastre (parcels)

-- planning zones

-- water bodies and water courses

-- contours (1 metre available for Melbourne metro area)

-- aerial photographs

-- future major developments.

Figure 1 Urban Development Program: online mapping data source
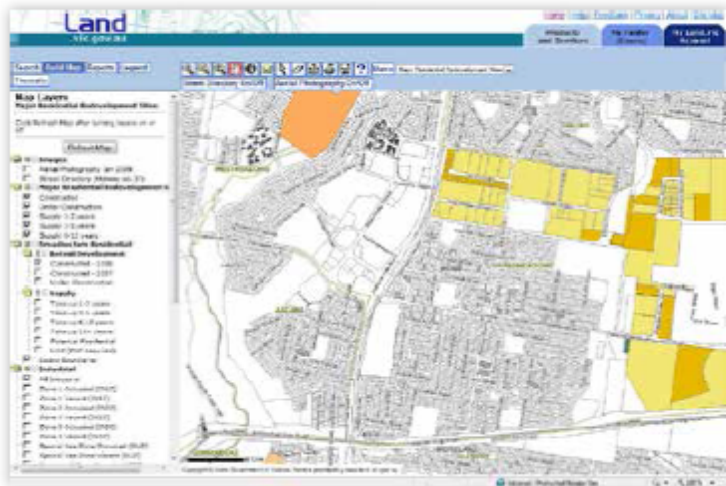
Figure 1 Urban Development Program: online mapping data source

Figure 2 Mesh block data contains information about population and dwelling numbers

Collate population data

Population data is important for delineating the PPN because it provides an understanding of how many people are potentially moving to and from a destination within a centre. Population data from the 2011 Census is publicly available for download and use. The data is in a form called mesh blocks which provide the finest grain level of detail for population analysis. A polygon is delineated for each mesh block and contains information about the number of dwellings and total number of people in each area.

- Source the Census 2011 mesh block data in GIS format at the link shown in the resources below. This dataset covers all of Victoria and will need to be reduced for the particular activity area.

Resources

- Urban development program – a database of known future developments can be downloaded in GIS or CAD format at: http://services.land.vic.gov.au/maps/content/udpintroduction

- Census mesh blocks – can be downloaded in GIS format at:

- www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/

- 1209.0.55.0022006?OpenDocument

- Vicmap – additional mapping data in GIS or CAD format can be purchased at: http://services.land.vic.gov.au/landchannel/content/productCatalogue

- Melways Street directory – printed directory or online version at:

- www.streetdirectory.com.au

- UBD Street directory.

Step 2 – Determine the primary destination(s)

Purpose

The purpose of mapping the primary destination(s) is to determine the location(s) of destination(s) for most walking trips to the centre.

The primary destination is likely to be the 'heart' of the shopping strip, where there is a substantial amount of pedestrian movement. It may be anchored by a major retail destination, specialty shopping precinct or community service facility.

In some centres, the primary destination may be co-located with a major transport hub such as a railway station or bus interchange, which generate significant trips.

Figure 3 Compact shopping strip with integrated railway station

Figure 4 Separated rail and shopping strip
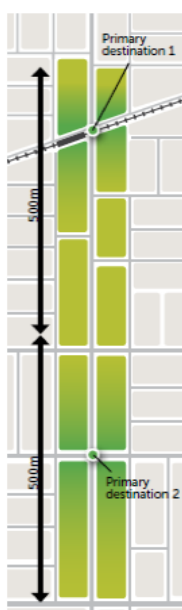
Figure 5 Long shopping strip with two primary destinations

Sometimes there will be more than one primary destination within an activity centre. This will be relevant within long shopping strips where there are a number of shopping precincts each with its own focus and retail anchors.

In Melbourne's suburban shopping strips, the retail core will typically have a length of approximately 500 metres, beyond which retail activity declines and peripheral uses become more prevalent. However, this is not always the case particularly where there is a series of major activity anchors along the strip or where the strip contains precincts which are popular destinations in their own right i.e. a clothes precinct or a restaurant precinct.

Tasks

- Map existing land uses within the activity centre to understand the key drivers for the primary destination.
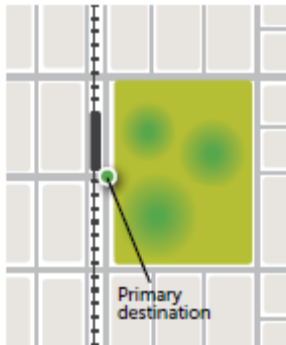
Figure 6 Mall based shopping centre with integrated station/transport hub

- Delineate a primary destination for the activity centre using the following parameters:

    -- the primary destination should be located within the highest pedestrian activity area

    -- if there is no clear high pedestrian activity area, locate the primary destination in the physical centre of the shopping area or within close proximity of a railway station provided it is integrated with the shopping area

    (refer Figure 6)

    -- for mall-based activity centres with a number of high pedestrian activity areas, the primary destination should be delineated either in the centre of the mall or in a location which is integrated with a major public transport hub such as a railway station or bus interchange.

Figure 7 Primary destination map with 2 kilometre buffer

- Delineate more than one primary destination in the following situations:

  -- if the shopping strip is longer than 500 metres and there is clearly more than one high pedestrian activity area within the strip (refer to Figure 9)

  -- where the shopping area is not linear however the high pedestrian activity areas are separated by a walking distance of approximately 500 metres or more.

- Map a 2 kilometre buffer from the primary destination(s).

  (See Figure 7)

Outputs
- Map of primary destination(s).

Resources
- Base map of the activity centre at an appropriate scale.

Step 3 – Map the pedestrian network and walking constraints

Purpose
This step involves mapping the key infrastructure and constraints for walking, which will influence the movement of pedestrians throughout the activity centre.

Tasks
The following data should be mapped within a 2 kilometre radius of the primary destination(s) and collated into a pedestrian network analysis map:

- VicRoad's SmartRoads operating network – this enables the identification of locations where the future PPN may intersect with another priority network (see Figure 8)

- existing road hierarchy – freeways, arterials, sub-arterials, connectors and local streets

- signalised pedestrian crossings

- rail crossings

- river/creek crossing points.

N.B. A substantial amount of this information can be sourced from a Melways or UBD street directory. Other information can be sourced from aerial photographs and council mapping data.
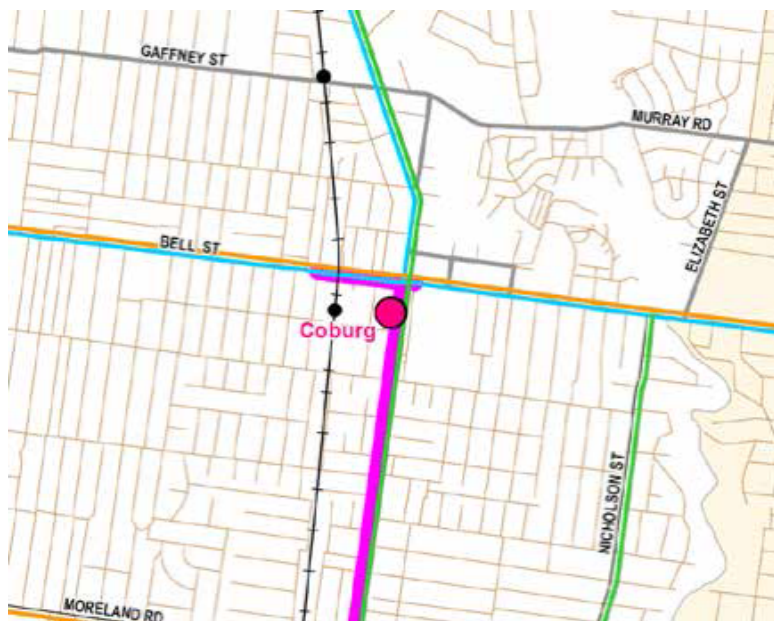
Figure 8 An example of a VicRoads Smart Roads Network Operating Plan

The existing pedestrian network should also be mapped in this step. This should be undertaken by mapping every on-street footpath, off-street path or shared access way that is suitable for walking within the 2 kilometre catchment:

- utilise GIS software to map the pedestrian network within the 2 kilometre catchment

- differentiate the types of access of each network segment in GIS by assigning an attribute to each part (i.e. on-street path, off-street path).

Outputs

- Pedestrian network and walking constraints map. (See Figure 9)

- Pedestrian network in GIS.

Resources

- VicRoad's SmartRoads network operating plans: www.vicroads.vic.gov.au/Home/ TrafficAndRoadConditions/HowWeManageTraffic/Smartroads/ SmartRoadsNetworkOperatingPlan.htm

- Melways or UBD Directory road maps.

- river/creek crossing points. N.B. A substantial amount of this information can be sourced from a Melways or UBD street directory. Other information can be sourced from aerial photographs and council mapping data.
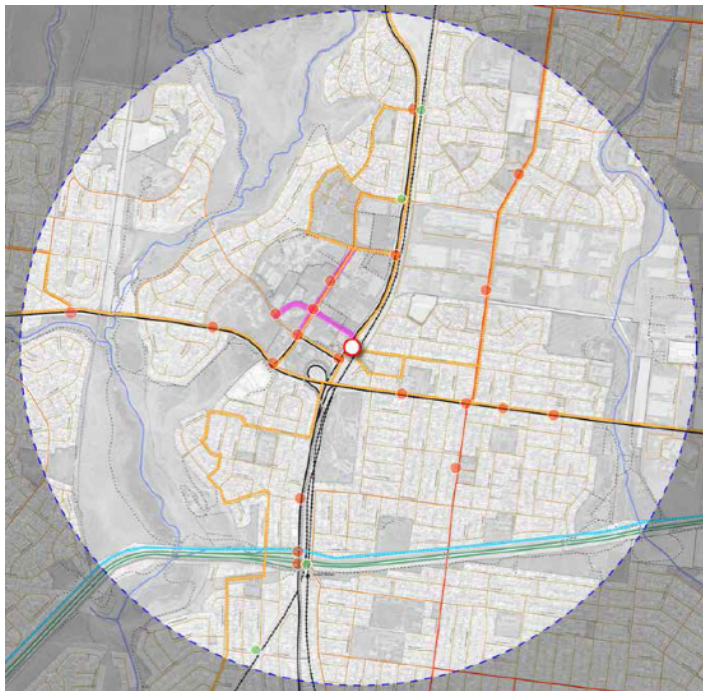
Figure 9 Pedestrian network and walking constraints

Figure 10 Freeways often create walking barriers between urban areas
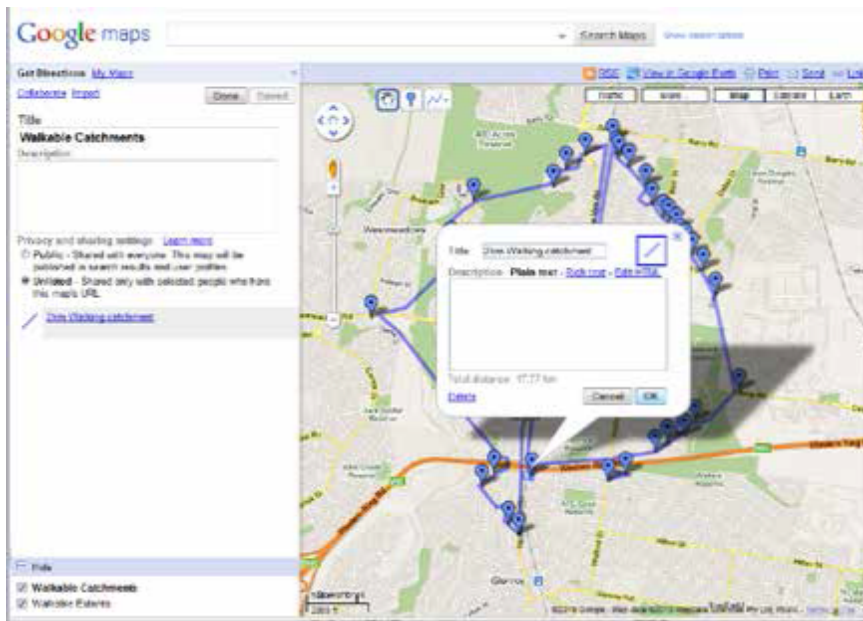
Figure 11 Plotting the 2 kilometre walking catchment in Google Maps

Step 4 – Map the walkable catchment

Purpose

This step sets out the focus area for the PPN. It determines the likely catchment that people will walk to the primary destination(s) from surrounding areas.

Previous studies show that pedestrian trips for the purposes of transport are likely to extend up to 20 minutes (approximately 2 kilometre) to and from a destination. However there are a number of factors that can reduce or increase this distance, these include:

- proximity of surrounding activity centres and primary destinations – pedestrians may choose other destinations from their origins

- major barriers – freeways or creeks with limited crossings could reduce the walkable catchment.

For the purposes of determining the PPN, the 2 kilometre distance is recommended as a starting point.

Tasks

Map the walkable distance of 2 kilometre (plus optional distance of 1 kilometre) along road centre lines from the destination(s). Mapping the optional 1 kilometre catchment along roads provides greater information when prioritising parts of the network and identifying projects.

Outputs

- Map of 2 kilometre walkable catchment showing catchment along roads and 2 kilometre buffer showing extent of the catchment

- Map of 1 kilometre walkable catchment along roads (optional).

Resources

- Base map with pedestrian network.
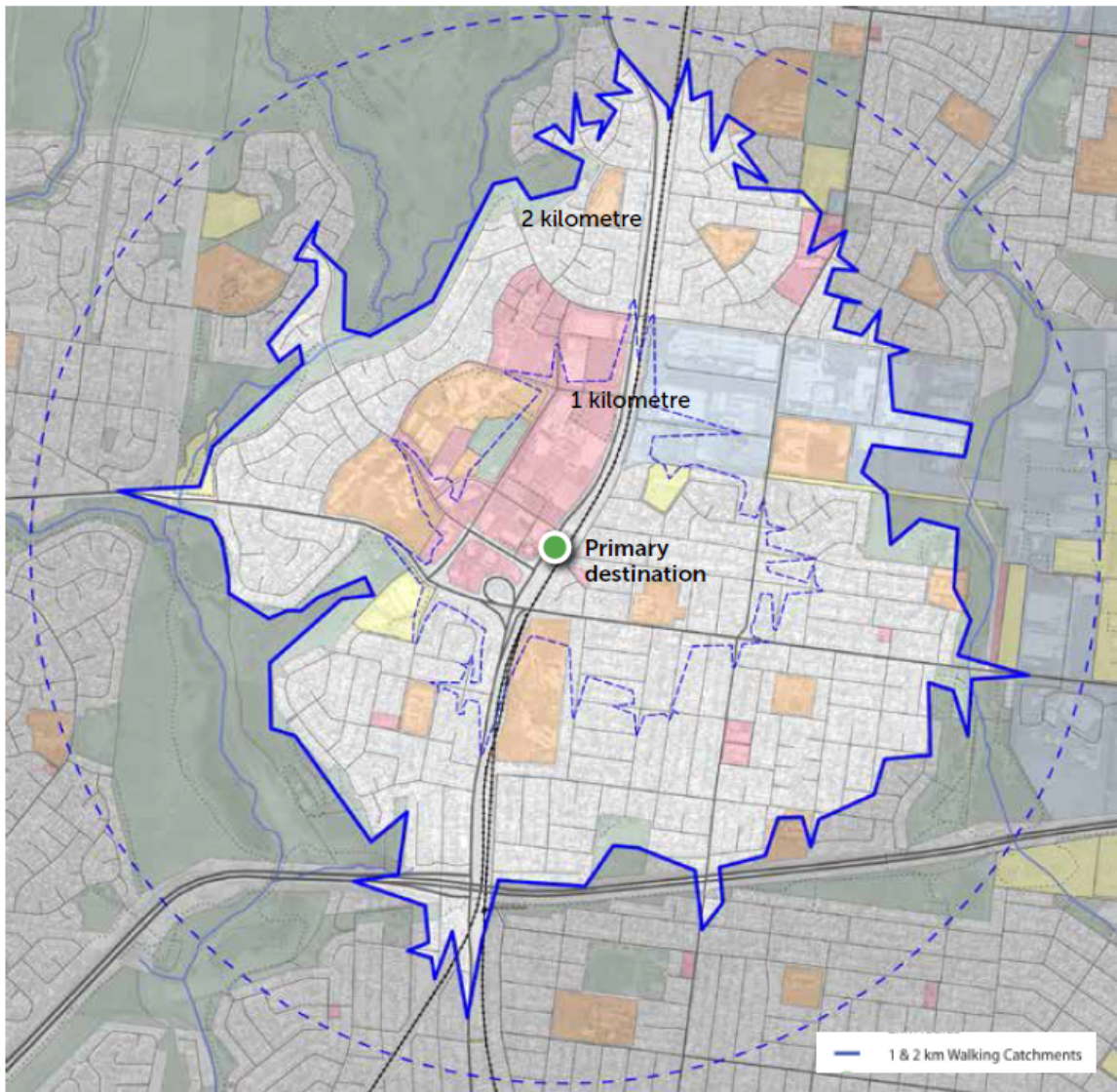
Figure 12 1 & 2 kilometre walking catchment from primary destination(s) along pedestrian network

Step 5 – Map existing residential populations

Purpose
Using the latest available Census mesh block data, existing population densities within the activity centre can be mapped. This will provide an understanding of the potential number of trips that could occur from the surrounding residential areas based on existing populations.

Tasks
- Collate Census mesh block data for the 2 kilometre walkable catchment of the activity centre.

- If the information is readily available, update the Census mesh blocks with information about recent developments that have occurred since Census collection night in 2011. The precise number of dwellings will need to be known as well as the number of dwelling that were demolished. The population from the new dwellings can be estimated based on the average household size in the centre.

- Create a 'heat map' of the mesh blocks based on the existing population or dwelling density of each mesh block area. This will enable a quick graphical comparison of each mesh block area.

- Create a point at the centre of each mesh block. This can be undertaken utilising a script in GIS. The centre point will provide an origin point which will have population attributes

for both the existing and future scenarios. All centre points with a population attribute of zero should be removed from the dataset.

- Centre points for the purposes of mapping are often referred to as centroid(s). A centroid is the geometric centre of a shape or area, such as a mesh block used in Census area categorisation. Mapping software such as ArcGIS has a tool for finding the centroid of shapes such as mesh blocks (the smallest census mapping area). The collection of these points will form the proxy origins for pedestrian network mapping.

- Incorporate heat map and origin points into a population analysis map.

Outputs

- Population heat map

- Mesh block centre point, to determine shortest routes from residential areas to the primary destination(s).

Resources

- Census mesh block downloads:www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/ 1209.0.55.0022006?OpenDocument

- Urban development program– provides information about completed major residential developments:

- http://services.land.vic.gov.au/maps/content/udpintroduction

- Council building approvals database.
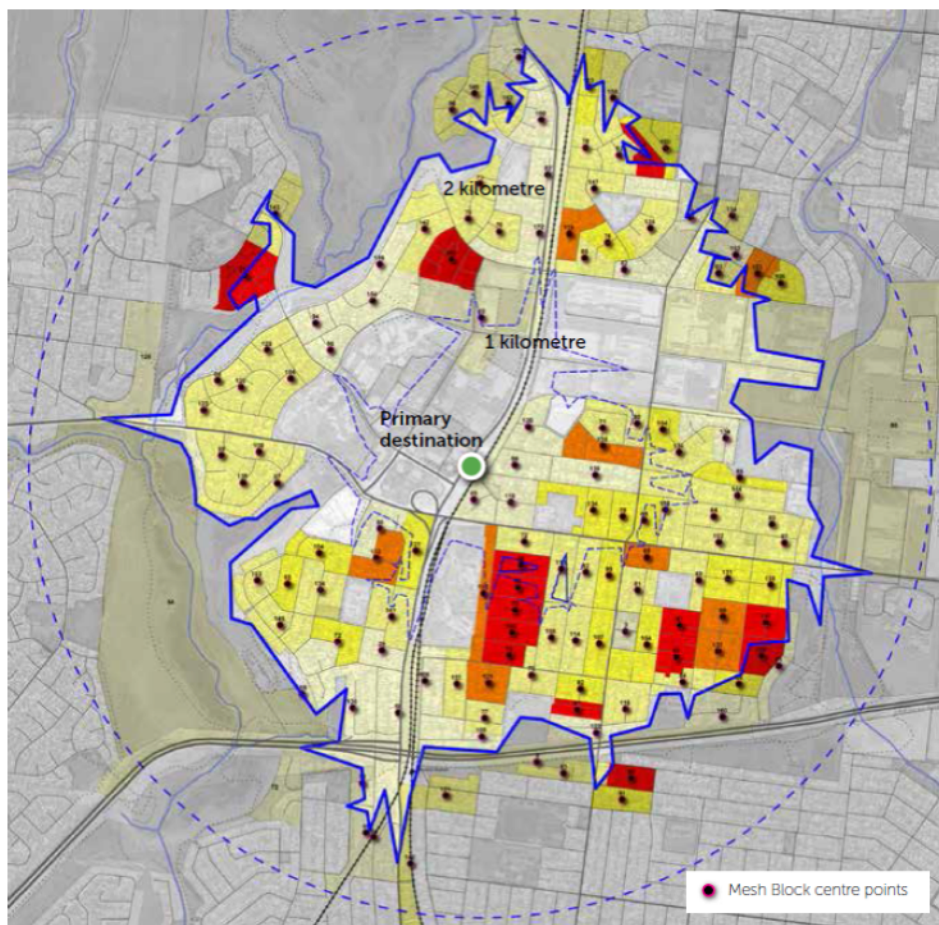
Figure 13 Population analysis: Mesh Block areas and centre points

Step 6 - Map secondary destinations and likely populations

Purpose

This step will identify key secondary destinations within the activity centre which have the potential to generate a significant number of trips to or from the primary destination(s).

These routes will form part of the PPN.

An example is an employment area which is located at the periphery of the activity centre, and has the potential to generate trips to and from the shopping strip and railway station.

Tasks

- Utilising a range of sources, identify potential secondary destinations. These could include:

-- areas of employment

– Industrial land uses, offices

-- tertiary education facilities

-- secondary schools

-- hospitals

-- community facilities – shire offices, libraries, regional recreation facilities.

- Map secondary destinations which will generate significant trips to or from the primary destination. These should be mapped as a centre point for the particular area. More than one point may be used for secondary destinations that cover large areas.

- Estimate the potential population of the destination through a number of techniques:

-- measuring the floor area of buildings and applying an average population density for that particular use

-- researching the potential population through discussion with the landowners/operators or other sources

-- for large employment areas with many buildings, it may be more efficient to measure the total area of the employment area and apply a population density per hectare.

Outputs

- Map of secondary destinations

- Estimated populations for secondary destinations

Resources

- Street directories, online maps or planning zone maps

- Land owners/business operators
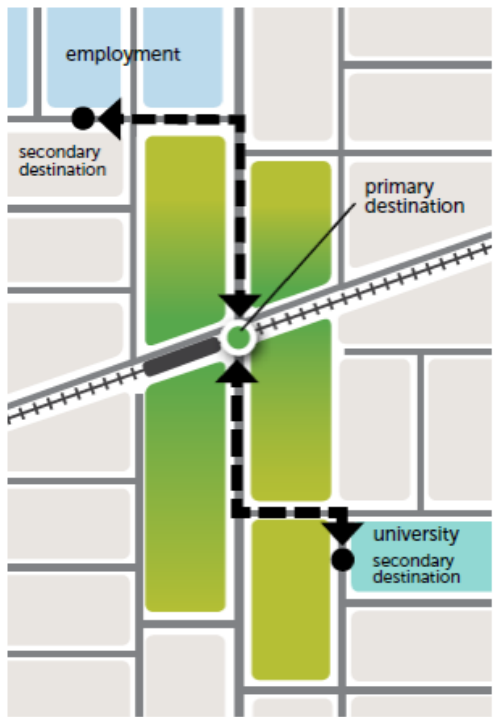
Figure 14 Links between primary and secondary destinations
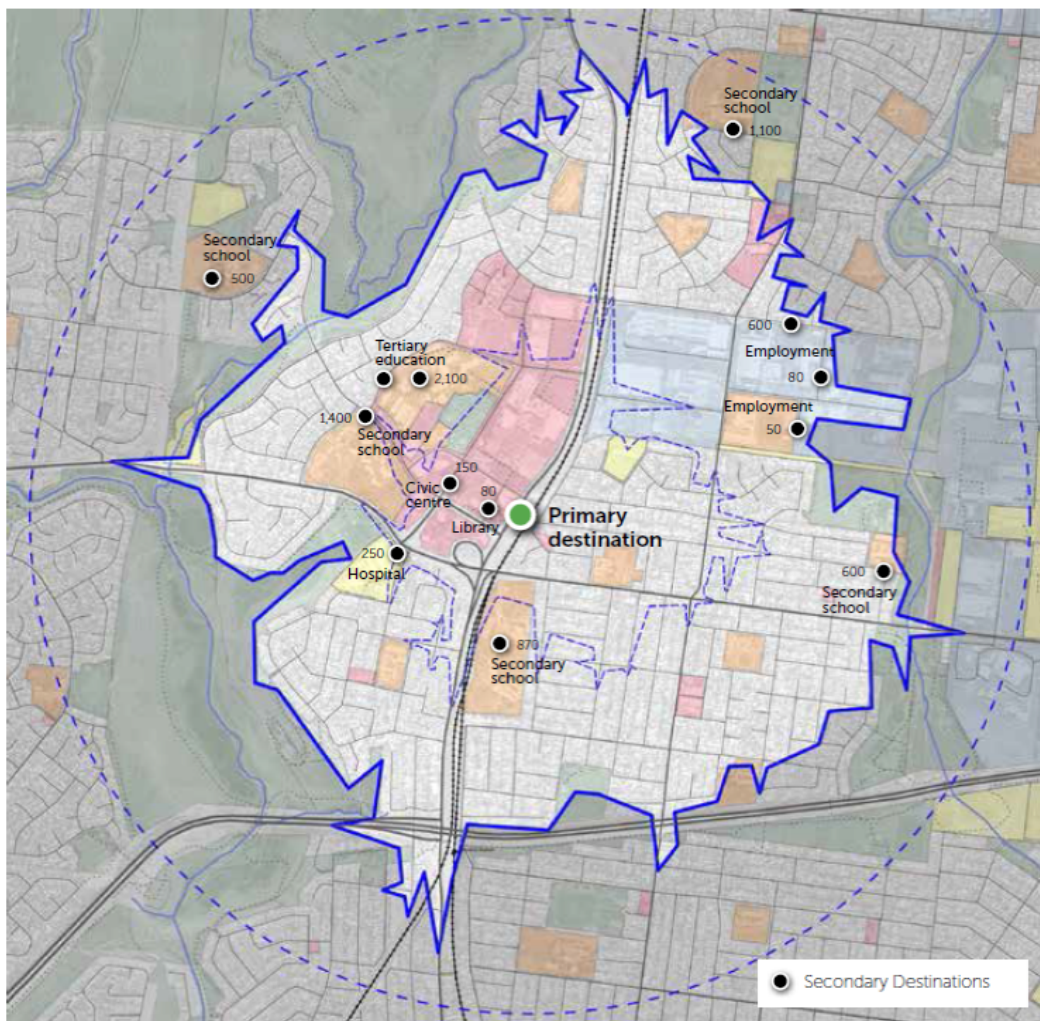
Figure 15 Map of Secondary Destinations N.B. The population figures shown on this plan are indicative only

Step 7 – Map shortest distance routes between primary and secondary destination(s)

Purpose

This step will map the shortest pedestrian route between the primary destination(s) and the secondary destinations.

This stage will produce a plan which shows the density of potential pedestrian routes within an activity centre based on the census population data assigned in Step 5 and the likely population of the secondary destinations assigned in Step 6. This plan will be a major input in delineating the PPN.

It should be noted that the accuracy of the shortest pedestrian routes will be dependent on the comprehensiveness of the pedestrian network data that is available to the routing software. Local knowledge and site walks can provide additional input to determine whether the routes are accurate.
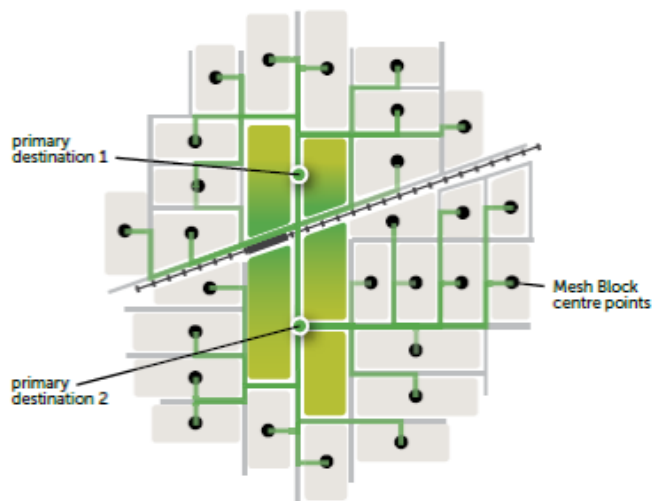
Figure 16 Shortest route mapping for more than one primary destination
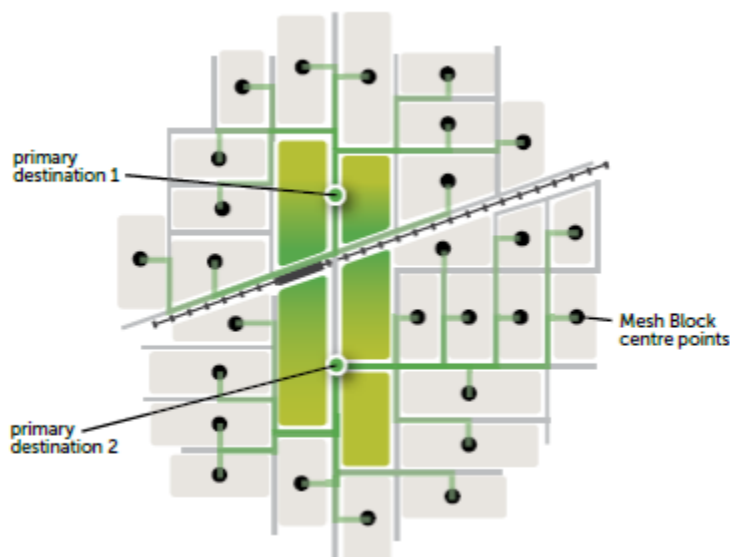
Figure 17 Shortest route mapping for more than one primary destination

Tasks

- Map the shortest distance route between the mesh block centre points and the primary destination(s). This will be undertaken utilising the methods outlined in the Appendices.

- If there is more than one primary destination point the following options for route mapping can be undertaken:

   -- create the shortest route between each mesh block centre point and each primary destination (refer to Figure 16)

   -- create the shortest route between each mesh block and the closest primary destination (refer to Figure 17).

- Map the shortest routes between the secondary destinations delineated in Step 6 and the primary destination(s). These routes should be delineated from the mesh block centre point routes (refer to Figure 18).

- Graphically represent routes so that the population along a route is reflected in the opacity of the colour. This can be done in GIS or a graphics package such as Adobe Illustrator, by assigning a level of opacity to each line based on the potential population attributes of the route. For example, a route that potentially services 50 residents can be assigned a 5 per cent opacity whereas a route that potentially services 100 residents can be assigned a 10 per cent opacity. Routes can be grouped together to make this task easier.

- Combine all of the routes into one map to represent the intensity of potential trips within the activity centre. When combined together the routes with the highest number of potential trips will show as the strongest colour (refer to Figure 18).
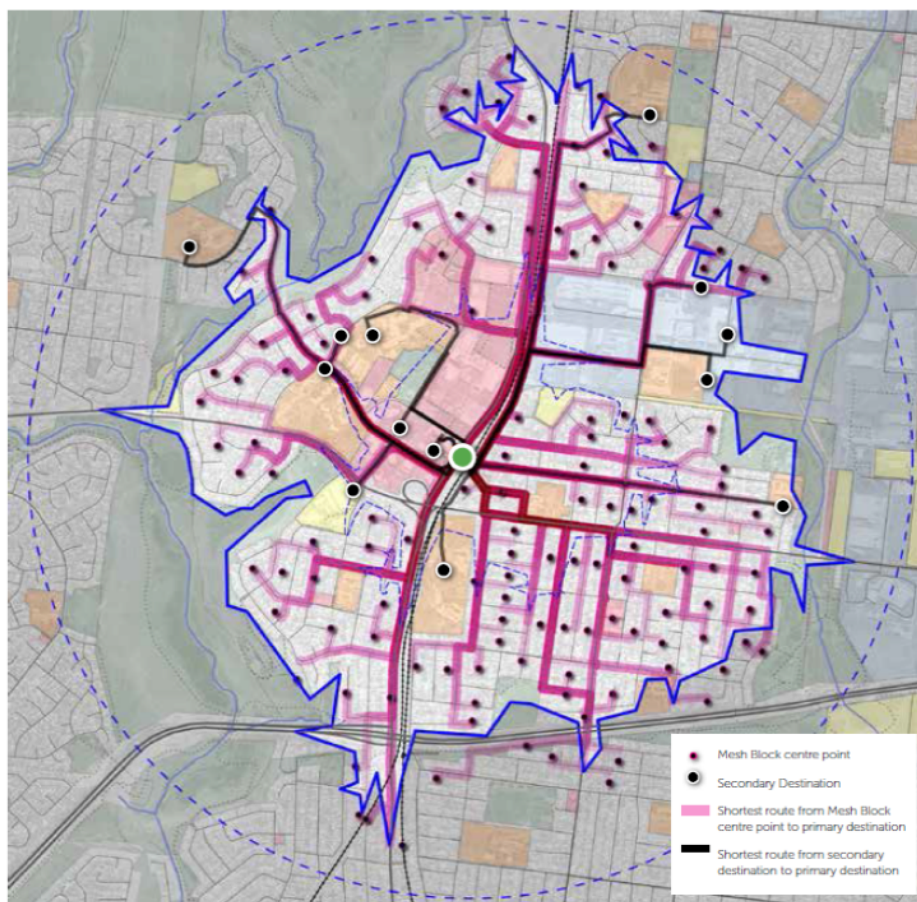
Figure 18 Shortest routes from primary destination(s) to secondary destinations and population centre points

Step 8 -Assess the intensity of pedestrian routes

Purpose
This step will utilise the shortest routes calculated in Step 7 to determine the total number of potential trips along each section of the route. This provides an accurate way to compare the intensity of the shortest routes within the centre for potential inclusion in the PPN.

It is important to consider that these numbers are based on potential trips if every person that lives or works within the centre point was to walk to the primary destination. It is likely that these numbers will be significantly greater than the actual trips, which can be verified with pedestrian counts.
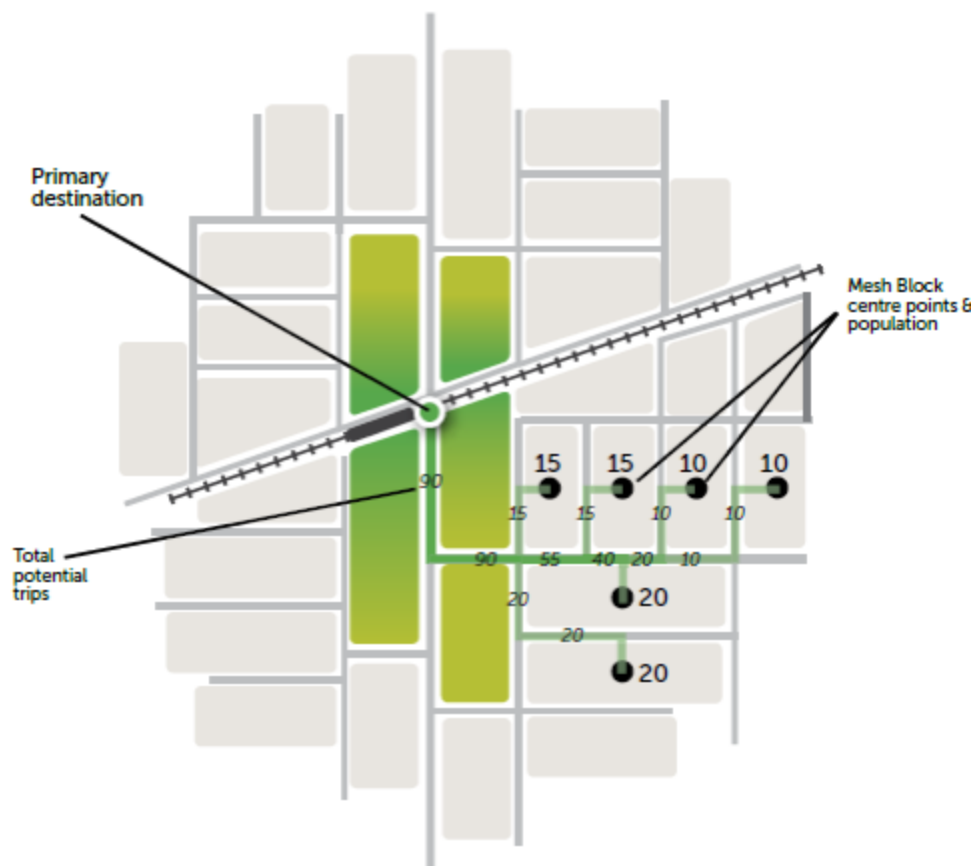

Figure 19 Calculating potential trips along a pedestrian route

Tasks

- Utilising the shortest route mapping, assign a potential trip attribute to each segment of the shortest pedestrian routes. This can be determined in the following ways:

  -- manually adding up the population numbers along a each section of a route

  (refer to Figure 19).

  -- Determine the potential numbers of trips along each route by utilising a GIS package (refer to Appendix A and Appendix B).

- Once the number of potential trips is assigned to each= segment of the shortest route, they can be calculated as a percentage of the overall population. This provides a good comparison of all of the shortest routes within the centre.

Outputs

- Potential Trip Analysis Map.

Resources

- Shortest routes prepared in Step 7.
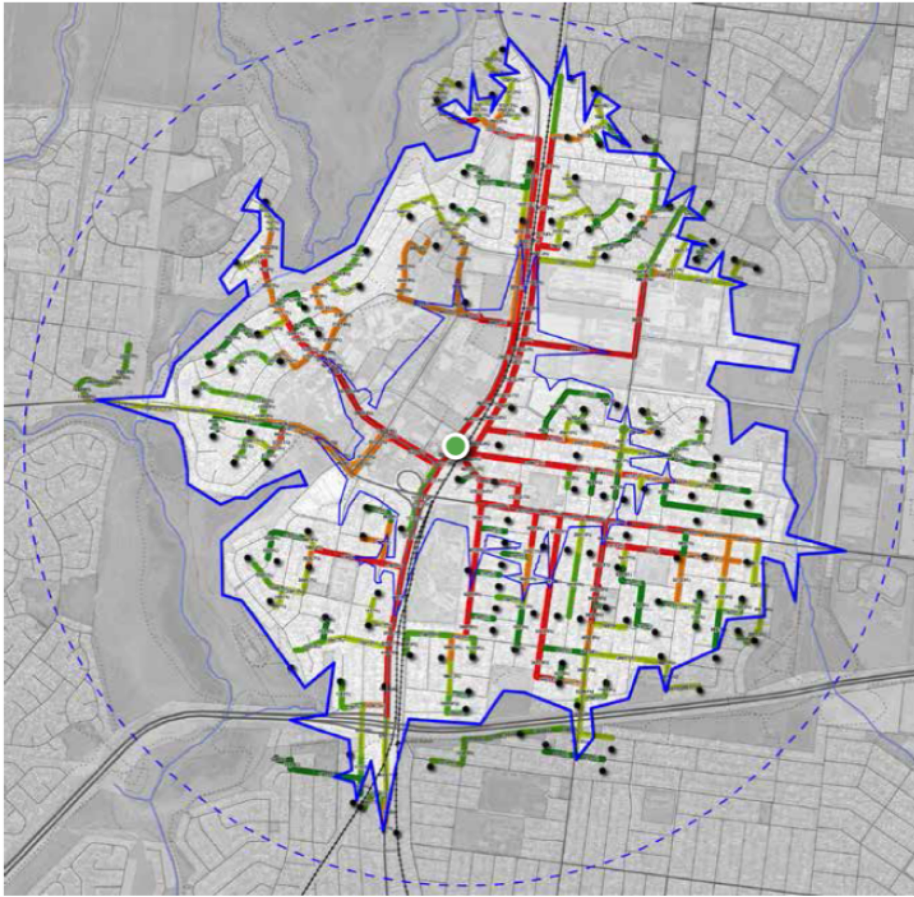
Figure 20 Potential trip numbers calculated in a GIS package

Step 9 – Delineate the Draft PPN

Purpose

This step combines all of the data that will be required for determining the PPN, including the mapping outputs from all of the previous steps. This will enable sufficient base data to determine the preliminary PPN based on desktop analysis.

As discussed in Part 1, the PPN will be delineated in two levels – primary pedestrian routes and secondary pedestrian routes. This section will focus on the delineation of the primary routes as the balance of the walkable catchment will be categorised as a secondary route.

Tasks

Prepare a combined analysis map

Determining the PPN is best undertaken by printing the combined map at a scale not greater than 1:10,000, then delineating the preliminary PPN network over the map on transparent paper. The combined map can be divided into a number of analysis maps if it is not legible with all of the information shown at once. The map(s) should clearly show:

- primary destination(s) – shown as a point and labelled appropriately

- the pedestrian catchment – The 2 kilometre catchment along road centre lines.

- the pedestrian network – usually road centre lines as well as off-street paths

- pedestrian infrastructure and movement barriers – creek or river corridors, major roads or freeways, rail line crossings, signalised crossings

- secondary destinations – shown as a point and labelled appropriately shortest routes – these should be displayed so that the colours or opacity illustrates a density and intensity of routes

- potential trip numbers prepared in Step 8, to illustrate the intensity of the shortest routes.

Delineating the primary pedestrian routes

General parameters for delineating the primary pedestrian routes:

- Pedestrians should generally be able to access the primary routes within 200 metres walk of each dwelling, which results in the primary routes being approximately 400 metres apart(refer to Figure 21). This distance can increase or decrease depending on the density of development and the structure of the activity centre.

- Routes should head towards the primary destination(s).

- Include routes that are known to be popular for walking to and from the primary destination, but may not have appeared as a preferred route on the shortest route analysis. This will require knowledge of the activity centre and potentially pedestrian counts to verify. Routes to be included as primary:

  - - include all routes that are fronted by ground level retail and form part of the core of the activity centre

    - ○ - include routes where the total number of potential trips is approximately 5 per cent of the total population within the centre

    - ○ - include all routes between the primary and secondary destinations if they are not already identified by the potential trip delineation above.

Delineating the secondary routes

- The balance of the pedestrian network within the walkable catchment can be delineated as a secondary pedestrian route. These parts of the network could be used to inform longer term planning for pedestrian improvements.
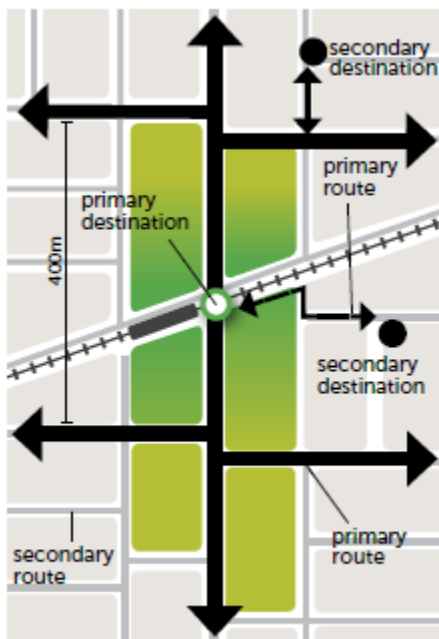
Figure 21 Delineating the PPN

Outputs

• Draft primary and secondary pedestrian routes.

Resources
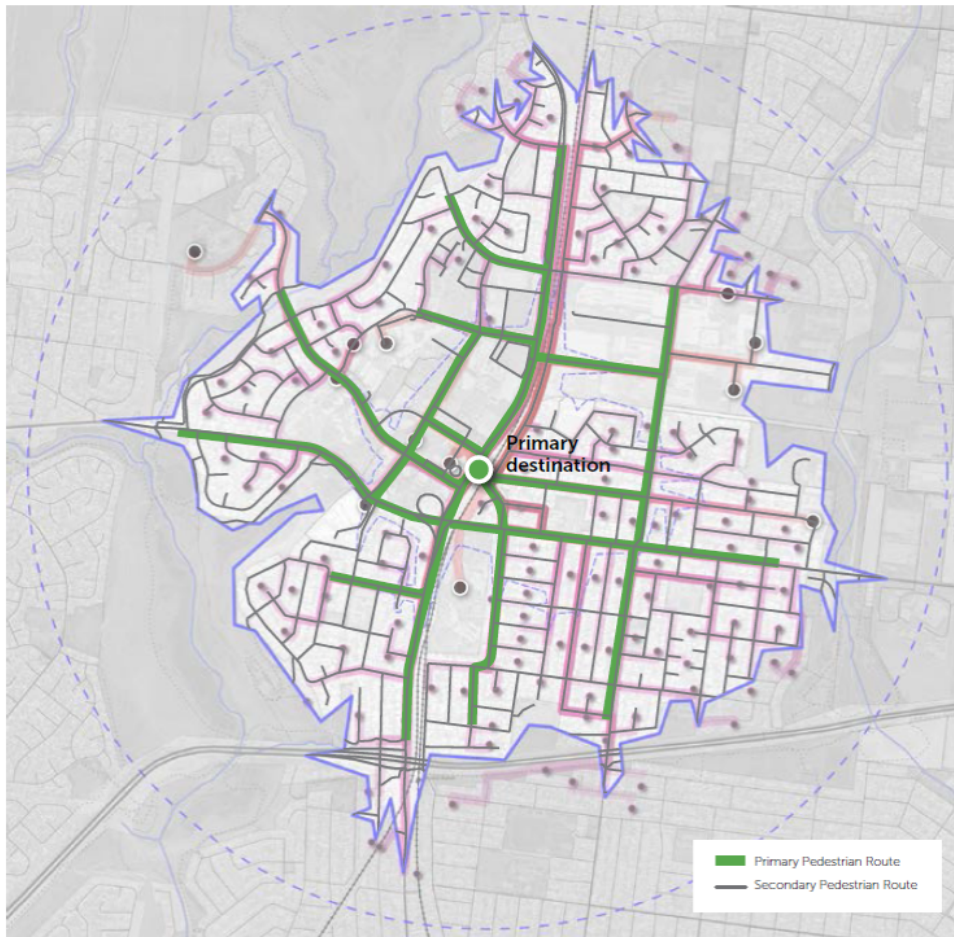
• Relevant data from previous steps

• Council staff.

Figure 22 Draft Primary and Secondary Routes

2. Validating the PPN

This section provides guidance on how to test and refine the PPN to ensure the routes identified in the delineation stage are the most appropriate priority routes.

Overview

This step is particularly important as the mapping techniques have limitations and can't always reflect on-the-ground conditions.

This step requires a combination of obtaining local knowledge about the usage of existing routes, incorporating future population increases and infrastructure changes, and undertaking site walks and pedestrian counts. From this, the primary and secondary pedestrian routes can be delineated with confidence.

There are six key steps that need to be undertaken to validate the PPN.

Step 1
Test the PPN with local knowledge (3-4 hours)
Step 2
Undertake a site audit (3-4 hours)
Step 3
Pedestrian counts (2 days)
Step 4
Consult with key stakeholders
(3-6 hours)
Step 5
Plan for future population and infrastructure changes (4-8 hours)
Step 6
Finalise the PPN (2-5 hours)

Step 1 - Test the PPN with local knowledge

Purpose

This step involves testing the PPN routes with local activity centre knowledge. This is particularly important because software cannot always predict the way people will walk within an activity centre.

A review of primary and secondary destinations and proposed routes will be undertaken in this step to check whether some secondary routes should in fact be elevated to a primary position.

Some secondary destinations may provide a relatively small number of potential trips, however the route may play a significant role in the local community for connecting a particular group of people to the primary destination.

These elements cannot be predicted through the previous delineation phase. A balanced judgment needs to be made on whether or not the route between the secondary destination and the primary destination should be classified as a primary route.

Tasks

Test routes with activity area knowledge

Utilising the PPN analysis maps and population route analysis, consider the following in the context of the activity centre:

- whether the identified routes are known to be heavily used by pedestrians within the centre

- whether it is known that an alternative route is currently being used by pedestrians

- whether there are existing walking impediments that prevent the identified route from being used or diminishes the efficiency of the route.

Assess the secondary destinations

Assess whether routes between the primary and secondary destinations will be included as primary routes by considering the following:

- the total number of potential trips generated by the secondary destination

- whether the secondary destination is likely to generate a significant amount of walking trips to the primary destination. This can be based on nature of the land use and its users

- the strategic importance of providing access for the users of the secondary destination to the primary destination.

In addition, connections between surrounding residential areas to the secondary destination should also be considered. This is particularly relevant where there is a large residential area in close proximity to the secondary destination that requires regular access to the secondary destination. In this case the route should be considered to be a primary route.

Outputs
- Updated maps to reflect local knowledge of the activity centre.

Resources
- Draft PPN map

- Council officers

- Local business and service operators.

Step 2 - Undertake site audit

Purpose

This step will test potential primary routes by comparing the mapping outcomes to the on-the-ground conditions. It will enable the identified routes to be documented through photographs and knowledge of local conditions and also allow the identification of routes that may not have been captured through the mapping process.

Techniques such as intercept surveys and casual chats with pedestrians can be used to ascertain the reasons for usage of particular routes.

This audit can also allow an initial qualitative examination of the draft PPN, including the nature and extent of delays, the presence or absence of footpaths, the quality of those footpaths and their width, as well as the identification of physical barriers or impediments.

Tasks

Preparation

- Print a version of the updated PPN analysis maps that can be marked up at a useable scale.

- Bring a camera for taking photos to support the findings of the site walk. The location of the photo should be recorded on a map or with a GPS device.

Walking the identified routes

The identified routes should be walked in their entirety and information should be documented for the following elements:

- Observe whether the routes are being used by pedestrians.

- Investigate why the route may not be utilised and record information with photographs and mapping.

Key considerations include:

-- whether intersections at major roads are safe and easy to cross

-- whether it is safe and convenient to cross railway lines

-- whether links are provided across natural barriers such as rivers and creeks

-- whether there are barriers that exist which were not identified as part of previous analysis.

- Document the locations of future anticipated population changes and the infrastructure changes through mapping and photographs.

- Ask pedestrians about their preferred routes within the centre and why they utilise particular routes and not others (optional).

Map the findings

- Update the PPN analysis maps to reflect the findings of the site visit and note any potential changes to the draft PPN.

- Incorporate photographs into the mapping database so that an existing condition can be easily cross referenced to an on-the-ground location.

Outputs

- Refined analysis maps incorporating site walk data

- Photographic database to integrate with analysis maps

- Notes to support site walk.

Resources

- Draft PPN map

- Informal conversations with locals

- Camera

- GPS device (optional).

Figure 23 Poor quality pedestrian environments may contribute to the low usage of the route

Step 3 - Verify with pedestrian counts

The purpose of the pedestrian count is to validate the potential trip numbers developed through the PPN analysis mapping step with actual usage of the pedestrian routes within the activity centre.

The proposed pedestrian counting method allows future comparison between activity centres and some of the major cities in Australia, whilst recognising that lower pedestrian volumes are expected in Melbourne's activity centres.

Tasks

- The streets selected for the pedestrian count should be locations where the primary routes are intended to be delineated. This includes the routes where the highest number of potential trips are concentrated, and also where the site audit and local knowledge indicates these will be a significant amount of walking trips.

- The location within the street should be carefully selected so that it is in close proximity to the primary destination and it is in an area that does not overlap with other routes that are also being counted.

- Counts should be carried out in selected streets for 15 minutes in every hour between 8 am and 6 pm. The count results will need to be extrapolated to produce an hourly estimate. This allows the data collector to obtain data for up to three sites that are in relatively close proximity within one day.

- The pedestrian count should take place on a mid-week weekday ideally Tuesday. This is because people tend to behave according to their usual travel patterns on a mid-week weekday. On other days such as Fridays people tend to use their car or another form of transport to tie in with after work commitments or similar reasons.

- Compile the pedestrian count data for each location and compare the potential number of trips identified in Step 8 of the PPN Delineation Stage.

Outputs

- Pedestrian counts for selected PPN routes

- Comparison of the counted pedestrians against the potential trip data.

Resources

- Base plans showing the locations for the pedestrian counts

- Timing device

- Sheets for recording pedestrian numbers with location, date, time of day recorded.

Step 4 – Consult with key stakeholders

Purpose

This step involves consulting with key stakeholders within both councils and VicRoads to critically analyse the delineation of the draft PPN.

Tasks

- Prepare relevant maps to convey the development of the draft PPN to key stakeholders.

- Undertake meetings with key council staff from relevant departments to discuss the draft PPN.

- Undertake meetings with VicRoads to discuss the draft PPN.

- Collate suggested changes to the draft PPN.

Outputs
- Summary of potential changes to the draft PPN.

Resources
- Previous PPN mapping analysis

- Pedestrian counts

- Revised PPN Map

- Council staff

Step 5 - Plan for future population and infrastructure changes

Purpose

This step provides the opportunity to forecast the effect of future population and infrastructure changes within the activity centre. This is particularly important as the PPN will need to adapt to the changing needs of the activity centre.

The initial task is to update the population data to reflect any known future residential developments that will be occurring within the activity centre and the likely population increase from those developments.

In addition, future pedestrian network changes will also be mapped, which could affect the existing pedestrian routes within the centre.

Tasks

Map future population changes
- Research future population changes within the centre by investigating the following:

  -- planned future developments that are known to council

  -- planned future developments that are included in the urban development program.

- Utilising the mesh block centre points create an additional attribute to the relevant centre points to provide information about future dwelling and population increases.

- Create new mesh block centre points if necessary to reflect a new area of development that wasn't accurately reflected with the existing mesh block centre points.

Map future infrastructure changes
- Research any studies that have been undertaken for the centre relating to infrastructure changes that will affect the pedestrian network. These changes should include:

  -- new roads planned as part of a future development

  -- proposed changes to intersections such as pedestrian crossings, signalised crossings or roundabouts.

-- future off-street footpaths.

- Map the planned changes on the PPN analysis maps and consider how the changes could affect the PPN.

Update the pedestrian routes
- Create a duplicate of the routes create to establish a new dataset, which reflects the population forecasts and any infrastructure changes.

- On the duplicate copy, update the population attributes of routes where applicable to reflect the future population changes in the centre.

- On the duplicate copy of the routes, re-align existing routes or create new routes to reflect the proposed changes to the pedestrian network.

- Combine the updated routes into the PPN analysis maps to show a comparison between the existing conditions and the future infrastructure and population changes.

Outputs
- Combined PPN analysis map showing updated infrastructure and population weighting to routes.

Resources
- Urban development program (contains information about future known developments): http://services.land.vic.gov.au/ maps/content/udpintroduction

- Councils, state government planning, VicRoads – to determine future known developments, or proposed land use or urban form changes in the centre.
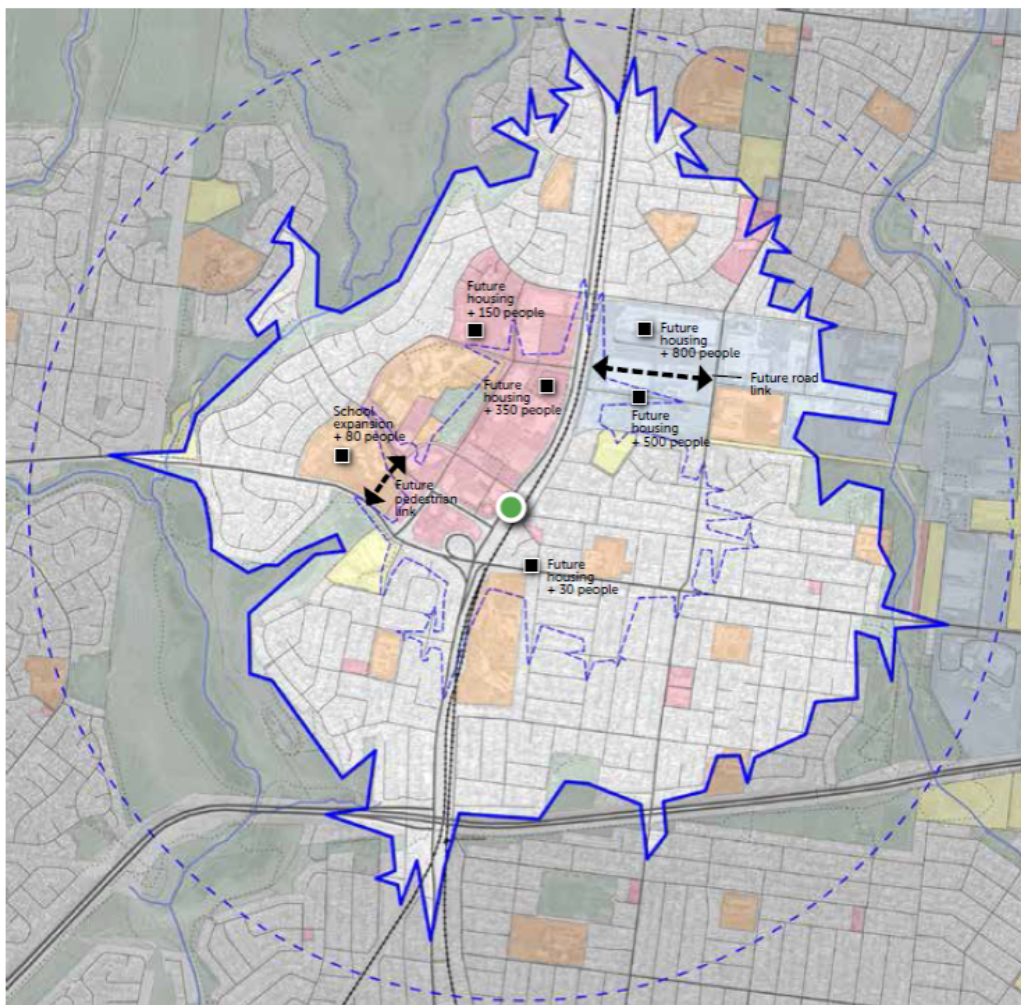
Figure 24 Future population and infrastructure changes N.B. The changes shown on this plan are indicative only

Step 6 - Finalise the PPN

Purpose

Following the discussions with council officers, VicRoads and state government planners (if required), the PPN can be finalised. This will require an assessment of the potential changes identified in Step 3.

Tasks

- Assess the recommended changes to the draft PPN.

- Refine the PPN if necessary.

- Prepare summary report which provides an overview of the analysis and the development of the PPN. Include relevant maps, notes and photos where necessary.

Outputs

- Final PPN map

- Summary report.

Resources

- Previous PPN mapping analysis, notes and photos

- Final PPN map.

3. Implementing the PPN

Overview

The first step in implementing the PPN is to undertake an assessment of the pedestrian environment to determine the gap (if any) between the existing quality of pedestrian environment (including elements from delay at signalised crossings to footpath surface quality shade) and the desired quality of the pedestrian environment for a PPN

An implementation action plan can then be prepared, which identifies key projects that need to be undertaken in order to improve the pedestrian environment of the PPN.

A monitoring and review process could also be developed which allows the PPN to be updated as change occurs within the activity centre. These are three key steps to be undertaken to implement the PPN.

Step 1
Pedestrian environment assessment (2-3 days)

Step 2
PPN implementation plan (ongoing)

Step 3
PPN monitoring and review (ongoing)

Step 1 - Pedestrian environment assessment

Purpose

The pedestrian environment can be assessed in a variety of ways. A level of service assessment (LOS) can form part of the evaluation of the quality and performance of the pedestrian network. A LOS could be adopted to assess signal delay to pedestrians across an area (refer to Appendix D for further, information). The assessment of the pedestrian environment could also include a walkability assessment, an assessment of soft landscape, resting opportunities and quality of the footpaths. The assessment framework adopted will help identify actions and projects to improve specific sections of the pedestrian network.

Tasks

- Assess the quality of the pedestrian environment. This will require the use or development of an assessment framework tailored to each local government. These are often informed by council

- specific urban design and image guidelines. This may require a site visit or walk or a series of walks, which may usefully be combined with other visits as part of the PPN development.

- Determine a rating for each part of the PPN and identify the scope of the work required for each part of the network to achieve the desired outcome.

- Retain the assessment of the pedestrian environment on the PPN for future reference when planning and prioritising pedestrian infrastructure works.

Outputs

- Pedestrian environment assessment, including

- Identification of gaps between existing quality of the pedestrian environment and the desired pedestrian environment

- Improvement needs and potential projects

Resources

- Final PPN map

- SmartRoads network operating plans.

Step 2 - PPN implementation plan

Purpose

This step involves preparing an implementation plan that focuses on the locations where changes to the pedestrian network are required. This will enable the PPN to be transformed from a 'line on a plan' to a physical network on the ground.

Key projects will be identified along with the key steps required, the priority of the project, who will implement the project, its cost and potential funding opportunities.

A key consideration in this step will be determining the importance of each project in relation to the PPN. Some projects may require negotiation with an external stakeholder, particularly where the project intersects with other routes along the VicRoads SmartRoads network operating plan. Understanding the role of the project and its importance in implementing the PPN will assist in these negotiations.

Tasks

Identify key projects

- Identify the key projects within the PPN that will need to be undertaken in order to bring the PPN to the desired pedestrian environment identified in Step 1.

- Categorise the identified projects so that a level of importance can be allocated. This will assist in future negotiations with key stakeholders and enable a priority to be allocated to each project. The following categories could be utilised to categorise projects:

-- **essential** – the project is critical to the success of the PPN and the highest level of pedestrian priority should be provided

-- **Important –** the project is important to the success of the PPN however there may be negotiation around the level of pedestrian priority that will be provided

-- **non-essential** – the project will assist in developing a successful PPN however the existing conditions and the likely usage of the route means that it is not essential to the success of the network.

- Determine whether the project will intersect with the VicRoads SmartRoads Network operating plan or VicRoads managed roads. Note the route type that it will intersect with ie bus priority route, preferred traffic route etc.

Prepare the PPN implementation plan

- Prepare an implementation plan which provides additional details around the key projects identified in the previous task. The implementation plan could be provided in a table format with the following details:

-- **project overview** – provide a summary of the project details and the likely benefits to the PPN

-- **key steps** – provide a summary of the necessary steps (tasks) that will need to be undertaken in order to implement the project

-- **roles and responsibilities** – list the roles within the organisation that will be responsible for implementing the project and how they will communicate with the other parts of the organisation and external stakeholders

-- **external stakeholders** – list the likely external stakeholders and how they will need to be consulted with.

-- **priority** – determine the level of priority for each project including a staged timeline for works. Classify each project as: Short term (0-5 years), Medium term (5-10 years) or long term (more than 10 years).

-- **cost** – likely costs of the project.

-- funding opportunities – possible funding sources over the shorter term (up to 5 years) or longer as appropriate. Implementation progress – this section will be updated periodically to note the progress of the project implementation.

- Map of key projects with priority classification

- PPN implementation plan.

Resources
- Final PPN plan

- Council staff

- External stakeholders.

Step 3 - PPN monitoring and review

Purpose

This step will ensure that the routes delineated are still valid in the context of actual and planned change within the activity centre. It will also enable the success of key projects to be measured and assessed.

Tasks
- Undertake a periodic monitoring and review of the PPN to ensure that the proposed network is validated against the current and planned characteristics of the activity centre. The following steps should be undertaken as part of this review:

  -- monitor changes to the population, infrastructure and land use and consider how these changes may affect pedestrian movements

  -- update pedestrian counts at the locations you have previously chosen to collect pedestrian data from, in order to monitor changes in route usage

  -- determine whether the projects implemented have improved the pedestrian network within the activity area based on pedestrian counts and site observations

  -- determine whether any additional projects will be required or whether the priority of planned projects should be altered

  -- make changes to the PPN as required

  -- update the PPN implementation plan following a review of the PPN.

Outputs
- Updated PPN and implementation plan as required.

Resources
- PPN implementation plan

- Final PPN plan

- Council staff

- External stakeholders.

The monitoring and review process will enable the success of key projects to be measured and assessed.

Appendices

Appendix A - Advice on mapping techniques

Technical advice on mapping techniques

Delineating the PPN relies heavily on mapping software in order to define the pedestrian network and establish the shortest routes between the origins and destinations within the particular area.

From a technical perspective, there are a number of different approaches available for carrying out the mapping and analysis tasks outlined in Steps 1 to 9 of this report part. Each approach has trade off's between accuracy, technical complexity and software accessibility.

The following techniques have been developed for their ability to suit the needs of a range of project types, software availability and technical ability. Other software packages may be used to complete the steps outlined in the methodology. Local governments are encouraged to give consideration to the most time and cost effective software for mapping their networks.

GIS (MapInfo or ArcGIS, ESRI ArcGIS)

Geographic Information System (GIS) packages are commonly used in local and state governments.The main advantage of GIS is that metadata can be attributed to mapped shapes in their real world coordinates. This allows the development of a comprehensive database of pedestrian networks.Complex formulas can also be used to help delineate the network.

Strengths
- the software and required mapping data is generally available to Councils

- it can undertake the majority of steps in delineating the PPN. However both GIS packages will require an 'add on', which can be costly

- the mapping data created through the PPN can be incorporated into council's database.

Weaknesses
- 'add-ons' are required to complete the route mapping, which can be costly

- requires a higher level of technical expertise for some tasks

- graphical output isn't strong particularly when trying to combine data into one map.

Google Maps/Google Earth

The Google packages are freely available for public download and use and integrate a mapping database that is maintained by Google. The main strength of the Google packages is that they are freely available and require a lower level of expertise for use.

Strengths

- the software is free to use and a substantial amount of mapping data is available

- free route mapping can be undertaken in Google Maps

- additional data can be added to the mapping database including photos

- data can be shared easily and made accessible to the public if required

- allows a higher level of control over the graphical output.

Weaknesses

- cannot undertake all of the tasks required in the steps. GIS software is required for extracting

- the Census data and also automatically populating routes

- requires switching between Google Maps and Google Earth to complete the tasks

- the Google Maps database may not contain all of the routes that are available to pedestrians. Google MapMaker will allow users to update pedestrian network however it is not currently available in Australia.

- It is expected to become available sometime in the future.

Appendix B - MapInfo mapping steps

Introduction

The following provides a guide to undertaking the PPN analysis mapping in MapInfo GIS software.

This guide will require a version of RouteFinder which is a route modelling plugin for MapInfo.

Go to: www.routeware.dk/ routefinder/routefinder.php

Alternative route mapping software can be used in MapInfo if required, however a number of these steps refer specifically to RouteFinder.

1.1 Collate mapping data

With base relevant base information opened in MapInfo, the primary destination can be delineated within a new table.

1. **Collate data**

   - Collate and open relevant base data in MapInfo format. This could include cadastre, road centre lines, planning zones, rail line and railway stations and aerial photos. Ensure data is provided on the same mapping projection.

   - Gain an understanding of the attributes of each MapInfo Table. i.e. road centre line data often contains information about road classification.

   - Collate any other relevant transport network data.

2. Clip data to 3-4 kilometre catchment around likely primary destination

   - Estimate what the primary destination is likely to be and clip the mapping data to a 3-4 kilometre radius around the likely primary destination. This will ensure that future mapping is more efficient.

   - Save copies of the tables with the clipped mapping data.
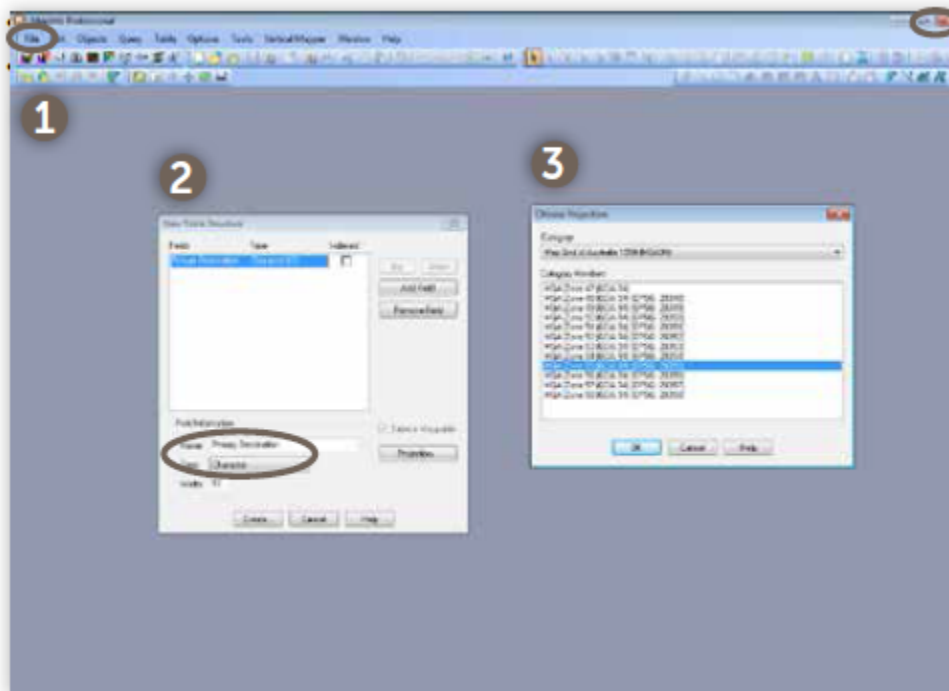
Create new table
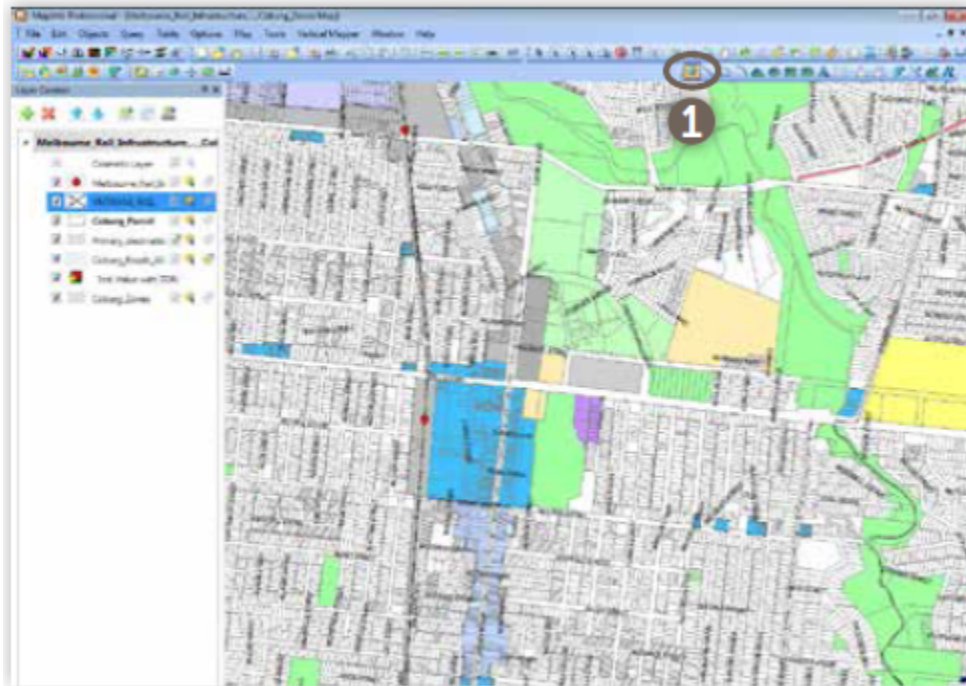
Create new symbol

1.2 Map primary destination(s)
With base relevant base information opened in MapInfo, the primary destination can be delineated within a new table.

1. Open relevant data

- Open relevant base data within MapInfo to enable the primary destination to be determined. This could include cadastre, road centre lines, planning zones, rail line and railway stations and aerial photos.

2. Create new table

- select file menu > new table

- ensure add to current mapper is selected in the new table window and table structure – create new

- new table structure window

  – add relevant fields and choose relevant projection. The projection should be the same as your other mapping data.

3. Create new symbol

- select the symbol tool to create new symbol at the primary destination

- the primary destination should be located on a road centre line so that the routing in Task 1.6 is accurate. Use the snap tool to ensure that the symbol is located on a centre line

- change the symbol style so that it is easily discernible amongst other mapping data

- select file menu > save table.

4. Provide 2 kilometre buffer from primary destination

- select primary destination symbol and ensure it is editable

- select edit menu > buffer

- utilise a value of '2' and ensure the units are set to 'kilometres'

- separate the new buffered object from the primary destination by copy and pasting into a new table

- save the new table.
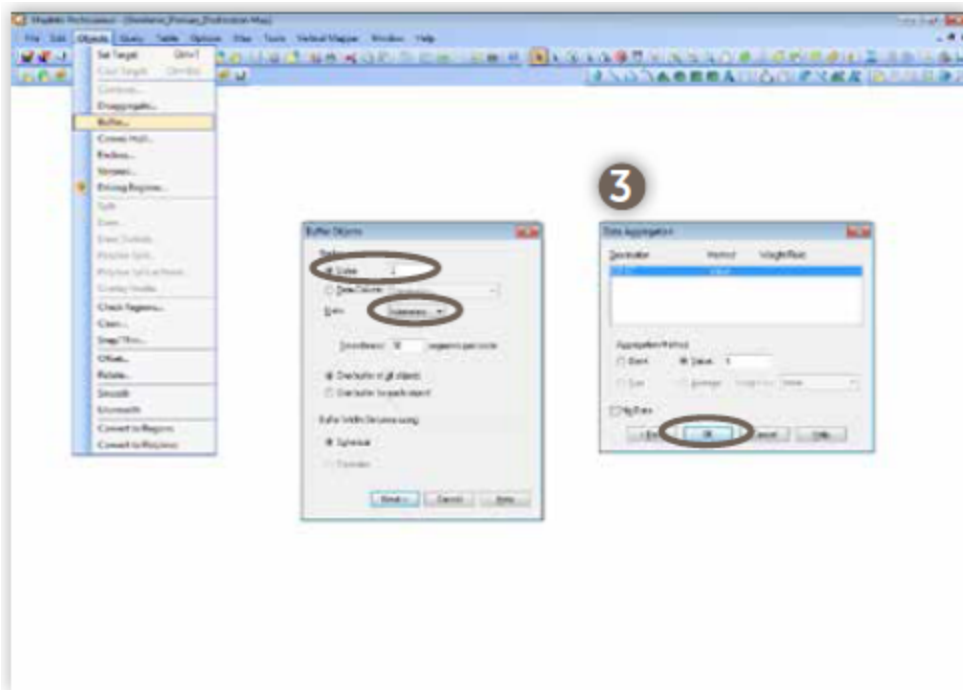
Provide 2 kilometre buffer from primary destination
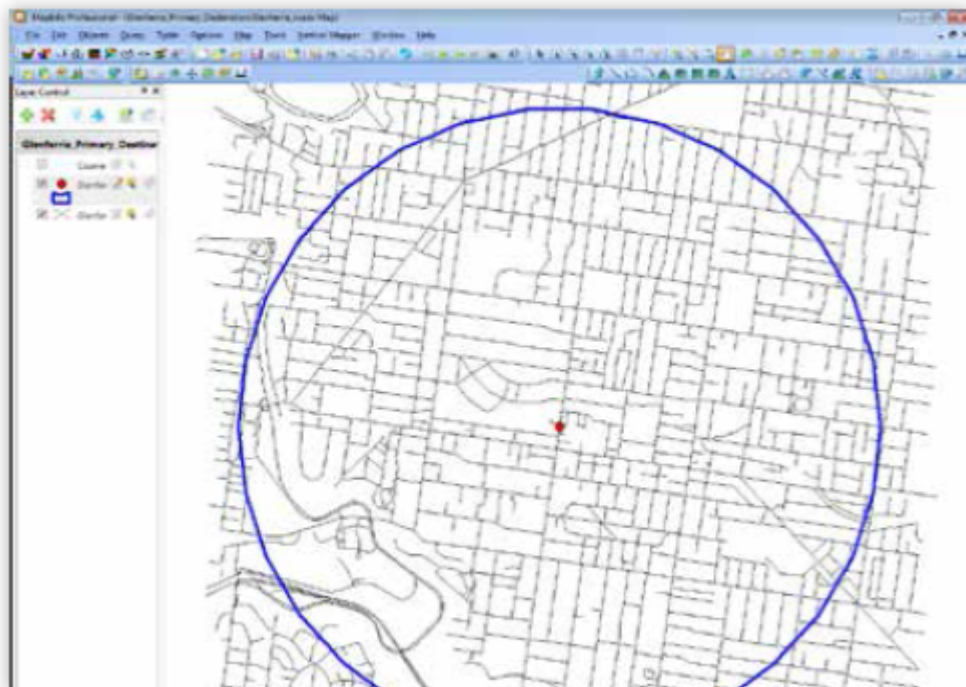
Provide 2 kilometre buffer from primary destination

1.3 Map the pedestrian network and walking constraints
1. Map the pedestrian network

- open the road centreline mapping data or other mapping data that will be used as a base for the pedestrian network

- select file menu > save copy as

- save new copy as 'pedestrian network' and open it

- select roads that will not form part of the pedestrian network and delete these from the mapping data. These roads could be freeways or bridges where there is no existing pedestrian access

- add in additional pedestrian network elements including off-street paths and new roads that aren't included in the existing dataset.

- save the table: select file menu

  ➢ save table

- pack the table: select table

- menu > maintenance >pack table

2. Map walking constraints and other elements

- open up sufficient base mapping data that will allow the mapping of walking constraints

- and other elements such as signalised road crossing, rail or river crossings or barriers such

- as freeways

- create new tables where appropriate and create new elements using lines or symbols

- as appropriate. Assign attributes to new data.

- save the new tables.

1.4 Map the walkable catchment from the primary destination
1. Create network in Route Finder

- open Route Finder in MapInfo

- open both the primary destination(s) and the pedestrian network tables

- select Route Finder menu > network > create network from table

- Set 'attribute column' to whichever column contains information about the pedestrian network. i.e. off street paths, on-street paths etc.
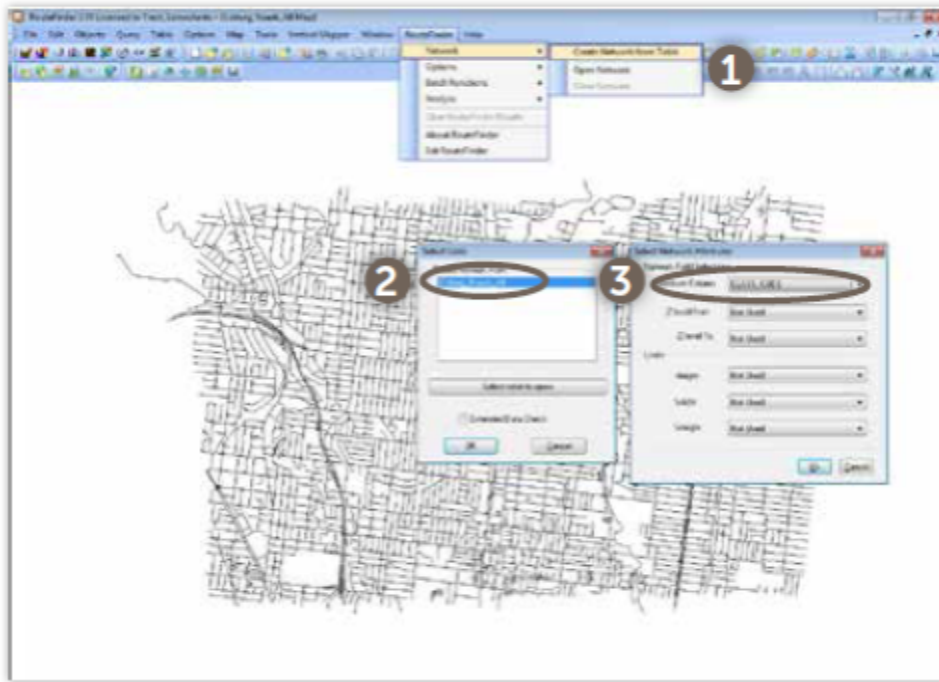
Create network in Route Finder

2. Configure the walkable catchment options

- select Route Finder menu > options > driving distances

- ensure driving distances are set to 'distance' rather than 'time'

- set routes to 'most accurate'

- set a driving zone to 1 kilometre. Provide an additional driving zone to 2 kilometre

3. Map the walkable catchment

- select Calculate 'Voronoi based drive time' from the Route finder toolbar

- click on your primary destination point in the map window to create the 1 kilometre walkable catchment

- save a copy of the catchment table.
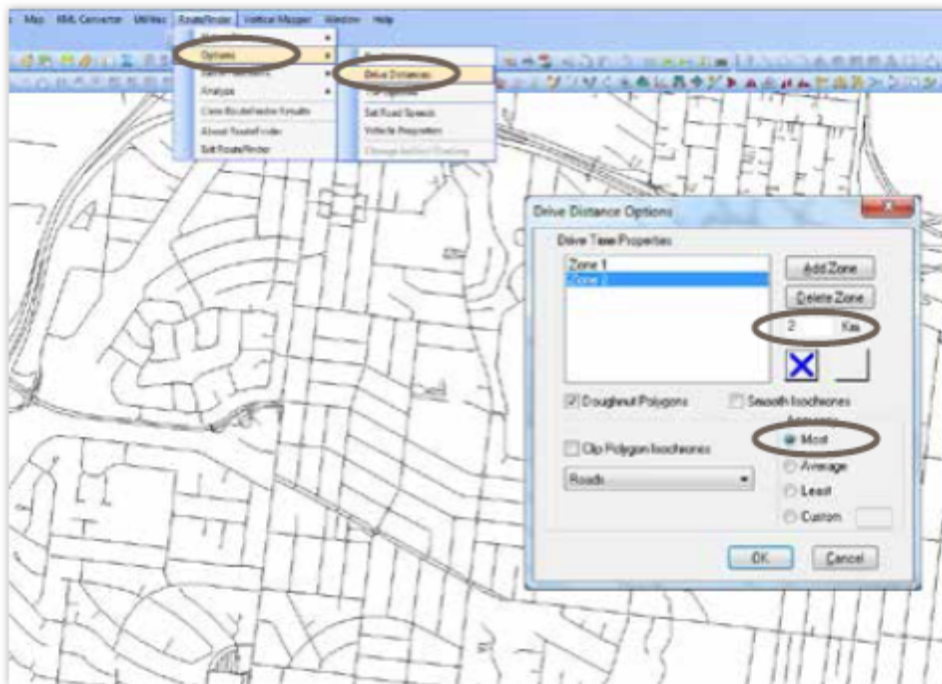
2. **Configure the walkable catchment options**

3. Map the walkable catchment

1.5 Map existing populations

1. Obtain Census mesh block data

- Go to www.abs.gov.au to download the current Census mesh block data in .shp or .tab format. Save this to a location on your computer.

2. Open mesh block table in MapInfo

- Open MapInfo. Click *File*, then *Open* from the top left drop down menu. Browse to the location where you have saved the mesh block Data.

3. Select all mesh blocks within the 2 kilometre catchment

- open the 2 kilometre walking catchment. Select file > open. Browse to the location where you have saved the 2 kilometre walking catchment

- ensure the Census mesh block layer is selectable

- while holding down the *Shift* button on your keyboard at the same time, using the *select tool* with your mouse; *click* on every mesh block which is contained by or overlaps the 2 kilometre walking radius

- copy the selection by pressing *Ctrl* + c on your keyboard.
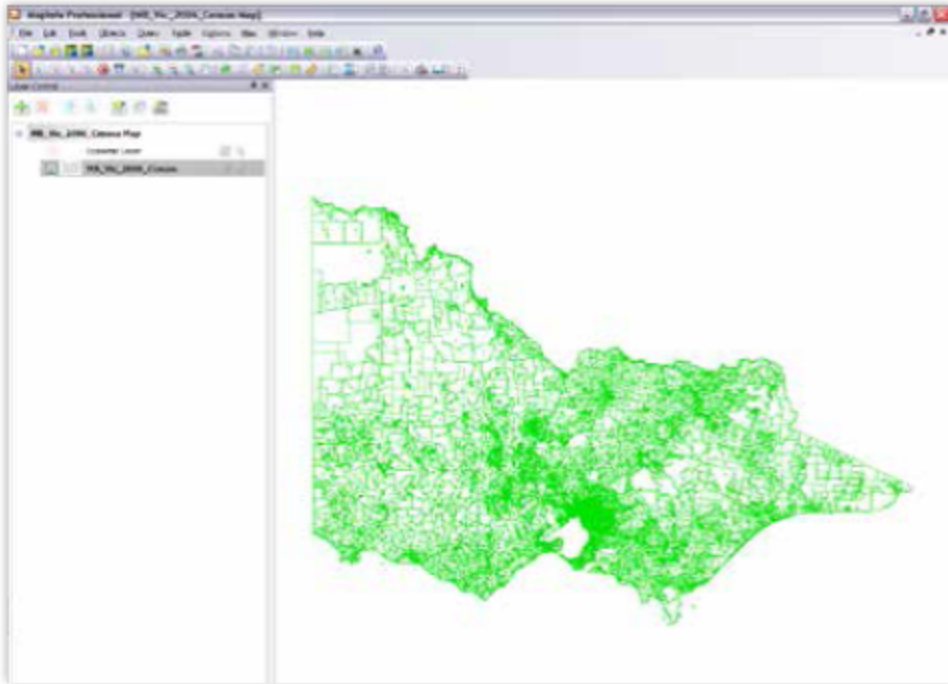
2. Open Mesh Block table in MapInfo
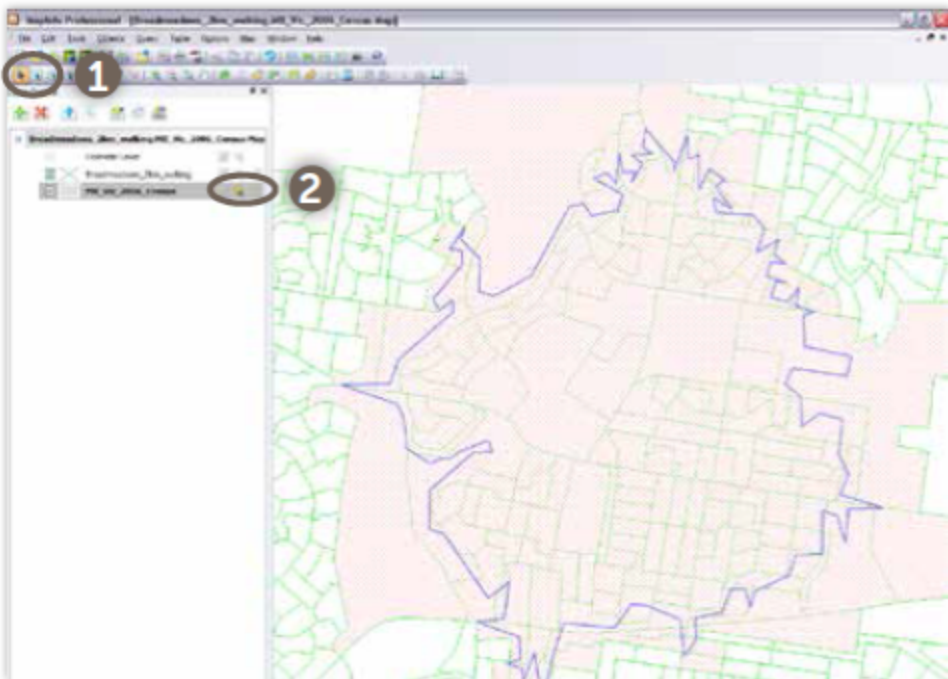
3. Select all mesh blocks within the 2 kilometre catchment

4. Create new table

- Select file > create New table
- use the same structure as the Census mesh block table
- set the projection to the same projection as your pedestrian network
- paste the selection from the previous into your new table by pressing *Ctrl + v* on your keyboard

- in the layers panel, *right click* on the layer you have just pasted and select View entire layer.

5. Delete mesh blocks with a population of 0 Use the query function to select mesh blocks with a population of 0.

- select query menu > Select :

- Select records from table: Choose your new mesh block Table

- *That satisfy:* Total_UR_ Population_2006 – 0

- click *ok* to complete the selection query.

A query browser table will open which you can close. All mesh blocks with a 0 population will now be selected.

- ensuring the mesh block layer is editable, press the *delete* button on your keyboard to remove

- the unwanted mesh blocks. save the table

- pack the table: select Table menu > maintenance > pack table.
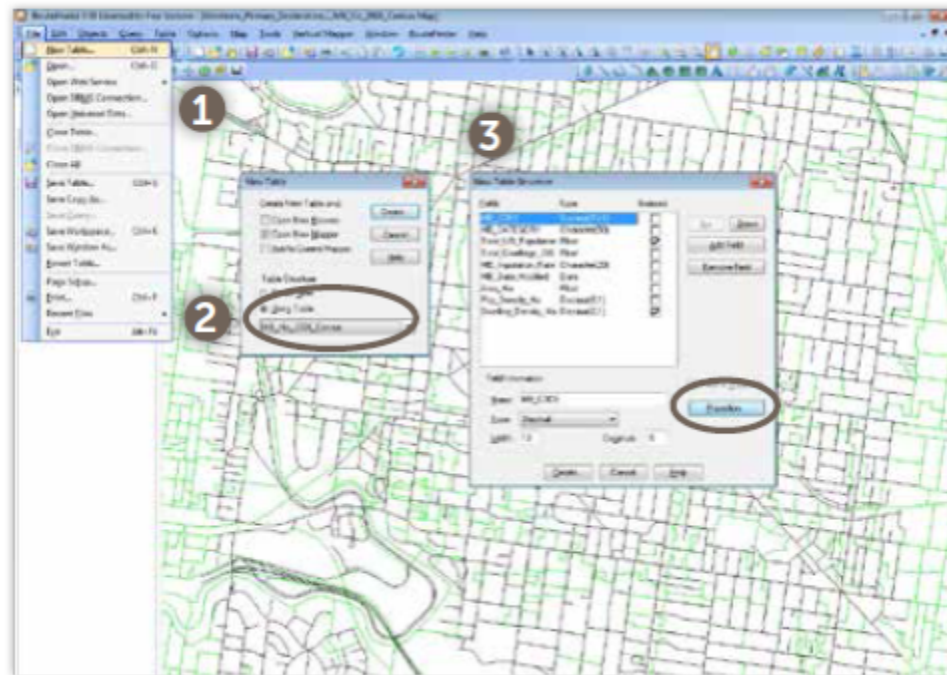
4. Create new table
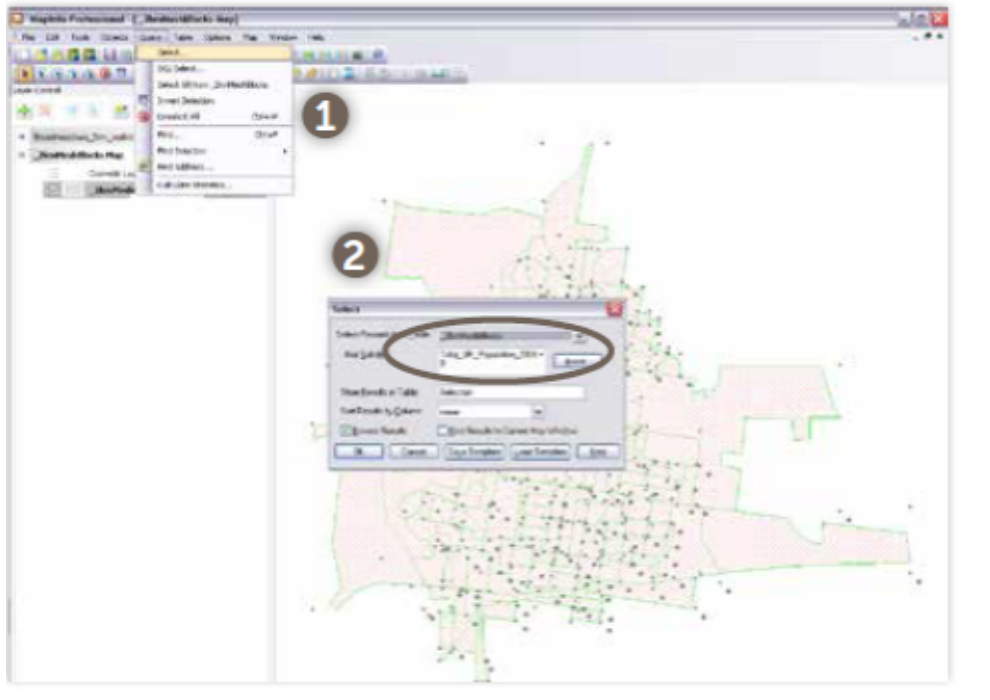
5. Delete mesh blocks with population of 0

6. Create mesh block centre points

- select options menu > *show Mapbasic window*

- paste the following script into the Mapbasic window: update

- *<layer_name>* set OBJ – centre point (OBJ)replace *<layer name>* with the name of the layer containing your mesh blocks. Replace any spaces < >with an underscore <_>.

- press the *number enter* button on your keyboard

- select file menu > save copy as

- browse to a location where you would like the file saved and specify and file name

- the new layer will show a series of points located in the geographical centre of each mesh block.
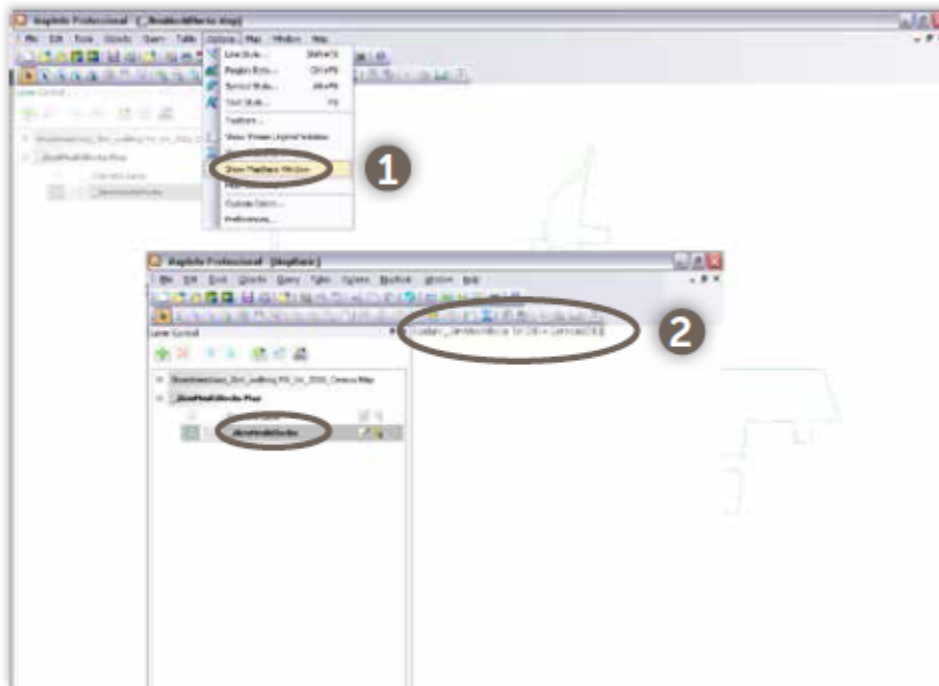
6. Create Mesh Block centre points
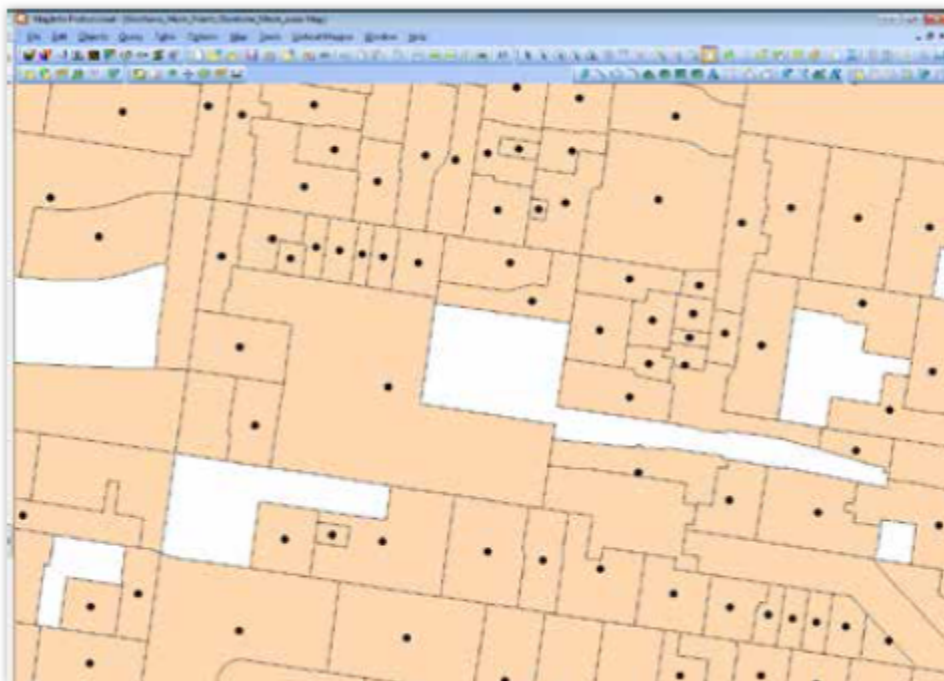
1.6. Create Mesh Block centre points

1.6 Map the secondary destinations and likely populations
With base relevant base information opened in MapInfo, the primary destination can be delineated within a new table.

1. Open relevant data

- Open relevant base data within MapInfo to enable the primary destination to be determined. This could include cadastre, road centre lines, planning zones, rail line and railway stations and aerial photos.

2. Create new table

- select file menu > new table

- ensure add to current mapper is selected in the new table window and table structure – create new

- new table structure window – add relevant fields and choose relevant projection. The projection should be the same as your other mapping data.
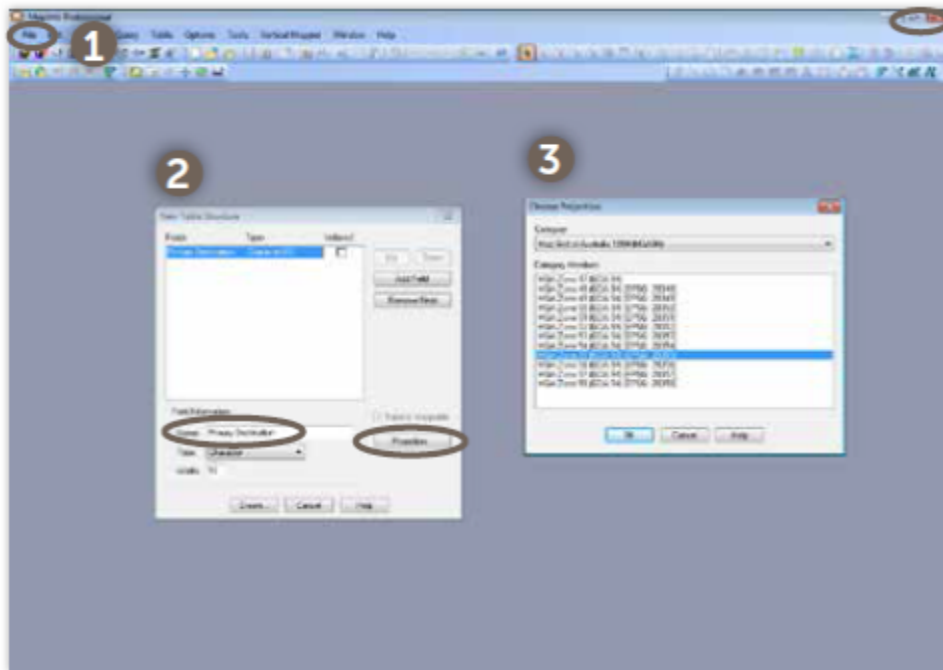
2**. Create new table**
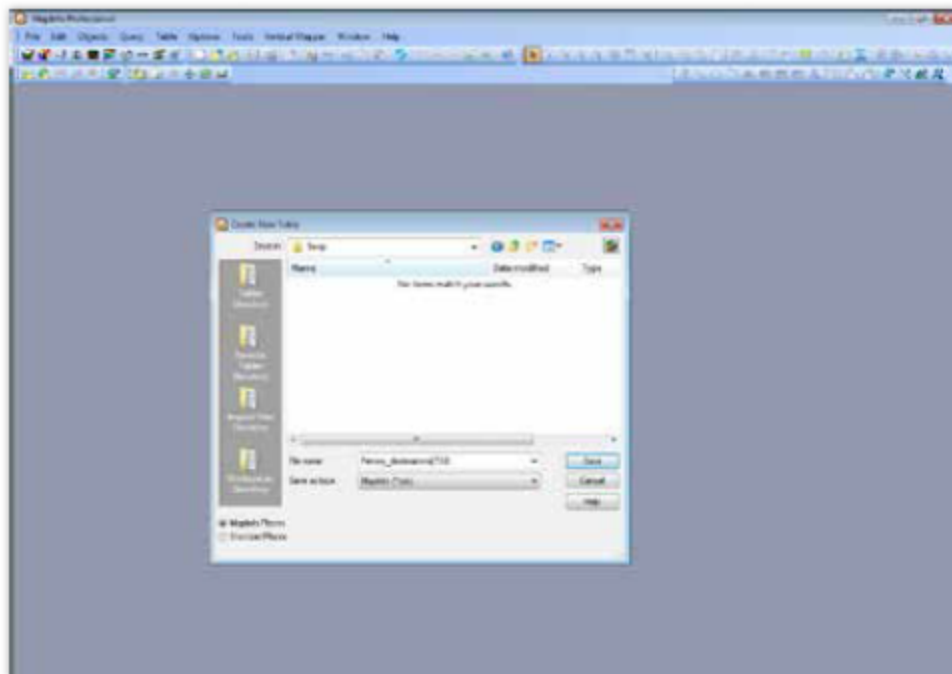
2. Create new table

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3. Create new symbol

- select the symbol tool to create new symbol at the primary destination

- the primary destination should be located on a road centre line so that the routing in Task 1.6 is accurate. Use the snap tool to ensure that the symbol is located on a centre line

- change the symbol style so that it is easily discernible amongst other mapping data.

- select file menu > save table.
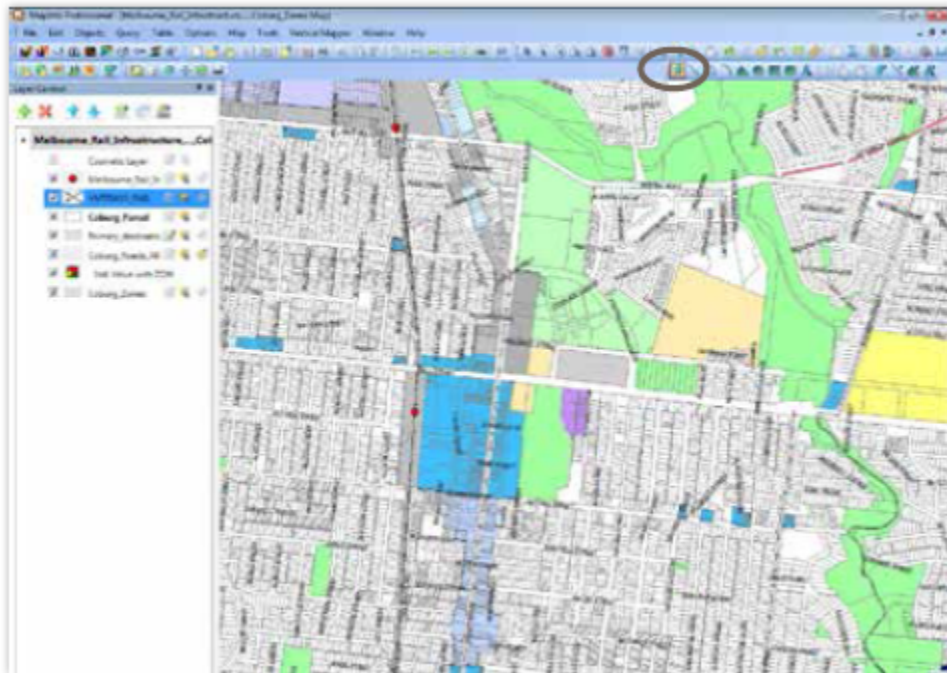
3. Create new symbol

1.7 Map shortest distance routes between origins and destination(s)

1. Open network in Route Finder

- open Route Finder in MapInfo

- open the primary destination(s), Census mesh block centre points and the pedestrian network tables

- select Route Finder menu > network > open network.

2. Configure the route options

- select Route Finder menu >Options >route

- set 'calculation type' to 'most accurate'. Set 'route type' to 'exact'.
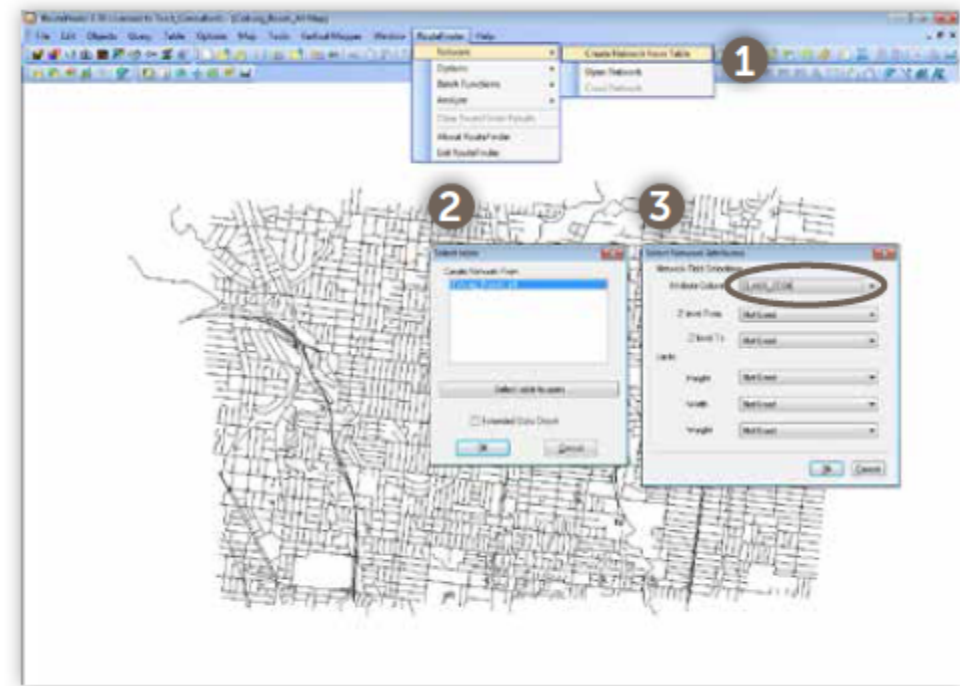
1. Open network in Route Finder
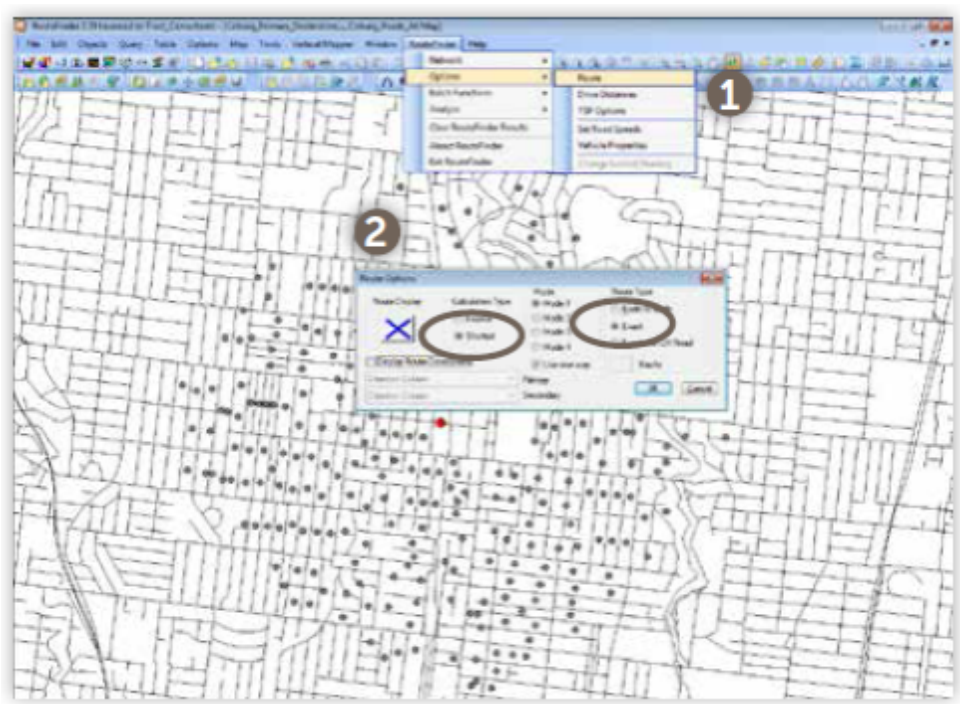
2. Configure the route options
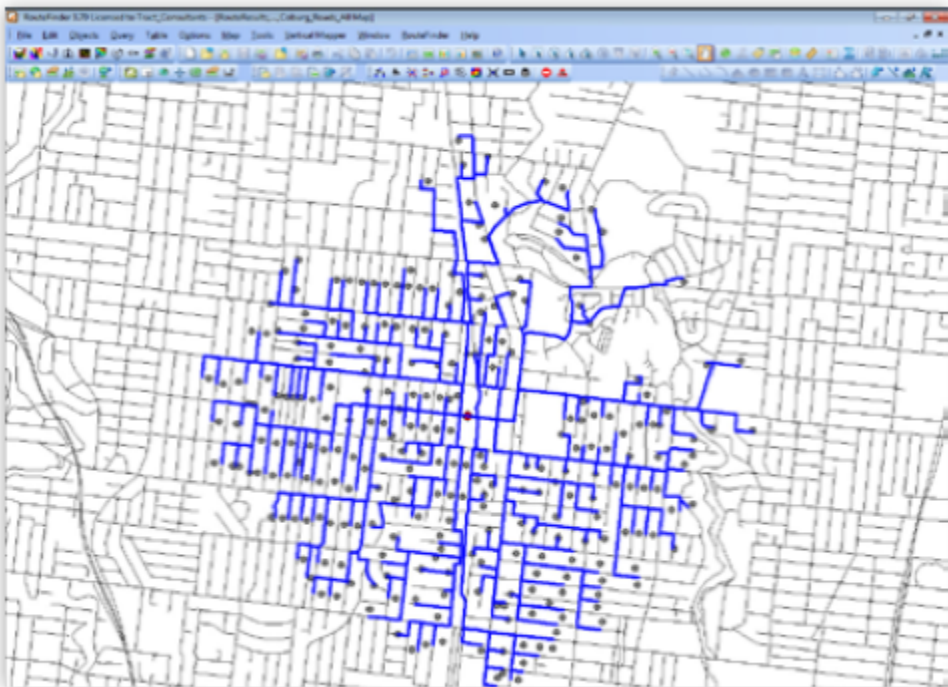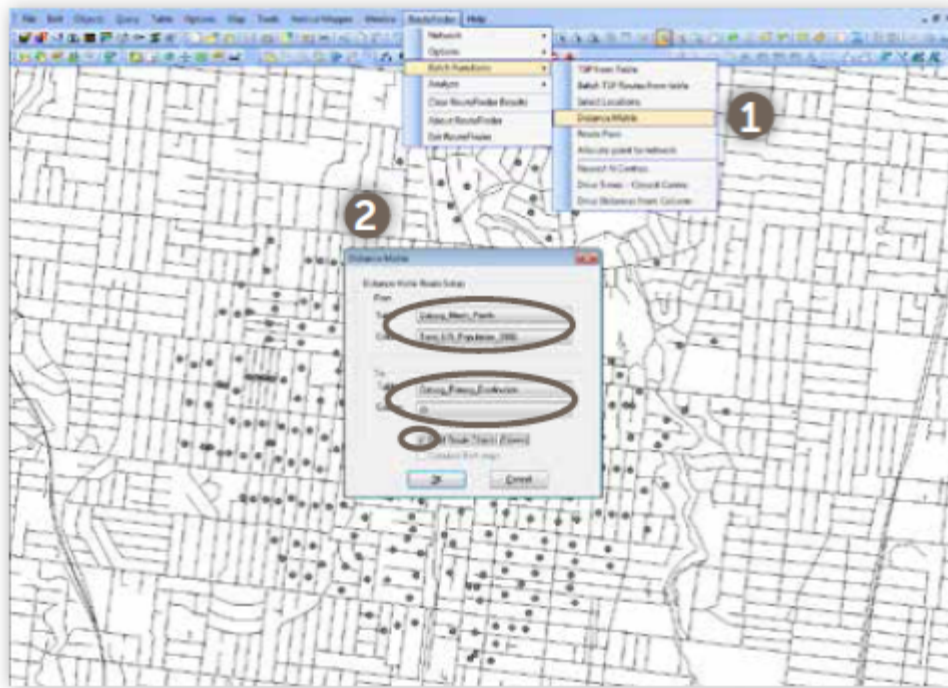
3. Map the shortest routes

- select Route Finder menu > batch functions >distance matrix

- in the 'route setup' window, select the route from 'table' to be the select Census mesh

- block centre points. Select the column containing the population as the 'Column'

- For route To, select the 'table' containing the primary destination. Select the column containing information about the destination as the 'column'

- ensure 'build route objects (slower)' is checked

- click 'Ok'. The routes will be generated on the screen and stored in a table named "route results"

- save a copy of the "route results". Select file menu > save copy as.

1.8 Assess the intensity of pedestrian routes

1. Update table structure

- open shortest routes table in new mapper

- select table > maintenance > table structure

- change the 'from ID' field from a 'character' type to 'integer' type. This converts the data field to a number which can be totalled.

- save and pack the table.

2. Break shortest routes into segments

- open shortest routes table in new mapper

- select all of the shortest routes and ensure layer is editable

- select objects Menu >disaggregate

- save the table.
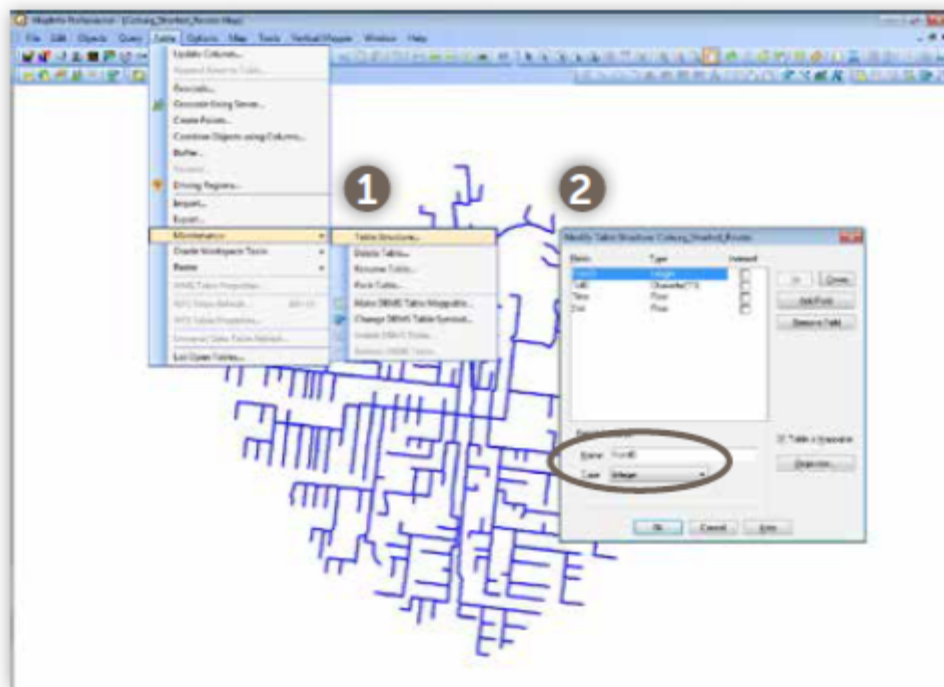
1. Update Table Structure
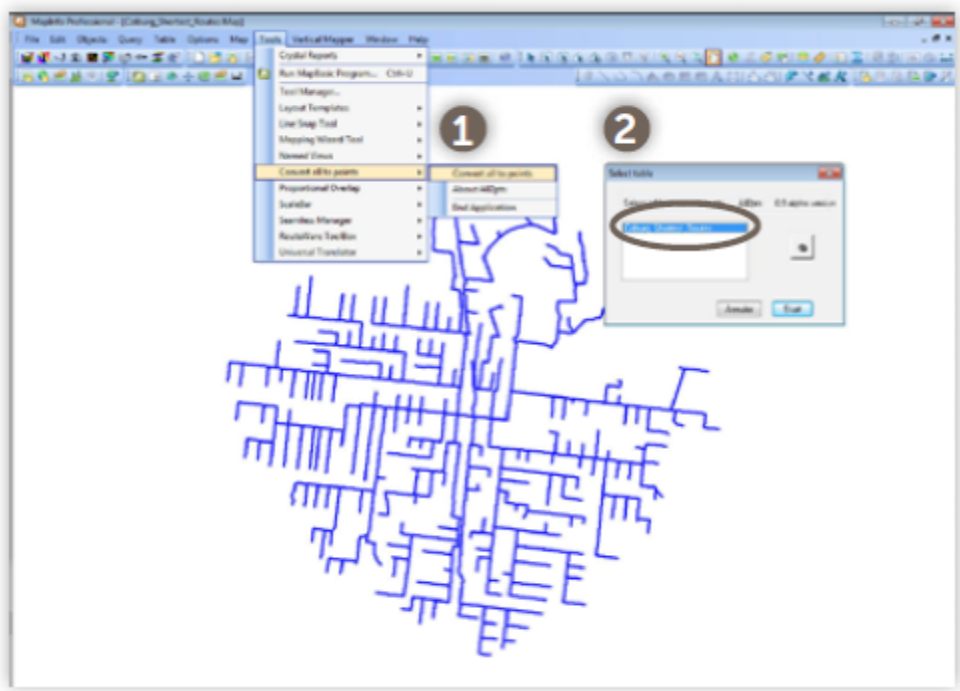
3. Create points from each route segment

3. Create points from each route segment

- this step requires a tool name 'All2pts'. It can be downloaded from: www.directionsmag.com/files/view/all2pts-85mbx/138923

- load the 'All2pts' tool into MapInfo

- save a copy of the shortest route table and open it

- select tools menu > convert all to points > convert all to points

- select the copy of the shortest route table. Click 'start'. The tool will generate points at every point along each of the routes. A new table will be created which will contain both the shortest route line segments and the points

- the tool will leave the route line segments selected. Ensure the layer is selectable and select edit menu > clear. This will leave the points remaining with no lines

- save and pack the table.

4. Create a buffer around each point
- select all of the objects in the shortest route point layer and ensure the layer is editable

- select menu objects > buffer

- set the 'value' to '0.6' and 'units' to 'meters'

- ensure 'one buffer of all objects' is checked

- select 'aggregation method' as 'value' and click 'ok'

- this will create a buffer of 0.6m around each point. The buffered object will be selected once the tool has completed processing

- select query menu > select inverse. This will select all of the points which can now be deleted

- once deleted, save and pack the table.
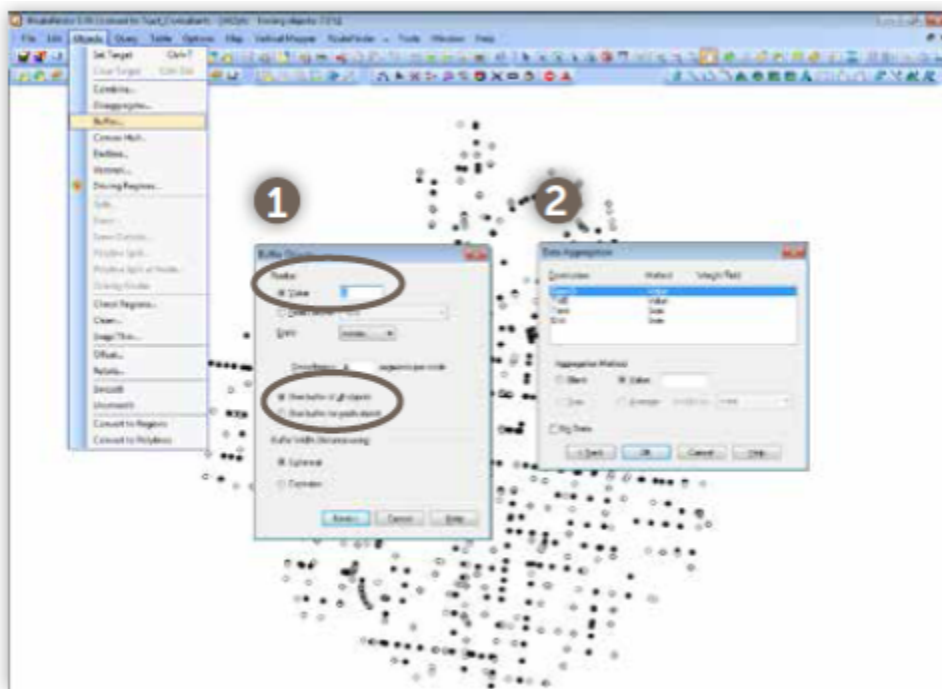
4. Create a buffer around each point

5. Break the routes into detached segments

- save a copy of the shortest routes table and open it along with the buffer points table

- select all from the copy of the shortest routes table and ensure it is editable

- select objects menu > set target

- select all from the buffer points table

- select objects menu > erase

- ensure 'disaggregation method' is set to 'value'

- the tool will erase the locations where the point buffers overlap with the shortest route line segments

- save and pack the table.
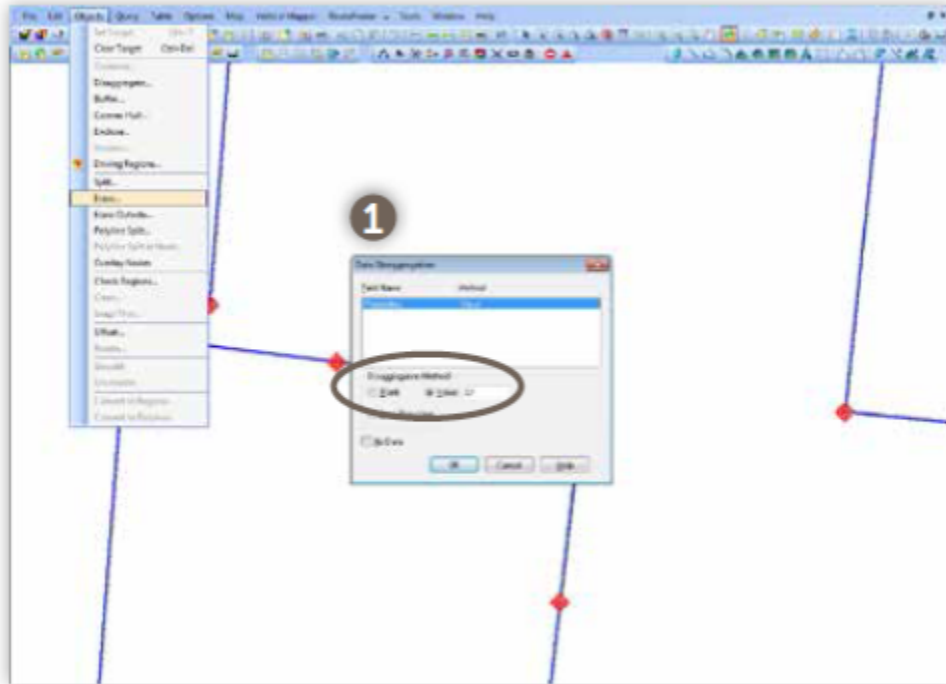
5. Break the routes into detached segments
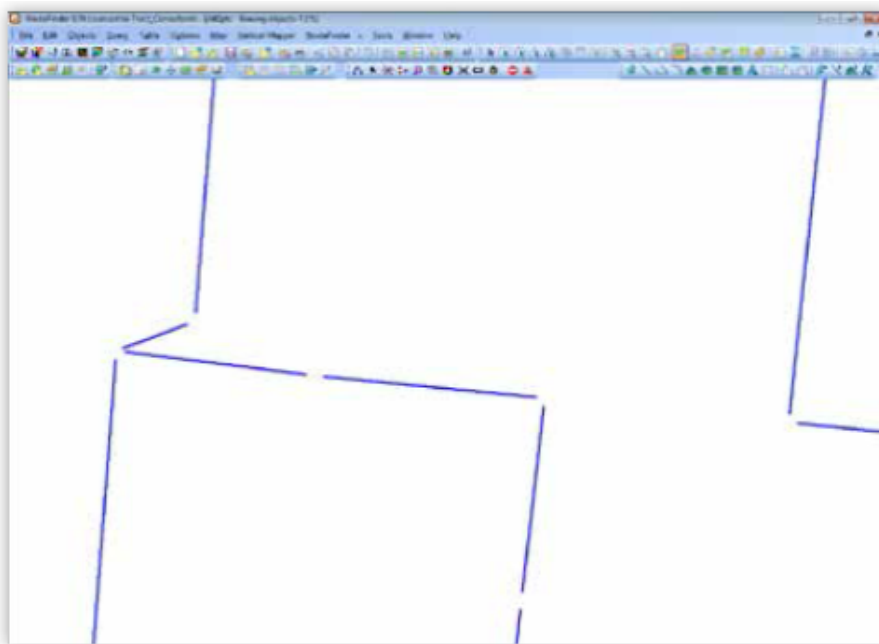
6. Create a buffer around each route segment

- save a copy of the table created in the previous step and open the copy in a new map window

- select all from the table and ensure the table is editable

- select menu objects > buffer

- set the 'value' to '0.2' and 'units' to 'meters'

- ensure 'one buffer of all objects' is checked

- select 'aggregation method' as 'value' and click 'ok'

- this will create a buffer of 0.2m around each point. The buffered object will be selected once the tool has completed processing.

- select query menu > select Inverse. This will select all of the lines which can now be deleted

- select all of the buffered objects and ensure the table is editable

- select objects menu > disaggregate

- save and pack the table

- You will now have a set of buffered objects which will completely contain the line segments created in Step 5.
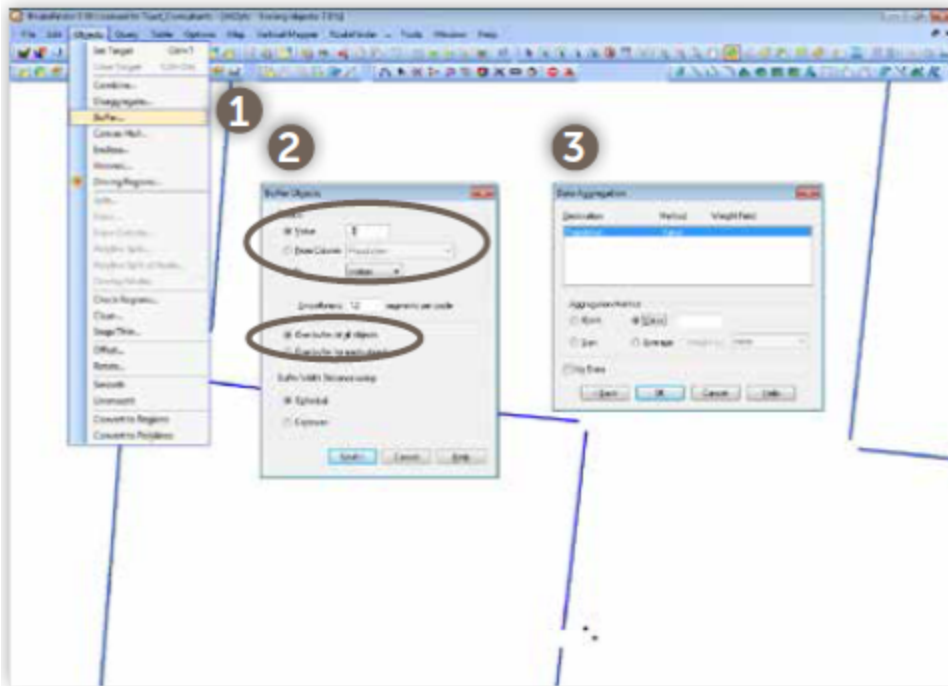
6. Create a buffer around each route segment
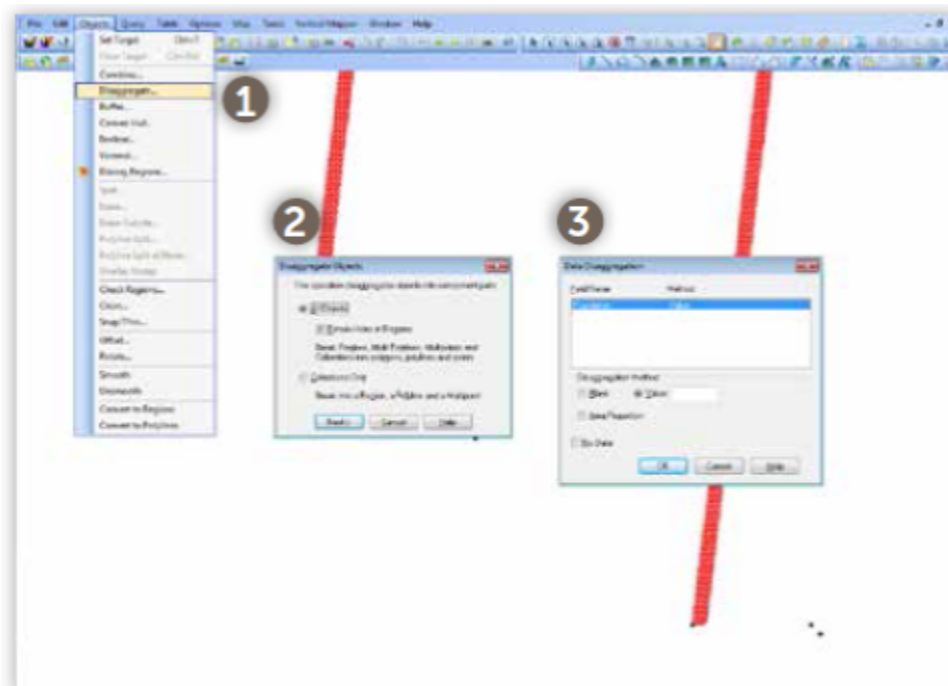
7. Calculate the total number of potential trips for each route segment

- open both the routes table which has the lines broken into smaller segments (created in Step 5) and the routes buffer table (created in Step 6)

- Ensure the tables have the same structure. This can be checked by selecting the table menu > maintenance > table structure

- select table menu > update column

- ensure the 'table to update' is the table that contains the route buffers (created in Step 6).Ensure the 'column' to update is the column that contains the population data

- ensure the 'get value from table' is set to the route table which was created in Step 5. Ensure 'calculate' is set to 'sum', and ensure 'of' is set to the column which contains information about population

- click 'join', which will bring up the 'specify join' window. Ensure 'where object from table…' is checked, and ensure the pull down menu is set to 'is within'. Click ok

- you will be in the 'update column' window. Click 'ok'

- you can now query the population column of your buffer route table and it should display the total number of routes within each segment

- save and pack the table.
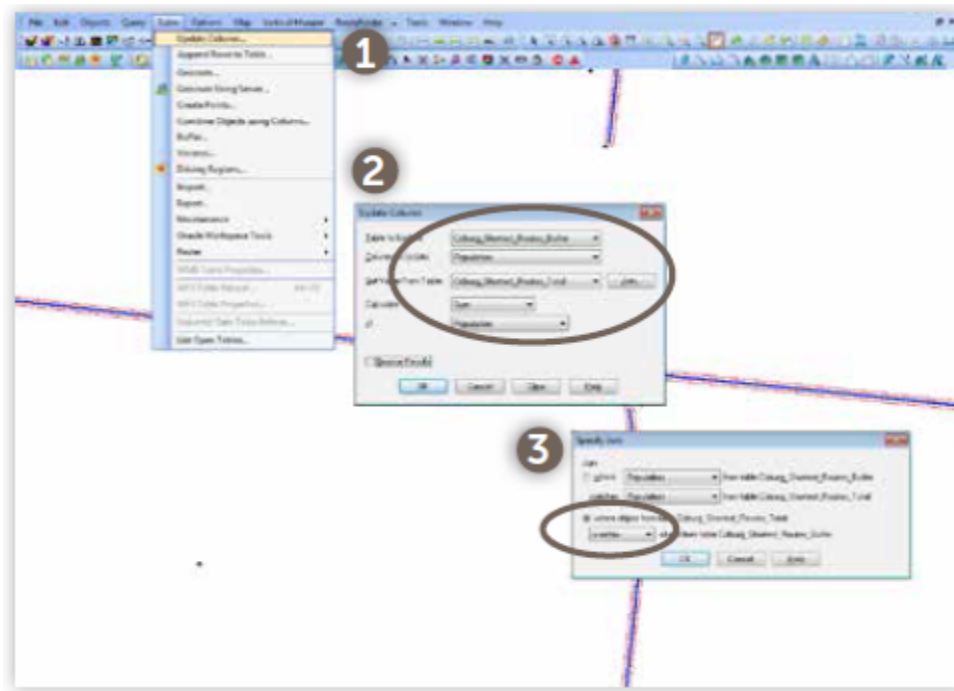
8.Calculate the total number of trips for each route segment

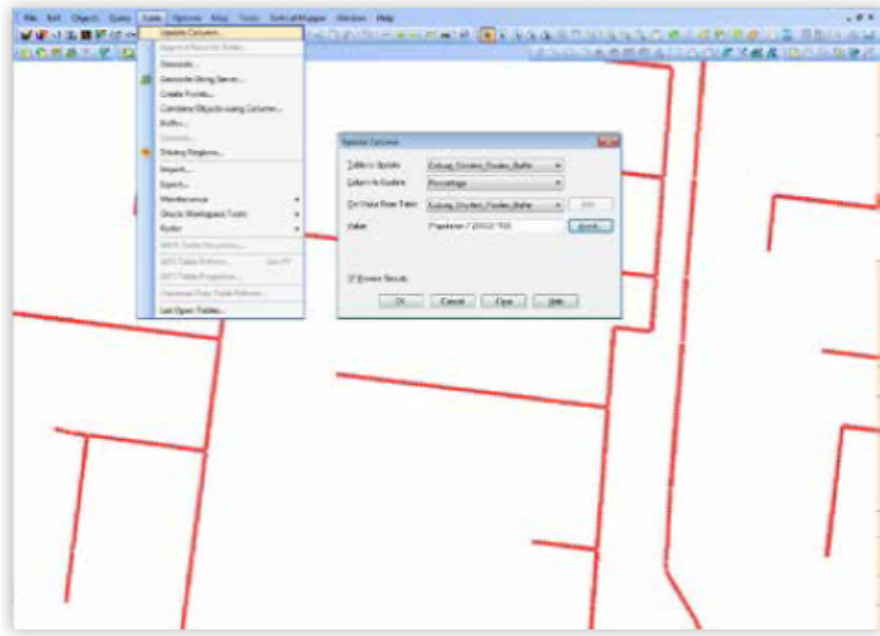**8. Calculate total potential trips as a percentage of total population**

You can now calculate the total potential trips along each route buffer object as a total percentage of the population within the walkable catchment.

- open the Census mesh block table for the activity centre

- select query menu > calculate statistics

- ensure the tTable' is set as your Census mesh block table and 'column' is set as your population column. Click 'ok'

- this will bring up a window which calculates the statistics for the population column. Note the 'sum' statistic and record it somewhere

- open your route buffers file (updated in Step 7) with the totalled population numbers for each route segment

- select table menu > maintenance > table structure. Add a new column to this table. Name this column 'percentage' and set it as a 'decimal' or 'float'

- select table menu > update column

- select the route buffers table as 'table to update'. Select the 'percentage' as 'column to update'. Set the route buffers table as 'get value from table'

- in the 'value' box, insert the following function:(Population/

- 25433)*100

- browse the table to see if the 'percentage' column has been updated

- save and pack your table.
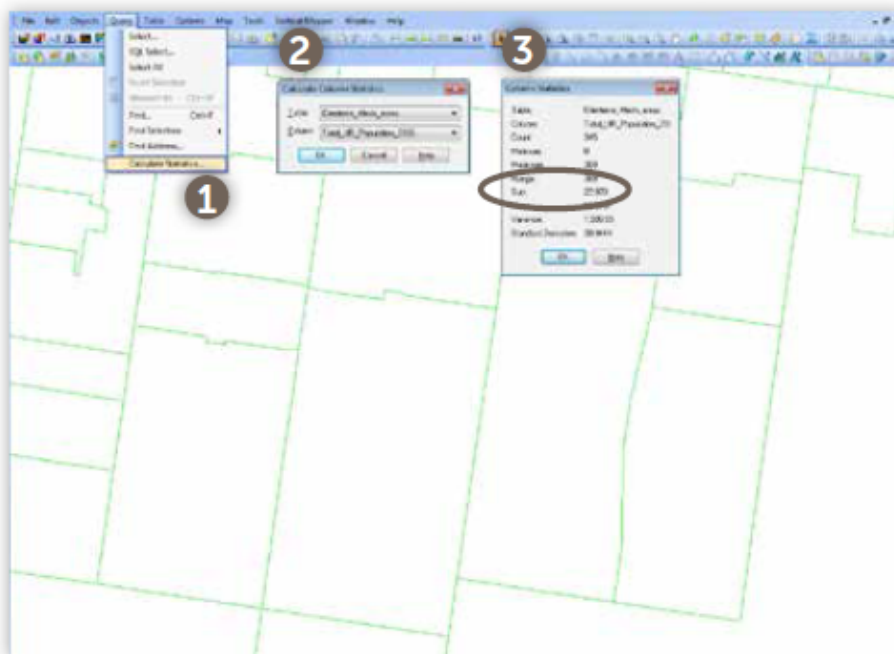
8. Calculate total potential trips as a percentage of total population

8. Calculate total potential trips as a percentage of total population

1.9 Delineate the draft PPN

1. Delineate the draft PPN

- create a new table for the draft PPN

- open the pedestrian network table created in Step 3 and save a copy of this table. This copy will be used for the draft PPN

- update the table structure and add columns which will you to allocate a level of priority to each route. Save the table

- open the route buffer table created in Task 1.8 and other data which will enable the

- delineation of the PPN.

- select each the relevant segments of the draft PPN and update the attributes to reflect the priority. I.e. some sections will be allocated as 'primary' and others as 'secondary'

- save the table once all of the mapping is complete.

Appendix C - Links, guides and references for use in assessing and planning the quality of the pedestrian environment

Victoria

Victoria Walks

- Assessing walkability –
- www.victoriawalks.org.au/
- How_to_assess_walkability/
- Walking Strategies –
- www.victoriawalks.org.au/
- walking_strategies/
- Measuring walking –
- www.victoriawalks.org.au/
- Assets/Files/FINAL_Guide_
- to_measuring_walking_
- WEBv1.0.pdf
- Smart Steps –
- www.victoriawalks.org.au/
- smartsteps/families/
- Planning for walking –
- www.victoriawalks.org.au/
- planning_walking/

Heart Foundation Victoria

- Healthy by Design –
- www.heartfoundation.
- org.au/SiteCollectionDocuments/
- Healthy-by-Design-a-plannersguide-
- to-environmentsfor-
- active-living.pdf City of
- Greater Geelong
- Walkability Toolkit –
- www.healthyplaces.org.
- au/userfiles/Geelong%20
- Walkability%20Toolkit%20
- June09.pdf

VicRoads

- Traffic Engineering Manual, Volume 1Traffic Management, Chapter 4: Pedestrian Facilities, Edition 4, available online www.vicroads.vic.gov.au/ Home/Moreinfoandservices/ RoadManagementAndDesign/ DesignStandardsManualsNotes/ TrafficEngineeringManual/ Vol1TrafficManagement.htm

VicRoads

- Traffic Engineering Manual, Volume 1Traffic Management, Chapter 4: Pedestrian Facilities,

Australia

Austroads

- Guide information for

  Pedestrian facilities –

  www.onlinepublications.

  austroads.com.au/items/APR423-

13

- Guide to Road Design – Part6A,

  Pedestrian and Cycle Paths

  – www.onlinepublications.

  austroads.com.au/items/

  AGRD06A-0

South Australian Active Living Coalition
- Healthy by Design: A guidefor planning, designing and developing healthy urban environments in South Australia– http://saactivelivingcoalition com.au/resources/

Institute of Public Works Engineering Australia,Queensland Division Complete Streets
Urban Design Guidelines, available online –www.engicom.com.au/products/complete-streets/ International

World Health Organisation,
- Pedestrian Safety – a road manual for decision makers and practitioners www.who.int/roadsafety/projects/manuals/pedestrian/en/index.html

Department of Transport
- Manual for Streets –www.gov.uk/government/publications/manual-for-streets

- Local Transport Note, Mixedpriority Routes, Practioners Guide – http://assets.dft.gov.uk/publications/local-transportnotes/ltn-3-08.pdf

- Local Transport Note, Pedestrian Guard Railing – www.gov.uk/government/uploads/system/uploads/attachment_data/file/3806/ltn-2-09.pdf

Transport for London
Improving walkability 2005 –www.tfl.gov.uk/assets/downloads/improvingwalkability.pdf

Pedestrian Comfort LevelGuidance 2010 – www.tfl.gov.uk/assets/downloads/businessandpartners/pedestriancomfortguidance-technicalguide.pdf

New York City Council
- Active Design Guidelines –http://centerforactivedesign.org/guidelines/

New York City Department of Transport
- Broadway Pilot Program: Improving Traffic Flow and Safety in the Heart of Midtown – www.nyc.gov/html/dot/downloads/pdf/broadway_0223409.pdf

Walk21
Walk 21 is an annual conference on walking that has been held since 2000. The website contains conference papers across a wide

variety of aspects of walking. A working group has been developing best practice for measuring walking www.walk21.com/

- Pedestrian Quality Needs Assessment – www.walkeurope.org/uploads/File/publications/PQN%20Final%20Report%20 [short].pdf

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Plan Melbourne –

www.planmelbourne.vic.gov.au/

Contact details for further information

For further information about Principal Pedestrian Networks and this methodological framework please contact the Strategic Transport Planning Branch, Transport Policy, Planning and Reform Division, Department of Economic Development, Jobs, Transport and Resources.

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