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ACCESS TO TRANSPORT FOR SENIORS AND DISADVANTAGED PEOPLE IN RURAL AND REGIONAL NSW

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Investigation of the potential to develop flexible or on-demand transport solutions for regional NSW

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Briefing Paper

1 Introduction

ITLS, funded by the University of Sydney Business School and Transport for NSW (TfNSW) partnership, undertook research to "investigate flexible or on-demand transport solutions for regional NSW", an action in the 20 year NSW Long Term Transport Master Plan (NSW 2012). The overarching goals of the research are to link the needs of individuals to existing transport opportunities so as to identify shortfalls in accessibility, design a flexible transport solution for different spatial settings in Regional NSW, provide a methodology for quantifying business and social impacts of implementation and develop an evaluation framework for monitoring performance of a pilot or pilot schemes. This project assists TfNSW to implement Flexible Transport Services (FTS) in Regional NSW where public transport cannot operate cost effectively due to low public transport demand.

This briefing paper is prepared to present an overview of the investigation, discuss the key issues and put forward recommendations for TfNSW to consider developing an FTS scheme for implementation in Regional NSW. The four deliverables from this project are appendices to this briefing paper.

1.1 The purpose of FTS

A flexible transport service (FTS) is broadly defined as a transport service where at least one of the characteristics (route, vehicle, schedule, passenger and payment system) is not fixed. In the public transport context, this contrasts with the conventional public transport service which has a fixed route, fixed timetable and fare, and vehicles with drivers scheduled on a regular basis.

FTS can take many forms and often is associated with a particular passenger type targeted by the service. For example early FTS such as 'Dial a ride' services were designed for people with disabilities, and therefore vehicles and service provision were tailored to their specific needs. The 'family' of services now called FTS include services which are restricted to special need users as well as services which are 'open to all'. This review concentrates on issues relating to 'open to all' or 'open access' FTS as well as services regarded as more 'cross-cutting', where the same vehicles are being used to provide an open access mobility services to a mix of travellers, both special needs (including passengers with lower mobility) and 'regular' public transport travellers that previously were supplied separately.

The type of barriers that FTS can address varies and this in turn has an impact on its structure and design, and the regulatory and economic framework in which it operates. Successful FTS are generally targeted to provide a service which meets an accessibility gap (or gaps) left by conventional fixed route services. Accessibility is a multi-dimensional concept relating to the ease with which people can reach destinations. Accessibility gaps exist due to a lack of service (spatial gap), inaccessible vehicles (physical gap), no service at the required time or the journey takes too long (time gap), lack of information (information gap), fares are too high (economic gap) and cultural or attitudinal issues around the use of public transport (cultural/attitudinal gap) (Mulley et al 2012 p.4). In the open access FTS domain, most services exist because of the spatial or time gaps, but are often also designed to meet physical and sometimes the economic gap.

2 Structure of the investigation

The investigation was structured in seven stages (and four deliverables) with differing methodologies appropriate to each task. Deliverable 1 and 2 assessed the issues and barriers, first in relation to the literature and then specific to Regional NSW. Deliverable 3 developed and demonstrated a method for assessing the potential for FTS to be integrated into the public transport mix in Regional NSW. Deliverable 4 then establishes an evaluation framework for FTS pilot schemes.

The key issues and implications from each deliverable of the research are outlined below.

2.1 Deliverable 1: A literature review

Deliverable 1 was a review of the literature to present the state of the art for successful FTS internationally. It was found that the success of FTS is largely dependent on how institutional, economic, operational, attitudinal and cultural or information barriers are dealt with.

Clearly articulating which accessibility gap that a FTS is created to meet is critical to its design and its success.. In the NSW context, this means being clear about the role that FTS is to play in Regional areas and in particular whether this is to:

- Address transport disadvantage by, for example, providing opportunities to access particular trip generators such as health or shopping alternatives.
- Address gaps in access by extending accessibility to public transport corridors
- To increase accessibility by capturing ‘choice travellers’ to public transport through improving service frequency, network connections and/or journey times
- To enable operators a more flexible business model that can reduce operational costs by operating ‘on-demand’ in areas with low population densities and/or low patronage.

The accessibility gap, and therefore policy goal may not be the same in every area of FTS implementation. Good practice requires an examination of patronage generators in short-listed sites and the role these play in overall demand for public transport and a clear articulation of the policy goal.

Yet at the same time, identifying the network plan that meets the accessibility needs of an area with appropriate regard to coverage and frequency is a pre-requisite to identifying a sensible role for FTS. This is important as the design of FTS, and its role within the network, as either an 'add-on' or an instigator for network redesign will have funding implications for FTS and conventional transport service operators. International FTS schemes have shown that overlaying FTS to the network of conventional public transport is expensive and can cause duplication of services. Positioning FTS within the public transport budget would mean a different trade off for resources. FTS can support spatial coverage and desired levels of frequency across the public transport network, especially if FTS is designed to complement fixed route services as part of the overall public transport offer. Indeed, a case study of Windsor and Richmond in NSW showed that within a given budget, fixed route services between major centres could be enhanced with access to these fixed routes being provided by FTS with the result that overall accessiblity was greatly enhanced (Mulley and Daniel 2012)

Changes in the legislative framework are often a pre-requisite for successful FTS as the standards applying to conventional transport may preclude FTS. Similarly, policy decisions on fares, and the decision to procure for services, or to procure from a provider are important as it will impact service design and the financial business case. For example, cross-cutting services and the development of a vehicle brokerage scheme can provide effective use of off-peak spare capacity.

Other factors found to be critical for success include:

- Implementing the appropriate level of technology that can balance economies of scale gained from implementing dynamic scheduling and e-based booking systems with levels of demand.
- Allocating sufficient educational resources to overcome attitudinal and cultural barrier of both operators and the travelling public
- Long-term investment in marketing, education and design of service information as building patronage amongst potential users can take some time, and the flexibility of FTS can make it 'invisible' to non-users.

2.2 Deliverable 2: Investigation into the policy and institutional options available to NSW

Deliverable 2 focused on the context of NSW and considered two sets of inter-related barriers that need to be resolved for implementation of FTS to be a success in NSW. First were issues in the legislation, some of which have since been addressed to some degree in the Passenger Transport Act 2014 (such as a common accreditation framework for all public transport). Second were other policy barriers that the NSW government could influence through careful decisions about contracting, funding and marketing of FTS in the existing market environment.

Drawing on the state of the art practice of successful FTS, the report is predicated on the need to integrate FTS services into the public transport offer more widely rather than simply an overlay to existing services with a view to meeting the accessibility needs of citizens and closing an accessibility gap (or gaps) left by the existing conventional fixed route services network. Whilst the government is motivated by providing greater accessibility with the benefits this confers, including enhancing social inclusion, Deliverable 2 focused on how this is synergetic with business motivations where responding to accessibility needs with FTS can reduce operational costs for operating in lightly patronaged areas and the expansion of transport services into new markets.

The better use of existing supply in Regional areas could take a number of forms and have implications for the way in which FTS might be implemented in providing a holistic approach to the public transport offer. Using resources better requires an understanding of existing resources but this alone is not sufficient. It is important that these resources are matched to potential and existing demand, and that the conditions of allocation are flexible to respond effectively to change. In this context, the work done by TfNSW on developing a Social Access Framework could lead to a better understanding of demand (latent or actual), but it would need to be accompanied by a structured framework with which to share and act on information amongst knowledge stakeholders if it is to contribute to FTS success.

Effective collaboration between operators of different types of transport services (public transport, taxi, FTS) and government should be at a meaningful spatial scale. These areas should reflect the connectivity of existing places as demonstrated by journey to work data, and catchment areas for core services such as health and education. Establishing a mobility management approach that can effectively bring together information, services and planning is difficult to achieve without high level commitment and adaptive governance arrangements. This is especially important when pooling resources is constrained by the different funding contract arrangements between FTS providers operating under different regulatory frameworks with different objectives.

In planning public transport networks, trade-offs must be made in network design between coverage and frequency when the (subsidy) budget is constrained. If FTS is to form part of the public transport offer it is of key importance that TfNSW takes a more active role in determining the framework for expectations in relation to the network plan for a regional area. Changes to the contracting of regional and rural bus contracts are an opportunity for TfNSW to determine where resources should be expended and devise a network plan which meets planned coverage/frequency trade-offs.

Positioning FTS within the public transport budget would mean a different trade off for resources. International experience demonstrates that FTS can support spatial coverage and desired levels of frequency across the public transport network, especially if FTS is designed to complement fixed route services as part of the overall public transport offer. Frequency of services being an important factor in growing patronage (Currie and Wallis 2008, Hensher et al. 2010). In the context of Regional NSW, fixed route services includes also the network of coach services that have replaced train services. These coach links are well placed to service patronage generators along their routes and could make travelling between regional towns more feasible if able to be freed from Sydney-centric rail timetables. Finally, in addressing network planning issues it must be remembered that the community's travel patterns have been constrained by the options for connectivity and current use. Planning for FTS cannot rely soley on current travel data and must take account of current non-users. For example assessing potential demand amongst non-users could include those who currently use public transport but could use it more, those who have not previously had access, and those who had the choice of public transport but have opted for private car travel.

A business case for FTS should encompass practical considerations. In setting the business case for FTS there are a number of practical considerations. These include:

- alignment of contracts cycles as it impacts on the available fleet;
- area sizes as being as least as large as the labour market for the area as evidenced by journey to work (JTW) links;
- provision for subsidised public transport in the business funding case to include existing and potential patronage growth.
- the rate of patronage growth should be incorporated into the funding formula to ensure areas likely to experience slow growth have an opportunity to develop an economically sustainable model.

The size of vehicles available for FTS may not always match the service demand. This could act as a constraint to deploying FTS quickly, though this could be ameliorated by specific contract arrangements that have provision for fleet adjustments. A similar issue has been shown to arise in Regional NSW with existing bus operators orientating their business to provide transport of school children, placing less focus on designing effective services within and between town centres. The nature of the gross cost contracts should provide an incentive to operators to meet passenger demand in town centres, however the low patronage and design of routes suggests that this has not been working. Unless these Regional NSW bus contracts are changed, TfNSW will not have the opportunity to remove the cross-subsidy between school and town services. In the operation of FTS there is a trade-off between the size (and carrying capacity) of the vehicle and trip duration for passengers. The vehicle used, its speed, carrying capacity and the potential distance that can be undertaken in a fixed time cycle to meet timetabling requirements at the flexible transport service nodes will affect the number of passengers which can be carried for the bus km or associated service hours budget. Internationally, FTS is often contracted out to specialised operators, even when the conventional public transport is not tendered, as in NSW.

2.3 Deliverable 3: A business case framework incorporating supply and demand

Deliverable 2 identified a series of policy options and design considerations for the implementation of a FTS scheme in NSW. To investigate this further, three Regional areas, identified by TfNSW (Coffs Harbour, Orange and Wagga Wagga), were assessed against a common yardstick for demand and supply. The assumptions underlying the assessment were:

- FTS is to be incorporated into the public transport mix as an access service to corridors where scheduled public transport services link major settlements and to ensure that these are sufficiently frequent (at least 2 hourly frequency)
- Rules for catchment size to ensure efficient operations should be set
- FTS fleets should be flexible
- Use existing resources, particularly funding but reallocating to provide greater access for all and better opportunities for growth.

The methodology for the assessment addressing some key questions is as follows.

1. What characteristics of an area would make it a suitable location for an FTS scheme?
2. How could criteria be combined to reflect the NSW context?
3. Having chosen the area, how might demand for FTS be calculated?
4. How do different configurations of vehicles and catchment size affect the supply and the cost of supply?
5. What are the potential savings of implementing FTS to an area?
6. What is the Business case summary?

These are considered in more detail in turn.

1. What characteristics of an area would make it a suitable location for an FTS scheme?

In the context of regional and rural areas of NSW it is understood that FTS services are likely to be of particular benefit, and provide higher levels of demand, when providing access to areas:

- which are particularly rural,
- have a higher incidence of deprivation, and
- which have reduced options for travelling distances to access services/jobs.

The methodology for this analysis therefore involves using six variables (Density, Remoteness, SEIFA Index of Relative Socio-Economic Disadvantage (IRSD), Car ownership, ATSI population, population unemployed) from the Australian Bureau of Statistics census data. These are divided into bands with a score attached for use in weighting regimes. Tables 1 and 2 in Deliverable 3 provide further detail. Figures 1-6 in each Appendix map the six variables across each study area.

2. How could criteria be combined to reflect the NSW context?

Create a scoring system that can be used to provide a weighted sum which in turn can be used to identify areas which are most likely to have accessibility needs which can be met by FTS. Census data that is appropriate to spatially identifying potential users of FTS, as defined by the policy goals, can be used to create the scoring system for potential FTS demand. The weighting of the various variables allows the analysis can be informed by multiple variables simultaneously. This weighting regime can be easily adjusted to reflect policy goals.

In each of the major settlements, a potential catchment of 10 or 20 minutes by road was established. These catchment areas are assessed for each of the four regimes. Table 7 in Deliverable 3 compares the rankings of settlements in a 10 minute catchment, while Table 8 compares rankings for the 20 minute catchment. Table 1 in each Appendix shows the rankings of the major settlements in the study area against the four weighting regimes.

The findings show that Kempsey in the Coffs Harbour region rates highly on all four scoring regimes for the 10 minute catchment, but that its closest neighbour, South West Rocks scores highly for the 20 minute catchment area.

3. Having chosen the area, how might demand for FTS be calculated?

Potential demand through the identification of 'depots' at major settlements and the identification of catchment areas based on travel time to these 'depots'. Each settlement was allocated a depot where a vehicle or vehicles might be located and be used in a FTS service to provide access to the fixed route services linking the major settlements.

The assumed policy goal is social inclusion and increasing accessibility for the purposes of estimating potential demand. Using census data, key populations were identified (older people between 65-74 years old., members of households where there is little access to a private car (identified by dwellings with access to 0 or 1 cars), young people 15 years and below and people needing access to employment (i.e. labour force) and a number of trips identified per week for each category. Recognising potential overlap between these population categories is recognised by taking only a proportion of the identified demand as the potential demand for FTS. Details are provided in Table 5 and Figures 10-12 of each Appendix of Deliverable 3)

If the yardstick for introduction of FTS is to enhance social inclusion and minimise transport disadvantage, then better outcomes can be achieved by selecting settlements for FTS rather than a single case study area. This has, of course, to be qualified by the nature of the case study area, the opportunity to make savings through a movement from coverage with timetabled services to concentration of resources on timetabled services alongside FTS for access.

Results for the ranking of major settlements for each study area are presented in Table 1 of each Appendix in Deliverable 3. Table 3, in Deliverable 3 shows that the Coffs Harbour study area is likely to generate more trips than the other study areas as a result of its demographics and populations in the key groups considered (low car ownership, older and younger people and the employed).

4. How do different configurations of vehicles and catchment size affect supply and the cost of supply?

The costs of meeting demand will depend on the vehicle used at each depot. Vehicle type choice requires a trade-off between the size and carrying capacity of the vehicle and the trip duration for passengers. In addition, the need to provide a regular cycle time so that passengers can return home provides some constraints on vehicle operation.

The results of simulations by Bertocchi (2009) for how cycle time, patronage and vehicle size varies were applied using, as an assumption, that a catchment of 10 minutes travel on the road network from a depot would allow a scheduling of a vehicle at a depot at least once each half hour for the return journey. A distance of 20 minutes from a depot would allow a scheduling of a vehicle at a depot at least once per hour for the return journey.

The catchment area (whether 10 minute or 20 minute) significantly affects the number of potential trips demanded but not uniformly either within or between case study areas.

Tables 9 and 10 of the appendices show the provision of FTS using cars rather than minibuses is always more costly. This is the case for any depot serving a major settlement where there is sufficient patronage for a single minibus. However, even in those cases, supply by a car-sized vehicle needs to be considered in the context of the network plan and the road layout as, for example, 3 cars may be able to cover a wider geographical area than a single minibus and thus provide a superior service. Moreover, as the population served by a depot increases, it may be more efficient to serve the depot's population by a mix of vehicles although this could add to holding costs if the FTS operation is provided by a single entity (carrying more vehicle spares as the vehicle types increase in the fleet etc).

Moving from a 10 minute to 20 minute catchment does not simply double cost (see Table 10 in Deliverable 3). A separate evaluation of the benefits of the extra journeys using literature based benefits would identify whether the costs exceed the benefits of so extending accessibility (Stanley et al 2011).

5. What are the potential savings of implementing FTS to an area?

This requires two steps to evaluate. First, establishing the savings from removing fixed route services to be replaced by FTS and second, to identify the costs of the FTS provision.

The first step, to demonstrate the potential supply savings offered by FTS is illustrated in Figure 1 of Deliverable 3, reproduced below.

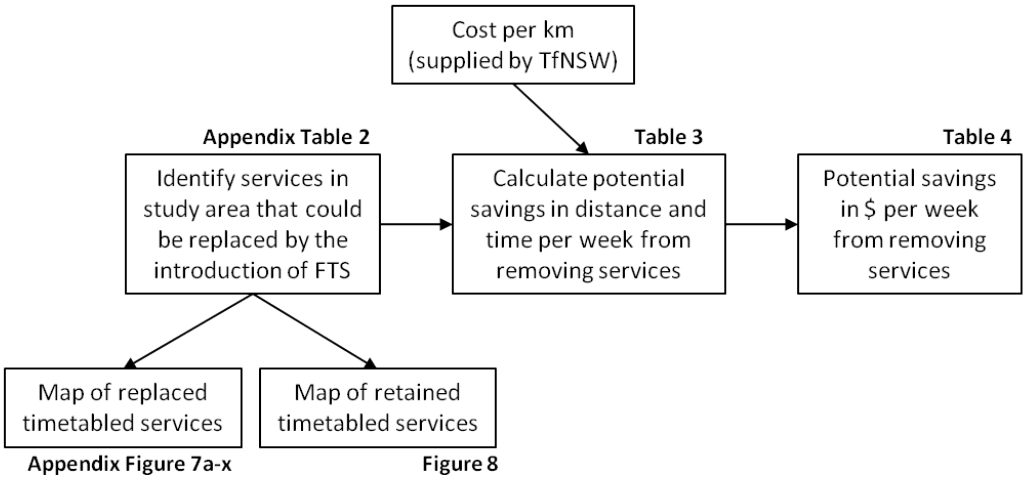

Figure 1: Methodology for determining potential savings if FTS replaces scheduled services

The results for each study area are documented in the Appendices of Deliverable 3, where:

- Table 2 identifies the potential services that could be withdrawn with the introduction of FTS services
- Table 3 shows the km and minutes of operation that can then be saved per week of operation
- Table 4 shows the weekly saving, based on cost per km from information provided by TfNSW

These savings are likely to be conservative in respect of savings since they are based on a category 4 vehicle rather than a full size bus and assume an eight hour operating day.

The introduction of FTS is predicated on ensuring the services linking the major settlements are strengthened to at least two hourly regular services, including services operating at times when employed people can use public transport to access jobs.

The results identified that the potential savings per week of removing timetabled services from major settlements are not unsubstantial.

The second step is to identify the costs of providing FTS services to access the fixed route services linking the major settlements.

Figure 2 of Deliverable 3, reproduced below, shows the steps of the methodology for calculate the cost of meeting demand in each study area. The assumptions can be varied for sensitivity analysis and to reflect different constraints to reflect the policy goals or budget.

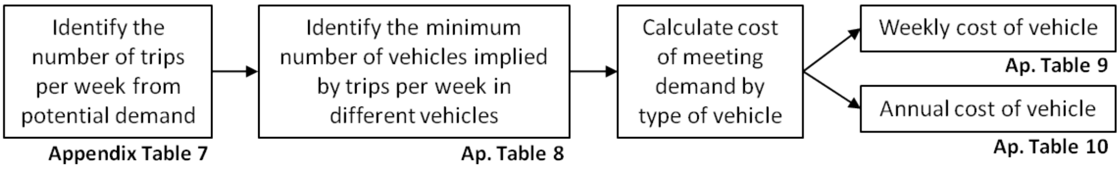

Figure 2: Methodology for determining costs of meeting potential demand

The results for each study area are documented in the Appendices of Deliverable 3, where:

- Table 7 of each Appendix converts the potential demand into trips per week, using the above assumptions about the different number of trips needed by different groups.
- Table 8 in each Appendix converts these to the minimum number of vehicle loads according to Bertocchi (2009), and selects a car and a minibus as giving the extremes of cost and loading opportunities. This allows an estimation of how many vehicles in total will be needed to meet supply on the basis of an even spread of patronage over an operating period of 8 hours for 7 and 6 day operations.
- Tables 9 and 10 of each Appendix turn the vehicle requirements into weekly and annual costs respectively. The costs of meeting demand will depend on the vehicle used at each depot. Using data provided by TfNSW on km and hourly costs, the *average* cost per passenger, if maximum passenger numbers can be achieved is $5.50 per passenger on the basis that a car equates to a category 1 vehicle, a maxi-taxi to a category 3 vehicles and a minibus to a category 4 vehicle. Assumptions about costs are provided in Table 4 in Deliverable 3.

6. What is the Business case summary?

The considerations about fares suggest that it would be inappropriate for this deliverable to implement a Business Case analysis on a particular fare level which is a policy decision. In the section below, the Business case proceeds on the basis of identifying the costs of provision, thus identifying the gap to be met by subsidy and through the fare box.

On the basis of the rankings of potential demand, Kempsey (10 minute catchment) and South West Rocks (20 minute catchment) have been identified as the most suitable starting point for an FTS pilot in Regional NSW.

It is unclear whether FTS is likely to be cost neutral in its introduction but the following figures for Kempsey and South West Rocks give some idea about the scale of the funding gap. Ignoring any additional funding required to upgrade the fixed route network to a good service, Table 1 below shows the savings from the removal of the fixed route services, as discussed above (Question 5), the cost of FTS provision assuming a 7 day service, and a break even fare found by looking at the cost, less the savings, divided by the number of assumed weekly trips for these two identified catchment areas.

Table 1: Summary of Business case for Kempsey and South West Rocks

	Savings from removal of fixed route services per week[1]	Cost of FTS provision to access fixed route services per week[2]	Number of weekly trips[3]	Fare to break even
Kempsey	$708.78	$11,216	7,810	$1.34
South West Rocks	$1,713.73	$22,432	4,451	$4.65

For source material please refer to Deliverable 3, Appendix 1: Coffs Harbour where Note 1 refers to Table C 4, note 2 refers to Table C 9, and note 3 refers to Table C 7.

After presenting Deliverable 3, TfNSW provided actual data about patronage on bus routes around Kempsey and this was used to test if the estimations for potential demand were realistic, and to rerun the implications for cost estimates and service design. It was found that actual patronage was much lower than estimated, and therefore the costs of meeting demand, at least in the short run, was likely to be much less than predicted in Deliverable 3. The new calculations, presented in an Addendum to Deliverable 3) suggest that overall, FTS could be provided at considerable savings, whether a 10 minute service area is provided compared to the existing timetabled services in the Kempsey area or a 20 minute area including SW Rocks. These calculations suggest that the 10 minute service area could be provided at one-third of the predictions of Deliverable 3 and the 20 minute area, including SW Rocks at one-quarter of the predictions of Deliverable 3. However, this should be noted with a word of caution: other FTS schemes introduced in areas of low patronage – as these areas clearly are – have been shown to have considerable growth as the community recognises the potential from increased accessibility. Whilst this is therefore a strong recommendation that Kempsey and South West Rocks would provide a suitable pilot area which has little risk for TfNSW in terms of recurrent budget – whilst also providing the opportunity to better tailor the public transport services to the needs of the community – it should be anticipated that there will be significant growth in patronage as the FTS becomes known and used.

2.4 Deliverable 4

Deliverable 4 sets out a plan for measuring the effectiveness of FTS pilots that have been identified, planned and implemented according to the methodology presented in Deliverable 3. The intention of the evaluation framework is not focused on evaluating service quality, but rather for enabling researchers and practitioners to combine the FTS theory with experience in the field so as to generate learning about how effectively FTS could be implemented and operated in NSW.

Factors that are being assessed through the evaluation framework relate directly to the aims of the pilots. These are to:

- Assess the feasibility of FTS in NSW

- Enable estimation of the practical outcomes of FTS implementation in the form of benefits with respect to different stakeholder groups;
- Test the accuracy of the needs assessment (demand forecasts) and the identification of FTS costs;
- Identify service quality issues to be addressed in future pilots or full FTS implementations in NSW.

The evaluation of FTS pilots should be resourced as part of the pilot and the evaluation reports should be disseminated to all stakeholder groups. These are defined as society/government, funders (TfNSW and others), bus operators, other operators (taxis, community transport, school buses), FTS operator, and service users.

3 Discussion

The NSW government has long recognised the potential for FTS in Regional areas but there has been uncertainty about the best way to implement it to secure its success as an investment and an expandable model within the context of NSW. As with any new project there are risks to getting it wrong, but benefits in getting it right. When things go wrong, there is a greater likelihood that stakeholders (users, transport providers, funders) will have selective long-term memories.

This investigation sought to help TfNSW prepare for a successful implementation of FTS by identifying the array of potential barriers and guidance on policy consideration to best overcome or manage issues. In doing so a number of observations were made that indicate that there are some favourable conditions that could make piloting FTS in Regional NSW easier than in the past.

The timing is favourable as the Passenger Transport Act 2014 has addressed important legislative barriers to FTS. It has established a new focus of consistency with the common accreditation framework, management of safety and through a focus on service, rather than mode. This means that FTS could be integrated into the public transport mix without resulting in inconsistent signals for acceptable levels of driver training, vehicle safety, duty of care, and operator requirements.

The move to establish new contracting arrangements for regional bus services is also favourable. The change in contract arrangements means that TfNSW, not regional operators, will be determining the design of the transport network and therefore the most effective model for allocating scarce resources to respond to an area's specific needs. This presents an opportunity to incorporate FTS into the redesign of the supply of services so that areas with low demand do not lose access to services that may compound levels of transport disadvantage.

The new contract regime does however present some challenges that could limit the opportunities for implementing FTS. The terms of the contract may create conditions where operators are hesitant to work with FTS due to concerns about competition, and the way in which FTS may impact on their KPIs. This can in turn have an impact on the flow and exchange of information, costs to users, decisions about deployment and planning.

Budgeting for marketing and education is already identified in the literature as an important component for successful FTS, but this may require more thought and resources in the context of the timing of bus contract negotiations in NSW. Change can be disruptive. In cases where the renegotiated bus contracts have resulted in changes to the fortunes of local transport operators this may heighten resistance to FTS. A focus on service delivery, rather than service providers, would be advised so that FTS results in a flexibility to use different sized-vehicles to meet fluctuating demand, and by implication the flexibility to procure services from the appropriate provider.

The timing could also be right if an FTS pilot was to be implemented in the Kempsey region. This research investigation identified that for the three regional areas that were assessed, the business case points to Kempsey and the South West Rocks being an appropriate site for a trial. Coincidentally there is anecdotal evidence to suggest that FTS implemented in the Kempsey area would be welcomed by the community. The transport disadvantages in the area have been identified as a significant barrier to local people accessing fresh and healthy food. The community and research networks that have developed to address this issue could be advantageous to the implementation of an FTS pilot, though should be viewed as one of many networks of community stakeholders with which an FTS pilot would need to engage.

The importance of using a structured evaluation framework alongside implementation of FTS cannot be overstated. Building up patronage requires time and information and attitudinal barriers need attention. The literature highlights that it may take up to 7 years to fully realise the demand on a FTS as the more flexible the service, the less visible it is to the travelling public. Clear policy objectives and setting up clear means of measuring progress against the goals will be important in communicating to stakeholders, and provide the right conditions to learn from issues and make adjustments to maximise the success.

4 Conclusion

Providing the same levels of accessibility enjoyed in metropolitan Sydney to those citizens in Regional NSW is always going to be difficult. Introducing FTS into the public transport offer in presents a model for addressing some of the accessibility barriers and, potentially building up patronage to support a case for expanding the public transport network of scheduled high frequency routes.

Although some barriers are identified, these should not be viewed as insurmountable. Flexibility in supply needs to be conditioned on the barriers FTS is intended to address. If the policy objective is clear, consistent, strong and resourced, many of the barriers can be worked through with stakeholders.

There are some issues that were identified as out-of-scope of this research investigation but which still merit consideration and further work. This research did not investigate:

- the attributes of resistance to FTS or the level of attitudinal resistance amongst users and operators in NSW
- the competition and trust issues that may need to be addressed amongst operators
- the spatial context of separate land use activities when assessing the three Regional areas.

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Investigation of the potential to develop flexible or on-demand transport solutions for regional NSW

Professor Corinne Mulley and Dr Patrick Tsai

Deliverable 1: State of the art evaluation of barriers and relevant practices in Australia and internationally

Background

A flexible transport service (FTS) is broadly defined as a transport service where at least one of the characteristics (route, vehicle, schedule, passenger and payment system) is not fixed. In the public transport context, this contrasts with the conventional public transport service which has a fixed route, fixed timetable and fare, and vehicles with drivers scheduled on a regular basis.

FTS as a concept have emerged from services originally introduced for special needs travellers. For example, 'Dial a ride' services for people with disabilities were early examples of FTS where there was an opportunity to tailor the vehicle and service provision to the specific needs of the traveller. The 'family' of services now called FTS include services which are restricted to special need users as well as services which are 'open to all'. This review concentrates on the issues relating to 'open to all' or 'open access' FTS as well as services regarded as more 'cross-cutting' where there is a mix of travellers, both special needs (including passengers with lower mobility) and 'regular' public transport travellers.

Typically FTS are provided by smaller than average sized public transport vehicles. The size of vehicle depends on the market being targeted but it is unusual to find FTS being supplied by conventional bus-sized vehicles. As a result, an examination of FTS and its suitability for the regional areas of NSW needs to include a review of procurement issues, whether this is by contract to existing bus operators or by an operator new to the operation of regular passenger services. Different operating models are in place in different parts of the world and a review of this is part of this report.

Mulley et al (2012) identifies the different settings that FTS has or is operating around the world. In the USA and Europe, much of the development of FTS was spearheaded by the need to provide public transport services meeting disability access requirements. However, despite disability legislation providing the impetus, FTS have since grown to serve a growing range of markets. In the USA there is a much higher incidence of FTS as compared to the UK or mainland Europe with over 750 open access FTS now being offered in the lower density non-metropolitan (as opposed to metropolitan) areas with many of these services having been in operation since the 1970s (Mulley et al 2012, p5). Open access services in the UK, prompted by “bus challenge” government funding in the early 2000s, saw the development of a number of FTS schemes, mainly in the rural or low density areas. Many of these schemes have now ceased although those that remain tend to provide connections to fixed route services on main corridors (Mulley et al 2012, p.5). In mainland Europe, there have been large scale FTS implemented primarily to support disabled access. The overlay of these services to the network of conventional public transport has proved costly. The current focus of universal access in Europe has removed much of the need for large scale FTS for particular groups which have been replaced by specialised FTS as complementary to the network (Nelson et al 2010)

There are few examples of open access FTS in Australia despite the low density nature of Australian urban areas. Only two long standing FTS are in operation: Telebus in Melbourne Vicoria, Roam Zone in Adelaide South Australia and until relatively recently, Flexibus in Canberra ACT. In NSW, Deane’s Buslines operate ‘Locallink’ in both Queanbeyan and on the South Coast as a FTS which is flexible around fixed points in the timetable.

This report focuses on synthesising best practices in FTS. It considers first barriers to implementation that have been identified internationally before turning to the situation in Australian and NSW more specifically. The purpose of this review is to evaluate the barriers to implementation and the criteria for success and how this might be used in determining where in Regional NSW it might be appropriate to introduce FTS.

Barriers to implementation of FTS

As identified above, FTS cover a variety of mobility options. Transport is required to provide accessibility to destinations, rather than as a service for its own sake. Conventional public transport does of course provide accessibility and is unlikely to be removed entirely. The role of successful FTS is to provide a service which meets an accessibility gap (or gaps) left by conventional fixed route services. Accessibility is a multi-dimensional concept relating to the ease with which people can reach destinations and gaps exist due to a lack of service (spatial gap), inaccessible vehicles (physical gap), no service at the required time or the journey takes too long (time gap), lack of information (information gap), fares are too high (economic gap) and cultural or attitudinal issues around the use of public transport (cultural/attitudinal gap) (Mulley et al 2012 p.4). In the open access FTS space, most services exist because of the spatial or time gaps, but are designed to meet physical and sometimes the economic gap. In an FTS environment, one of the greatest challenges is to meet the information and cultural/attitudinal gaps since these substantially affect take up of services provided and yet are the areas of accessibility that traditional transport providers find most outside their competence to provide.

The implementation of FTS has come from government on the one hand, implementing policy to reduce accessibility gaps aimed at improving social inclusion through enhancement of accessibility and a reduction in transport disadvantage. Although social exclusion and transport disadvantage are not synonymous, a reduction in transport disadvantage can demonstrably improve social inclusion. On the other hand, FTS has been introduced by operators who recognise the opportunities to reduce operational costs through operating 'on-demand' in lightly patronaged areas. Services in Australia such as Telebus fall into the former category and were initially a response to new built environment factors that prohibited the use of bigger vehicles into new housing estates whereas the Locallink services fall into the latter category of exploiting potential operational savings.

The barriers to the introduction of FTS are well documented in the academic literature both internationally (summarised in Mulley et al (2012)) and for NSW (Daniels and Mulley 2010). Broadly, barriers can be grouped into five main categories – institutional (policy, legislation and regulation), economic (funding issues, costs to users), operational (fleet and vehicle), attitudinal and cultural and information and educational barriers to use. These are considered in turn below.

Institutional barriers

Open access FTS as part of the public transport mix requires an institutional framework that can support services which are not predetermined at the time of implementation. Moreover, the institutional framework will need to provide a structure in which fixed route or conventional services and FTS can co-exist. In an environment where passenger loadings have an impact on an operator's livelihood (such as the net cost contracts in Rural NSW) it is important that the institutional structure supports both the operator of conventional public transport and the FTS operator without each feeling that they are threatened by the other in terms of competition for passengers. As identified in Mulley et al (2012), the competitive environment of the UK has successfully introduced the ability to include FTS in its legislative framework. In Australia, the ACT has also made provision for FTS in the form of Demand Responsive Transport (DRT) in its legislative framework. This is in contrast to the lack of legislative framework in mainland Europe where open access FTS services are provided as part of the Regional network plan and the USA where the legislative framework of disability provision has enabled special user FTS and where policy decisions have facilitated the funding of publicly subsidised open access services in the non metropolitan areas.

In NSW, the legislative framework is currently a mode by mode approach with specific service delivery linked to a mode and vehicle of delivery. So, for example, there is no facility for a bus to behave more like a taxi and deviate from its fixed route nor for a taxi to behave more like a bus and have a fixed route which is advertised. The review of passenger transport legislation (TfNSW 2012) appears to recognise that there needs to be a separation between the operator and the regulation of their ability to provide a safe and reliable service and the vehicle in which this service is provided (which also needs to be safe).

The procurement of FTS is a further issue that requires institutional or policy consideration. As noted in Daniels and Mulley (2010), operators (whether buses, taxis or community transport) are comfortable with their core business but unfamiliar with the requirements of an open access FTS. In mainland Europe, FTS are predominantly provided as part of the wider public transport network and funded as part of the global commitment to public transport. In the UK, the deregulated framework means that FTS are competitively tendered as part of the provision of services which are not provided without subsidy and are typically operated by bus or increasingly, by taxi companies. In the USA, FTS are typically tendered to private operators and there are 3 major private contractors and probably another 5 to 10 "regional" operators who do enough business ($25-75 million annual revenues) and have enough of a track record that they could (and sometimes have) replicated their successful operations outside of their home region. The large operators are First Transit (the USA branch of First Group, which is based in Aberdeen, UK), MV Transportation, and Veolia. Veolia in the USA has always had an arms-length relationship with its parent company in France (which is selling off its transport interests in the USA and elsewhere) and have lost several large FTS contracts in the past couple of years.

Economic barriers

Funding issues are key to successful implementation of FTS. At a policy level it needs to be recognised that overlaying FTS to a conventional bus service network is likely to be expensive (cf the European experience outlined above). A successful public transport network for an area must investigate the accessibility of the area (identify the patronage generators and the likely demand for these) and devise a network plan that takes account the role of different elements of the public transport mix. This should include conventional fixed route public transport, potential FTS and ideally, spare capacity on Community Transport services and taxis.

The provision of FTS is often so associated with the overlay of FTS to the conventional public transport network that FTS are labelled as prohibitively expensive. As an overlay to existing public transport services FTS are an additional burden on the budget. Moreover, simply overlaying FTS to existing public transport services does not take account of the extensive public transport literature on the way in which achieving mode shift from car to public transport is contingent on providing frequent services and travel times which compete well with the private car. Mulley and Daniels (2012) show how a network plan which transfers resources from spatial coverage to providing frequency with FTS to provide access to the more frequent services can provide significant enhancements in accessibility within the existing budget.

A decision for open access FTS must include a policy on how this should be treated alongside any conventional public transport provision in terms of fares. Whether or not a premium to the conventional public transport fare is charged will depend on the objectives for the FTS. For example, in terms of meeting social inclusion and transport disadvantage objectives where a premium fare would be counter intuitive versus providing spatial coverage as opposed to access to conventional services where a premium fare would be more appropriate.

FTS, as with any new service, takes time to build up patronage. However, building up patronage for FTS is likely to take significantly longer than a fixed route public transport service because of a relative lack of visibility (see section on information, education and promotional barriers below). Mainland European flexible taxi-based services appear to take up to seven years to become viable and this longer duration to build patronage can be a drain on supporting resources.

Operational barriers

In line with the different mobility offers and the different accessibility gaps that are being met by FTS, it is not surprising that there are also a range of vehicle sizes used in its provision. Vehicles range from car-sized vehicles, seating 5 including the driver to smaller minibuses (up to around 12 passengers) and small buses (perhaps seating as many as 28 passengers). In an operational sense, vehicles are an important part of the service provision decision since FTS tend to provide more individualised services. Alongside this, the higher the vehicle loading, the longer each person has to spend to get to their destination as well as affecting the distance that the vehicle has to travel. This trade-off is extensively discussed by Bertocci (2009). The size of vehicle is also closely linked to the nature of demand for the service, although this is not necessarily a straightforward decision as operators reap significant cost advantages from a uniform vehicle fleet and yet this might not meet the patterns of demand. The choice of vehicle size might therefore be somewhat of a compromise if operators are not to hold a diversified fleet.

In NSW there is a significant off-peak capacity in all public transport bus provision since the peak requirement is driven by the requirement to provide school services and peak period route services. However, these vehicles may not be suitable for FTS operation even when spare capacity exists. There are other operators of public transport services (Community Transport, taxi operators, health transport and special education transport) which may have appropriate vehicles. Creating the opportunities for cross-cutting services across policy domains has been shown, at least in the UK, to provide FTS at significantly lower cost through the utilisation of spare capacity otherwise restricted to a specific sector. In this context, vehicle brokerage can provide significant enhancement to supply without the need to purchase new vehicles.

FTS provision requires appropriate communication between the passenger and the operator. The outward (from home) journey is normally the easier to organise as this can be by phone to the driver or to a travel dispatch centre. Return journeys can be more difficult to organise for open access FTS and it is normal for these to be pre-booked (with up to one hour notice if a travel dispatch centre is used) or timetabled from convenient points if the FTS service is an access service to a higher frequency trunk service as described in Mulley and Daniels (2010). One of the key issues in FTS design is to ensure an appropriate level of technology is used in the provision of the service. There are significant economies of scale to be obtained in the use of technology but it is much more expensive than manual dispatching at low levels of demand. European experience suggests that larger areas can be supported by a single dispatch centre with the Netherlands operating a single country wide dispatch centre. To achieve economies of scale, NSW may wish to provide a state-wide dispatch centre, maybe aligned with the 131500 service which already has many of the necessary skills.

Attitudinal and cultural barriers

Differences in stakeholder perceptions as to what public transport should and does offer can create significant barriers to FTS implementation. On the institutional side, barriers are created by policy-makers not setting out clear guidelines as to the objectives for public transport nor for the contribution of different modes to these objectives. For operators, FTS can bring uncertainties to those operating conventional public transport operators in operation (if they also operate FTS) and from competition if the FTS is operated by a third party. On the demand side, passengers do not see FTS as being 'available' to them in the same way as fixed route services, even if the fixed route services are infrequent. Often too, individuals will seek to retain fixed route public transport services for their potential use (eg if the car breaks down) but without any intention of regular use. All this requires significant education of potential passengers and is an element which is often underestimated in the design and promotion of a new service. Bringing together these different perspectives gives rise to a complex set of barriers based on perceptions that need to be identified and addressed.

Information, education and promotional barriers

This is linked to the previous section since one aspect of overcoming attitudinal and cultural barriers is to provide information and education and to promote the service.

FTS are distinct from conventional public transport fixed route services which can promote the service simply through their presence. FTS services are more difficult to promote since the more flexible the service, the less visible it is to the travelling public. Marketing a FTS is one of the most overlooked challenges in FTS provision.

Providing information about FTS services is subject to practical difficulties in the way in which information can be provided – many information services provide information using GIS databases which are eminently more suited to fixed route services.

International experience points to ways to ameliorate these barriers. Information provision is key and must be targeted at the individual level with an expectation that word of mouth is the most effective marketing tool. Importantly too, if FTS replaces even a poor fixed route service, the ways in which the potential passenger is not disadvantaged needs to be carefully communicated to show FTS in a positive context.

Investigation of the suitability for implementation in Regional NSW

The review of literature and practice sets out existing best practice in FTS around the world. This section aims to clarify the set of barriers that require resolution before FTS could be implemented successfully in NSW and to identify the criteria for shortlisting Regional areas for potential FTS trial.

From the above sections the following actions are identified

Identifying the accessibility gap that FTS is designed to meet is critical to its design and its success.
This means being clear about the role that FTS is to play in Regional areas whether this is to extend accessibility to public transport more generally or to provide opportunities to access particular trip generators such as health or shopping alternatives. This may not be the same in all areas. It points to an examination of patronage generators in short-listed sites and the role these play in overall demand for public transport.

Identifying the motivation for the introduction of FTS has an impact on overall network design and the role for which FTS is designed.
Identifying the network plan that meets the accessibility needs of an area with appropriate regard to coverage and frequency is a pre-requisite to identifying a sensible role for FTS.
It is an important decision as to whether FTS is designed as an 'add-on' to the existing network or whether the existing network is redesigned to implement FTS as part of a new network. This will also have funding implications as well as implications for the current contract with bus operators. Linked to the previous point, patronage generators and likely demand, estimated from an examination of the socio-demographics of the area(s) is necessary.

Identifying a clear role for FTS in the legislative framework is important for collaborative working between operators of conventional transport and FTS.
Changes in the legislation are a pre-requisite to the successful implementation of FTS in NSW.
As the current legislative framework stands, it is difficult to implement FTS. Changes to the legislative framework are important to allow different sized vehicles, in particular, to undertake services for the public and to do so in a way in which safety standards for the travelling public are maintained. Moreover, changes are required to provide freedom to consider FTS as a service of choice, rather than to provide a service which is constrained by current legislation (eg Locallink in NSW must timetable the service to fixed points in order to qualify as a public transport service).

Procurement method is an important decision with international experience pointing to the advantages of contracting to 'specialists' rather than to existing public transport operators who may find operating distinctly different services within a single business more challenging.

Identifying the vehicle size and its relation to demand is an important part of FTS service design.

The decision as to how to procure should not be made independently of existing vehicle fleets which are available. Conventional bus services are locked into larger vehicles because of the way in which school services form such a significant part of the business. Much of the evidence points to smaller vehicles, such as those used by community transport and taxis being more appropriate. Investigating Regional areas where efficient community transport and/or taxi businesses exist maybe a priority for choice of area for a pilot scheme. Density also plays a role and should be part of the decision as to where a pilot scheme might be proposed.

The policy decision on the fare to be charged is an important aspect of FTS service design. The expectation that FTS services will take significant time to build patronage must be built into the case for support.

These two aspects are interrelated since an anticipation of slow build up of patronage has resource implications as does the way in which the fare system is structured. This must be an essential part of estimating demand for the FTS and its design.

Identifying the opportunities for cross-cutting services and the development of a vehicle brokerage scheme can provide effective use of off-peak spare capacity.

This is linked to the motivations for the introduction of FTS and the way in which opportunities exist for linking the mobility needs of health etc into the public transport mix. The evidence suggests that this is beneficial because of the opportunities for significant overall transport cost savings (or greater number of opportunities provided for travel from the same budget).

Identifying the appropriate level of technology to support FTS implementation is critical to its success.

The level of technology is an important decision in the design of a FTS scheme. There are significant economies of scale that can be gained from having dynamic scheduling and e-based booking system that cover a wide spatial area (as with the national booking centre in the Netherlands). Balancing this, if FTS is not likely to be widespread, the capital cost of a technology based system is unlikely to be turned into operational savings when patronage is low and manual booking or even booking directly with the driver could be appropriate.

Identifying sufficient educational resources when developing and implementing a new FTS service is important in overcoming attitudinal and cultural barriers of both operators and the travelling public.

Resolving the way in which FTS service information is provided is an important step in making it accessible to users.

Investing in marketing, information provision and education program is key to the success of FTS services and specific targeting to potential users.

Resources must be budgeted to overcome the attitudinal and cultural barriers if FTS is to be a success. Proportionally, these will be greater for FTS than for conventional services when the vehicles and their bus stops provide a visibility not afforded to FTS schemes. Attention needs to be given to the way of providing information for FTS, given its flexibility and thus its lack of suitability for conventional timetable provision.

Conclusions

This review has summarised the barriers to FTS implementation, as identified in the international literature, with a focus on potential implementation in Regional NSW.

The review highlights two elements to carry forward to the next stage of the project. On the one hand, a series of policy options for the implementation of FTS which need to be incorporated into the design of a potential FTS scheme. On the other hand, the review points to a number of characteristics (density, patronage generators, availability of vehicles and operators) which can be used for shortlisting sites for potential FTS trials.

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Investigation of the potential to develop flexible or on-demand transport solutions for regional NSW

Professor Corinne Mulley and Dr Claudine Moutou

Deliverable 2: Report of policy and institutional options for successful introduction of FTS in regional NSW

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Background

This report builds on the report providing a state of the art evaluation of relevant practices in Australia and internationally in relation to the successful implementation of flexible transport services (FTS) (Deliverable 1).

The report focuses on two sets of inter-related barriers that are identified as requiring resolution before FTS can be successfully implemented in regional areas of NSW. Part I focuses on barriers within the policy framework that need to be addressed. Some of these barriers are already a focus of attention in the Passenger Transport Legislation Review in NSW, and are expected to result in some legislative changes. Part II focuses on other policy barriers that Government could influence through contracting, funding and marketing of FTS in the existing market environment. Part 3 considers the three case study areas identified by TfNSW as potential pilot sites and comments on issues specific to these geographies.

This report concentrates on the issues relating to ‘open to all’ or ‘open access’ land based FTS as well as services regarded as more ‘cross-cutting’ where there is a mix of travellers, both special needs (including passengers with lower mobility) and ‘regular’ public transport travellers. The report addresses an action in the 20 year NSW Long Term Transport Master Plan (NSW 2012) to “investigate flexible or on-demand transport solutions for regional NSW”.

This report is predicated on the need to integrate FTS services into the public transport offer more widely rather than simply an overlay to existing services with view to meeting the accessibility needs of citizens and closing an accessibility gap (or gaps) left by the existing conventional fixed route services network. Whilst the government is motivated by providing greater accessibility with the benefits this confers, including enhancing social inclusion, this report will identify how this is synergetic with business motivations where responding to accessibility needs with FTS can reduce operational costs for operating in lightly patronaged areas and the expansion of transport services into new markets.

Introduction

Deliverable 1 identified a number of actions that need addressing for the successful implementation of FTS in regional NSW. These are summarised in Table 1.

Table 1: Actions identified in Task 1 that need to be addressed for successful implementation of FTS

	Opportunities and Constraints		
Actions	**Institutional**	**Economic**	**Operational**
Identifying the accessibility gap that FTS is designed to meet is critical to its design and its success.	X	X	X
Identifying the motivation for the introduction of FTS has an impact on overall network design and the role for which FTS is designed.	X		
Identifying the network plan that meets the accessibility needs of an area with appropriate regard to coverage and frequency is a pre-requisite to identifying a sensible role for FTS.	X	X	X
Identifying a clear role for FTS in the legislative framework is important for collaborative working between operators of conventional transport and FTS.		X	X
Procurement method is an important decision with international experience pointing to the advantages of contracting to ‘specialists’ rather than to existing public transport operators who may find operating distinctly different services within a single business more challenging.			X
Identifying the vehicle size and its relation to demand is an important part of FTS service design.	X		X
The policy decision on the fare to be charged is an important aspect of FTS service design		X	
The expectation that FTS services will take significant time to build patronage must be built into the case for support.		X	
Identifying the opportunities for cross-cutting services and the development of a vehicle brokerage scheme can provide effective use of off-peak spare capacity.	X		X
Identifying the appropriate level of technology to support FTS implementation is critical to its success.		X	X
Identifying sufficient educational resources when developing and implementing a new FTS service is important in overcoming attitudinal and cultural barriers of both operators and the travelling public.		X	
Investing in marketing, information provision and education program is key to the success of FTS services and specific targeting to potential users.		X	X

This report is structured to identify the opportunites and constraints which emerge from the reduction or elimination of policy based barriers discussed in Deliverable 1. Part I focusses on the opportunities for FTS that would arise from addressing legislative barriers, from addressing issues in existing resource allocation and capacity, and networks. Part II focusses on the constraints which need to be taken into account in the design and implementation of a FTS in regional NSW. These two parts synthesise the research undertaken in Tasks 2 and 3 of the project. Part III brings these together in a first assessment of the case study areas suggested by TfNSW as potential pilot areas as a preliminary overview to the demand analysis planned for Task 4.

Part I

Opportunities from addressing legislative barriers

Identifying a clear role for FTS in the legislative framework is important for collaborative working between operators of conventional transport and FTS.

The review of best practice [Task 1] identified that changes in legislation are often a pre-requisite to the successful implementation of FTS. Previous work by Mulley and others have identified that this is the case in NSW with the NSW Passenger Transport Act 1990 and Passenger Transport Regulation 2007. Both have mode-specific regulation with narrow, inflexible definitions, which have deterred integration of taxi and community transport vehicles in the public transport network.

Progress is being made to address these issues, specifically the Passenger Transport Legislation Review that commenced in 2012. TfNSW are leading the review process and, in keeping with an interest in integrated transport, the scope has of the review has included taxi and intrastate aviation as well as conventional public transport.

The intention of the review was to make changes to the legislative framework that would allow greater integration and flexibility in how passenger transport services are planned, managed and delivered (TfNSW 2012 p.20). The new legislative framework is expected to include mode-neutral definitions of public transport services. A move to more flexible definitions of public transport services is a positive outcome for FTS as it provides greater opportunities for cross-cutting services to develop. For example, with flexible definitions it should become easier for bus operators, community transport operators and taxi operators to pool resources to provide a more efficient and accessible transport services for the general public with open access services. In rural and regional areas where distances travelled are large, local government jurisdictions vast and resources stretched, providing the right conditions for cross-cutting services to develop will be important.

Air services

Of special significance to regional areas, is the likely inclusion of intrastate air transport under the same legislative framework as other passenger services. In regional areas, air transport has been an important element of the transport mix in regional areas but it has been regulated separately under the NSW Air Transport Act 1964. The federal government has transferred ownership of regional airports to the local community, with many now being directly or indirectly owned by the local government authority or community (AAA 2012 p.12, ALGA 2010 p.8). New reporting requirements for airline operators, and possibly airports, will provide better quality data on passenger numbers travelling between regional centres in NSW. Incorporating this new data into network planning in regional areas is important.

Whilst not central to intra-area accessibility, the provision of regional air transport provides an important economic and social lifeline to remote areas. More importantly, as an individual's accessibility is determined by the ease at which they can travel from the origin of the journey to the final destination. In this context, regional air transport is one part of a segmented trip with FTS having the potential to meet the home to airport segment.

Exploiting the developments in air services for regional areas in NSW provides a number of opportunities including:

- TfNSW encouraging airline operators to use FTS as a means to add value to their services as part of their contract to encourage recognition of the importance of door to door trip accessibility;
- Regional airports being identified as a regionally significant trip generator, demanding consideration in the network planning of regional public transport.
- Active co-ordination of public transport providers (both of conventional and FTS) to provide passengers better links to and from the airports.

Regulation of accreditation framework

The full list of changes arising from the Passenger Transport Legislation Review is not yet publicly available. It is nevertheless important that a number of barriers are addressed if FTS is to be available as part of the public transport offer. It should be noted that in other countries where there is a legislative framework for the operation of public transport, changes to this framework have had to be implemented for the successful implementation of FTS.

Under the current framework, the legislation is both service type and vehicle specific. This is detailed in Deliverable 1 but in summary the regulatory requirements for the accreditation of transport operators are different for the bus and coach operators, taxi operators, and community transport services. This has resulted in differences in training requirements, reporting requirements, and licensing requirements. More importantly, the mode of delivery is tied to particular vehicles thus leading to a degree of inflexibility in the use of the available vehicle mix. New regulations that aim to provide a common safe operational context for public transport need to move away from the one-to-one relationship between vehicle and service type delivery, whilst recognising that some customisation of accreditation to reflect the type of transport service will be necessary. This approach is in line with COAG discussions in relation to national law reforms in relation to heavy vehicles. In the future, legislation changes should ensure that, for example, a taxi sized vehicle can be used for the delivery of taxi services, conventional public services on a fixed route, open access FTS services and services for the aged and frail provided the vehicle meets the standards for safe operation and the driver has accreditation, plus any additional requirements for the different types of services. In addition, the legislation changes should ensure that, for example, a driver accredited for driving aged and frail services could do so in any safe vehicle for which they have a licence to drive, as defined by type, size and weight.

The over arching requirement of operator accreditation also needs to be uniformly applied to all forms of public transport delivery. Public transport services require, whether provided by a taxi operator, a bus operator or a community transport operator, accreditation of the operator to internalise the safety externalities of providing service. The current accreditation requirements for bus and taxi operators have common elements but need to be standardised. Community transport operators are currently outside the Passenger Transport Act, 1990, but should be recognised as public transport operators (with accredited operators and drivers). Including community transport operators would be a simple way to open opportunities for this sector to contribute to the wider public transport mix more generally and specifically in regional areas.

Requirements for drivers of Community Transport operators have recently changed for those organisations holding contracts with TfNSW. The change in requirements does not apply to other forms of community transport where a fare is not charged, for example where a community organisation, such as a local club, is using their own bus for their patrons. Again, as with Community Transport operated under contract to TfNSW, a standard form of accreditation for the operator and drivers would enable the vehicles of these organisations to be part of an extended future public transport fleet.

A common accreditation framework for operators and drivers, only distinguished by the need of particular service type, is critical to the development of cross-cutting services. Cross-cutting services are those services where passengers on a single vehicle originate from different sources. So for example, a vehicle may carry school-aged children to school together with passengers attending a doctor’s surgery, an outpatient hospital appointment or a workplace. The ability to share vehicles over different types of service has been shown in other jurisdictions as a genuine way of increasing accessibility and sharing provision costs thus reducing the cost per passenger of each trip. A common accreditation framework is an obvious pre-requisite to implementing cross cutting services but an overarching framework of operator co-ordination, in the form of mobility management is also required (and discussed further below).

In summary, a move to a common accreditation framework for operators of and drivers of public passenger transport is not only beneficial for passenger safety but also allows seamless movement between service types for accredited drivers, limited only by service type specific knowledge and drivers' licence requirements. This provides flexibility for operators to be serving a number of public transport market simultaneously - a possiblity not currently possible. In particular, in regional NSW, the major movement of school children may be more efficiently delivered with a mix of vehicles where the mix is determined by the wider opportunities of the area rather than simply delivering children from home to school.

Opportunities from addressing resource allocation of existing capacity

Making better use of existing resources, including community transport, so as to improve transport planning for social access, is identified as a goal in the NSW Transport Master Plan (TfNSW 2012, p.325). In response, TfNSW is developing a Social Access Framework that is likely to provide future opportunities to consider resourcing FTS as part of the transport mix. The two primary goals of the framework are: to guide NSW policy makers in ways to consistently incorporate social access in investment decisions about transport; and to mitigate against future transport disadvantage by incorporating social access outcomes in TfNSW's own policies, programs and services. An important outcome that could arise from the Social Access Framework is to increase awareness of the possibilities offered by FTS to reduce locational transport disadvantage and improve service affordability. This is anticipated to particularly benefit regional and rural areas where lack of basic access to transport is already an issue. .

The better use of existing supply in regional areas could take a number of forms and have implications for the way in which FTS might be implemented in providing a holistic approach to the public transport offer. Using resources better requires an understanding of existing resources but this alone is not sufficient. It is important that these resources are matched to potential and existing demand, and that the conditions of allocation are flexible to respond effectively to change (the subject of Task 4 of this project).

The majority of supply by Community Transport organisation is targeted at 'eligible' passengers. However, with the journeys of these eligible passengers often being directed at the same destinations such as hospitals, there is often spare capacity in one organisation's vehicles which could be available to other organisations converging on the same destination within the same spatial area or another from an adjacent spatial location. Recent developments within TfNSW in matching spare capacity with the Spare Capacity Booking System are a welcome addition in this area. However, while it has the potential to better meet the unmet need of this target passenger group it is unlikely that using spare capacity within the Community Transport organisations will be sufficient in meeting the demand for non-eligible passengers. Nevertheless, Community Transport organisations could be important to better resource allocation in public transport operations to the extent that their vehicles may not be fully utilised over the time period in which public transport services are offered. This would provide an opportunity for Community Transport operators to contribute vehicles to serve ‘access for all’ services when not being used for HACC and transport disadvantaged clients (supposing their contracts would allow this). Moreover, more ‘commercially’ minded Community Transport operators can determine to structure their delivery of services to HACC eligible clients alongside more commercially focussed activities, should the legislative and accreditation barriers be removed.

Within regional NSW, existing bus operators have largely orientated their business to provide transport of school children. Those operators with Regional and Rural Type B contracts have an additional contract requirement to provide services to meet service planning guidelines in regional towns. Operators have adapted to these conditions by cross-subsidising their conventional town services from the provision of school services and collecting the revenues on these conventional services as part of their total revenue for the business. Nevertheless, the (anecdotal) evidence is that much of the vehicle fleet in low density areas is idle for the inter-school peak periods despite the nature of such gross cost contracts providing an incentive to operators to meet passenger demand. One reason for this might well be that potential passenger loadings are thinly spread over space and time in regional areas such that conventional services are not a good way to meet demand, reinforcing the appropriateness of the use of a more targeted approach such as FTS.

In this context, the consultations on a Social Access Framework can lead to a better understanding of demand (latent or actual), but this will need to be accompanied by a structured framework with which to share and act on information amongst knowledge stakeholders. Although there exist collaborations between government, non-government, and community stakeholders to address unmet transport needs and find appropriate solutions for their local communities the effectiveness of these transport working groups can be hampered by varying spatial coverage. For example, Regional Organisation of Councils (ROCs) are collaborations of adjacent LGAs aimed to coordinate regional policy and where possible share service delivery (Kelly et al 2009, p.174). The scale of ROCs in regional and rural areas ranges from 18,008 square kilometres to 190,015 square kilometres, or involve groups of five to 18 LGAs (2012, pp.26-27). Such vast areas of regional governance can make ROCs an unsuitable model for the sharing of FTS fleets even if economies of scale are useful for establishing a shared FTS booking and despatch system.

Effective collaboration between operators of different types of transport service, service providers and multiple levels of government need effective partnerships at a meaningful spatial scale. These areas should reflect the connectivity of existing places as demonstrated by journey to work data, and catchment areas for core services such as health and education. Establishing a mobility management approach that can effectively bring together information, services and planning will be difficult to achieve without high level commitment and adaptive governance arrangements. This is especially important when pooling resources is constrained by the different funding contract arrangements between FTS providers operating under different regulatory frameworks with different objectives.

Opportunities from addressing network planning

In planning public transport networks, trade-offs must be made in network design between coverage and frequency when the (subsidy) budget is constrained. Whilst empirical evidence suggests that frequency is important in growing patronage (Currie and Wallis 2008, Hensher et al. 2010), service planning guidelines may encourage coverage to ensure equity of access. Emphasising equity of access in already dispersed, low density areas as those found in regional and rural areas, results in bus kilometres spread thinly over a large area.

As identified in Deliverable 1, there are many different forms of FTS. If FTS is to form part of the public transport offer it is of key importance that TfNSW takes a more active role in determining the framework for expectations in relation to the network plan for a regional area. An implication of this is that it would be better to remove Rural and Regional Type B contracts and limit contracts to Type A only, thereby releasing operators from the responsibility of meeting service planning guidelines. Instead the government becomes responsible for determining the scope and quantity of public transport in the area. This change could lead to an increase in the subsidy budget requirements as operators would no longer be cross subsidizing non-school passenger services. Whilst an increase in budget for subsidy is unlikely to be welcome, this change in contractual arrangements means that the government is determining where resources should be expended, rather than the operator, and can devise a network plan which meets planned coverage/frequency trade-offs.

TfNSW is of course responsible for network planning in the metropolitan areas and this includes a recognition of the multimodal nature of public transport provision and includes the co-ordination of, in particular, train and bus services. In contrast, network planning in the regional NSW areas is the responsibility of the Rural and Regional Contract B holders as discussed above. In the event of FTS being included as part of the public transport offer, there is a need to consider carefully the responsibilities of the various stakeholders providing public transport services and the constraints faced by each. In particular, all public transport services need to have equal access for picking up/dropping off passengers at places where passengers can interchange between different providers for both road and rail based transport.

Information about existing demand and patronage generators can be used in a network planning approach to FTS. It is recommended that information about supply of transport services includes the spare capacity of community transport, taxis, etc. This is important as the international experience is that overlaying FTS to a conventional bus service network is expensive and can cause duplication of services. Positioning FTS within the public transport budget would mean a different trade off for resources. FTS can support spatial coverage and desired levels of frequency across the public transport network, especially if FTS is designed to complement fixed route services as part of the overall public transport offer.

In terms of network design, it must be understood that network design, including FTS and conventional fixed route services, must be planned to faciliate the return journeys. Compared to outward journeys from home with FTS, return journeys are more uncertain in terms of their location and time. Network planning must take particular care with this aspect.

In the context of the NSW Long Term Transport Master Plan, the provision of FTS within an overall approach to network planning can be seen as complementing the measure (TfNSW 2012 p.261) to renew the approach to resourcing the community transport sector to ensure it can meet increasing demand for service. Integrated transport planning, is also advocated by the Australian Local Government Association (ALGA) as critical if rural and regional communities are to gain appropriate transport services that allow access to essential services (ALGA 2010 p.8). An integrated transport planning approach means including the network of coach services that replace train services evaluated as no longer economically viable as part of the public transport offer. These coach links are well placed to service patronage generators along their routes and could make travelling between regional towns more feasible if able to be freed from Sydney-centric rail timetables. Finally, in addressing network planning issues it must be remembered that the community's travel patterns have been constrained by the options for connectivity and current use. Planning for FTS cannot rely soley on current travel data and must take account of current non-users. This is addressed further in Task 4.

Opportunities to reassess fares and funding

FTS can be seen as part of the regular public transport or as a premium service. In the former case, use of public transport fares is appropriate whilst in the latter, a higher fare could be charged. The setting of fares for FTS higher than conventional public transport can compound social exclusion and transport disadvantage, and make it difficult to ensure integration and interoperability with conventional services.

IPART regulates fares for government-owned public transport services (train, bus and ferry) as well as taxi services, and contracted timetabled bus services provided by the private sector. Coach services operated as part of the NSW Trains network are treated as train fares. Unregulated fares include private ferry, and light rail.

Setting fares needs to take into account the known slow growth in patronage in low density areas and with FTS services (see Deliverable 1). The fares set will have an impact on the calculation of the required subsidy budget, alongside patronage growth predictions. It is important that fare setting decisions should be aligned with the policy objectives for introducing FTS . If FTS is to be part of the public transport offer then public transport fares, as regulated by IPART would appear appropriate and would allow the use of the Opal card as and when this is rolled out across regional NSW. Decisions about fares are especially important in the building of the business case for the introduction of FTS and an understanding of the impact on existing and new contracts.

The business case should encompass practical considerations. In setting the business case for FTS there are a number of practical considerations. These include:

- alignment of contracts cycles as it impacts on the available fleet;
- area sizes as being as least as large as the labour market for the area as evidenced by journey to work (JTW) links;
- provision for subsidised public transport in the business funding case to include existing and potential patronage growth.
- the rate of patronage growth should be incorporated into the funding formula to ensure areas likely to experience slow growth have an opportunity to develop an economically sustainable model.

Part II

Vehicle and technology constraints

Fleet issues

Fleet size and composition varies by regional area and an understanding of the nature of these is critical to the development of an appropriate FTS contribution to the public transport offer. The operator fleet size and composition is driven by peak requirements. In regional areas the peak requirements are centred on the provision of school services . The off-peak capacity of the fleet can vary by area and the network plan which it fits. Likewise, it is important to recognise that the deployment of FTS, in a network plan should be tailored to the specific needs of the regional area it serves.

Shifting to a focus on transport for all would mean other trip generators, not just schools, would influence fleet specifications across a network. In the short term however, the size of vehicles available for FTS may not always match the service demand. This could act as a constraint to deploying FTS quickly, though this could be ameliorated by specific contract arrangements that have provision for fleet adjustments. In the operation of FTS there is a trade-off between the size (and carrying capacity) of the vehicle and trip duration for passengers. The vehicle used, its speed, carrying capacity and the potential distance that can be undertaken in a fixed time cycle to meet timetabling requirements at the flexible transport service nodes will affect the number of passengers which can be carried for the bus km or associated service hours budget. Bertocchi (2009) has investigated the relationship between cycle time, patronage and vehicle size for flexible transport services using simulations which take account of the way in which bigger vehicles can have higher occupancy but the collection of additional passengers imposes additional time on the round trip with the pattern of pick up and drop off influencing the ability to achieve patronage levels.

Technology

It is crucially important that the appropriate level of technology is used. Otherwise viable FTS have failed to achieve economic viability because of overly elaborate technology deployment. GPS technologies can be useful for deploying vehicles on demand across busy service areas and where there is a large fleet. In the context of regional and rural NSW, consideration needs to be given to the reliability of these technologies. Alternative low tech solutions such as phoning the driver may be sufficient if demand is lower and passengers are required to pre-book a short-time ahead.

Technology can be expensive to set up and maintain, and less effective in low demand areas or where there are mobile phone blackspots. Moreover there are existing products on the market that should be cheaper to deploy than opting for custom-built solutions. For example, smartphone applications (apps) are being developed for booking taxis independent of the taxi networks which use different business models for financing the service. There are existing providers of FTS routing software and these are increasingly being used by Community Transport operators in Australia. Pre-existing policy commitments in the NSW Transport Master Plan, such as providing a single booking line for Wheelchair Accessible Taxis (TfNSW 2012 p.382) could concurrently help the deployment of FTS on a large scale. A single booking line that allows SMS bookings using a customer database, and notification if Wheelchair Accessible Taxi is not available, could be extended to become a single point of access for FTS services in regional NSW.

To achieve economies of scale it is important to match the deployment of technology to the level of demand and requirements of the service area even if this means that a dispatch centre dispatches more than one service in the area or dispatches the same type of FTS service over more than one area. Whilst the conventional wisdom is that local knowledge is important in the delivery of FTS services, there is a trade-off between this and spreading the fixed costs of a technology solution that can be mitigated by using a single ‘control room’ which could service NSW state-wide and be aligned to the 131500 information service.

A further advantage of a state-wide booking service comes from the way in which a service provider's boundaries of operation do not always reflect intra-regional and inter-regional connections people want to make. Communication using a centralised booking service can consolidate intra-regional trips. Dispatching multiple services from a single point (e.g. health service, public transport access, education site) can give more efficient service and provide opportunities for implementing cross-cutting services as discussed above. The Northern Rivers is an example where integrated regional transport planning is advocated (and done) as residents travel to South East Queensland for health, education, business and social reasons (Northern Rivers Social Development Council).

Attitudinal and information constraints

The public prefer fixed public transport routes because they are more visible and more familiar than FTS. Moreover, it is important to present FTS services as an improvement in accessibility provision as it is important to counter the negative public view that can accompany the implementation of FTS alongside a change in conventional fixed route services.

The public may respond more positively if FTS are designed and marketed as a way for passengers to reach an increased number of destinations, reduce their waiting time and increasing their choice of when and where they travel. FTS services are the least visible of public transport services and as such need a targeted marketing strategy. FTS have a tendency to be less visible to non-users and this is not helped by marketing and promotion of FTS often being focused on the set-up period. The implementation of FTS must be accompanied by a significant marketing budget using multiple strategies that includes low-cost options such as word of mouth as these build awareness of FTS amongst the community.

The provision of information for FTS is more difficult than for conventional, fixed route services because of the non-constant routes which are operated. This difficulty, alongside the way in which the flexibility of routes makes it difficult to map in the GIS databases typical of transport information services means that additional effort needs to be made to overcome this constraint. For example, FTS services can be presented as zonal systems alongside the fixed route services in GIS software and transport route matches.

Part III

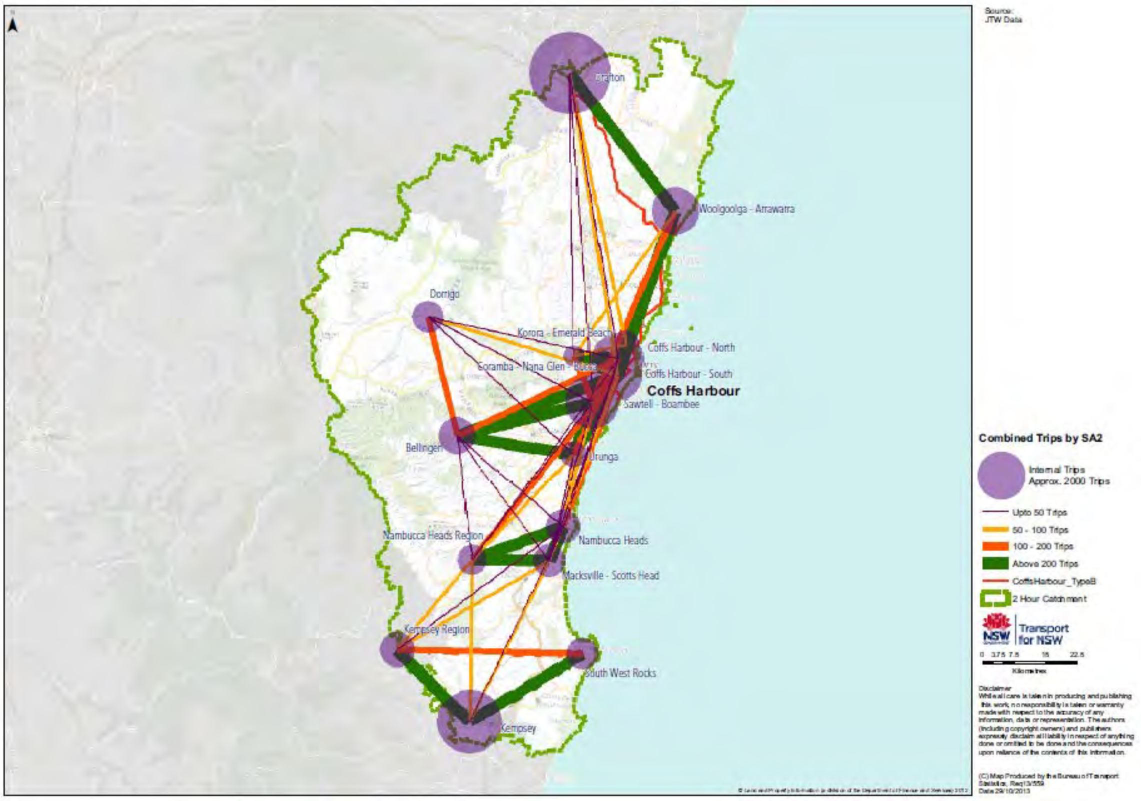
This section gives an initial assessment of the information provided by TfNSW in relation to the three possible pilot areas, centred on Coffs Harbour, Orange and, Wagga Wagga.

Of all journey purposes, servicing journeys to work by public transport confer the best opportunity to mitigate social exclusion since providing the opportunities to access employment prevents the downward spiral of economic disadvantage. Other journey purposes (shopping, social and access to health care facilities) are important in terms of ameliorating transport disadvantage.

In each of the three areas, as shown by Figures 1 to 3, there is an apparent mismatch between the origins and destinations shown by journey to work data and the existing public transport network, explaining the very high frequency of journey to work by car as a driver or passenger (Coffs Harbour 87%, Orange 87% and Wagga Wagga 85%). The mismatch between flows (upper half of Figures 1 to 3) with services (bottom half of Figures 1 to 3) is reinforced by the bus service frequency maps (Rural and Regional Service Review Figures 23, 44 and 65).

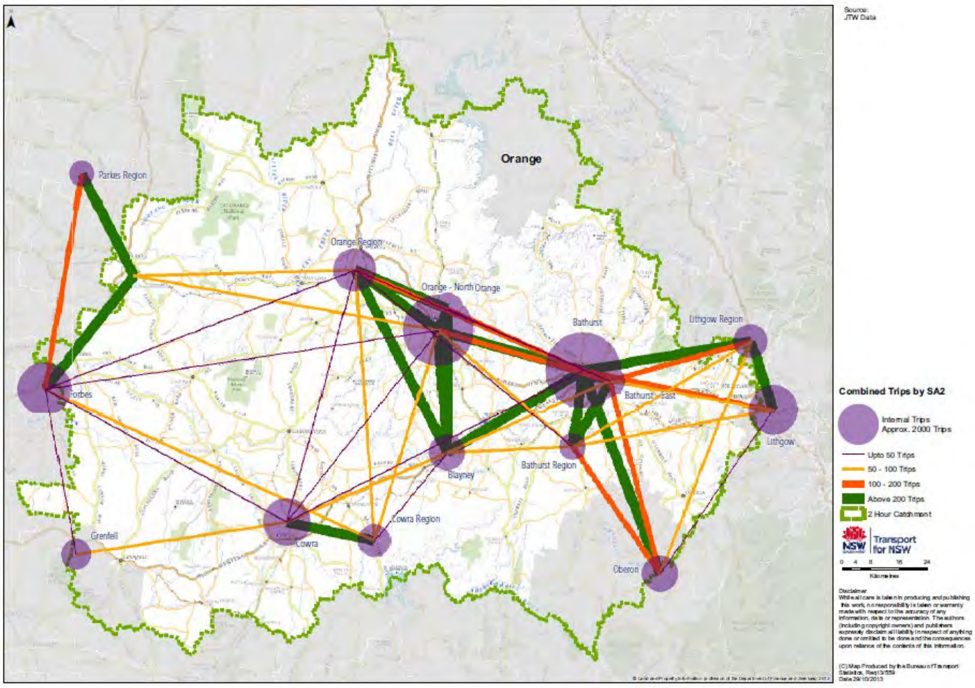
The mismatch between flows and services would suggest that FTS could be used to assist the redesign of a better network for public transport services. The network redesign would require resources from existing fixed route services to be transferred to corridors of regular and good frequency, at least at journey to work times, with FTS as a means of accessing these corridors. Fixed routes with higher frequency are likely to build patronage and FTS services can provide accessibility to these corridors. A change in emphasis from coverage to frequency will inevitably lead to winners and losers in access to fixed route services. Whilst some passengers will have access to an enhanced frequency scheduled route service, others will lose the ability to access destinations without changing. The provision of a FTS to access the higher frequency trunk scheduled routes offers the ability to ensure existing passengers do not lose accessibility which is currently provided. The FTS as an access service also provides the opportunity for public transport access for members of the community not able to access a scheduled route service in the existing network.

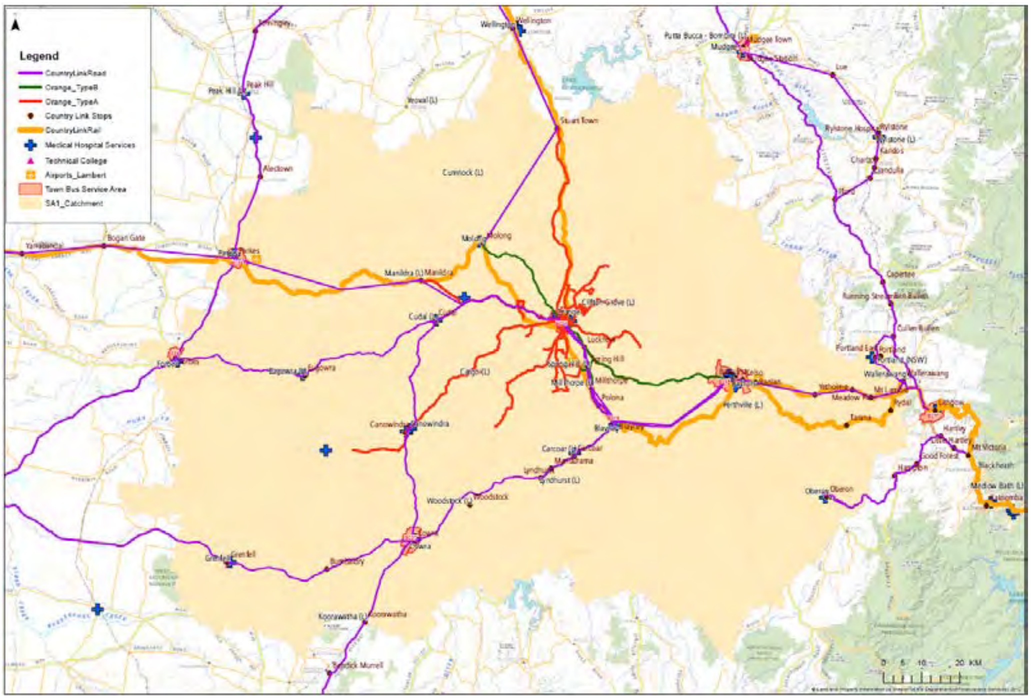
Figure 1: Coffs Harbour



Source: Rural and Regional Service Review, Figures 1 and 20

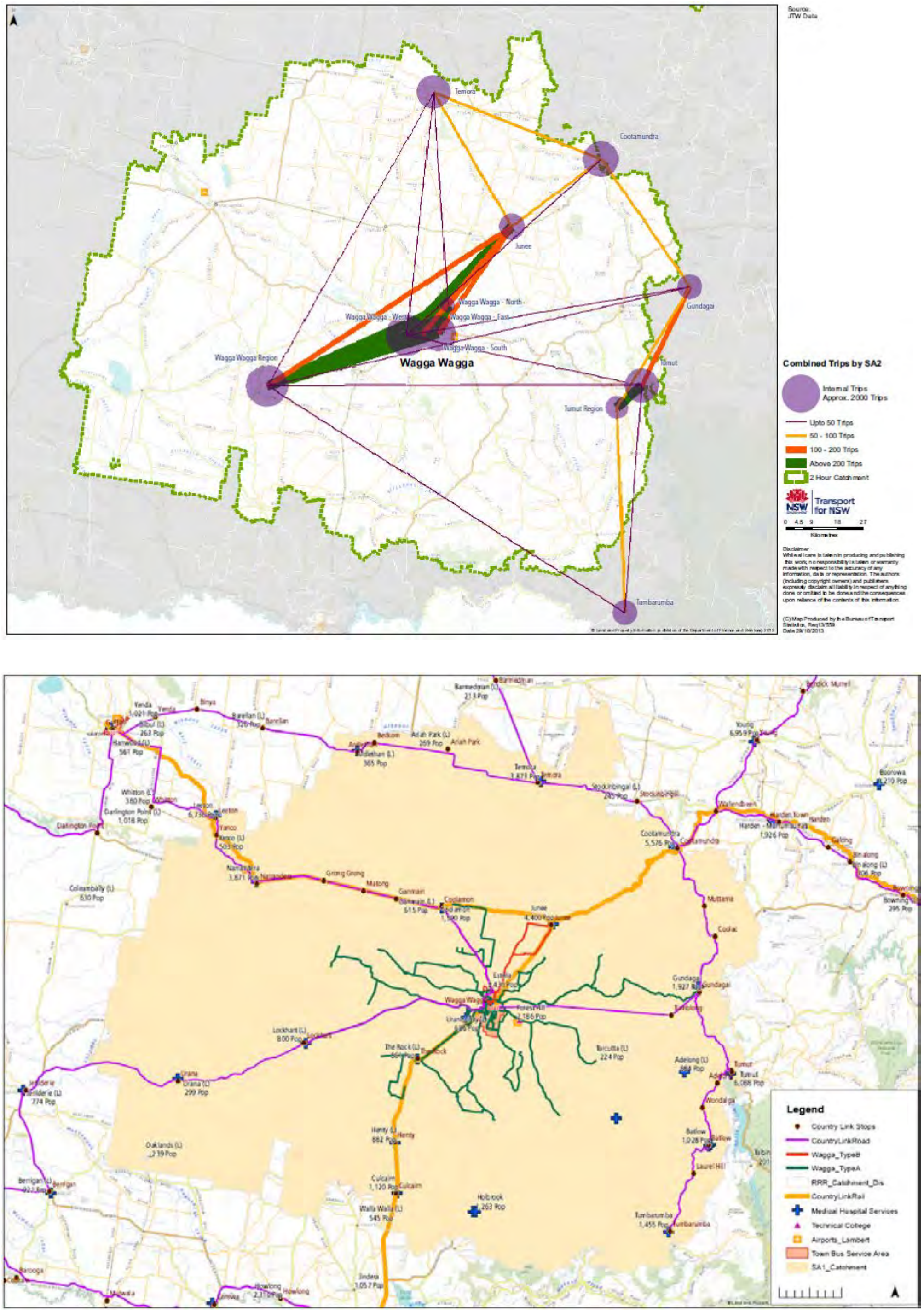
Figure 2: Orange





Source: Rural and Regional Service Review, Figures 25 and 43

Figure 3: Wagga Wagga



Source: Rural and Regional Service Review, Figures 46 and 64

In terms of service design, the fixed route services on key corridors, as identified by the journey to work data, can be designed for faster services with bigger distances between stops to provide an overall faster service. Some of these corridors are of the order of 40-60km and these might require intermediate hubs for transfer from the FTS to the fixed route service.

In regional NSW, school services of course provide the backbone of public transport services and the suggestion of re-orientating the network towards few higher frequency corridors does not presuppose that school services, already open access and used by the travelling public, should change. The proposed change is to shift resources from all other provision of public transport services towards key corridors to provide the opportunity for patronage growth and to ameliorate loss of accessibility to existing fixed route services by providing FTS access.

The catchment areas of Coffs Harbour, Orange and Wagga Wagga, as analysed in the Regional and Rural Service Delivery Review is large. In terms of a pilot scheme or schemes, it is proposed that the proposed service design be limited to key routes in the area with FTS being targeted around these routes.

The way in which the new network design might be made operational depends on the existing characteristics of the area and in particular, the number of existing taxi operators since the FTS element of the proposed network design is likely to require smaller vehicles. In Coffs Harbour there are 25 taxis of which 11 are accessible and two Hire cars, in Orange 32 taxis of which three are accessible and one Hire car and in Wagga Wagga 33 taxis of which 10 are accessible and one Hire car. On the basis of this, Coffs Harbour would appear to provide the largest proportion of accessible taxis and may therefore suggest this area would be more appropriate as a pilot area, if only one is to be chosen.

A further factor of importance in determining the choice of pilot area is the composition of fleet sizes of the bus operators for which no information is provided on the number or size of vehicles. More detailed demand analysis needs to be undertaken in Task 4 to identify the benefits of this approach and the likely demand profiles.

Contractually, the approach of providing FTS to access fixed route services could be vested in a single contract with existing bus operators, by providing a mobility management approach or by seeking separate contracts with different operators for different services. Conventional bus operators have shown little understanding of the FTS approach (as discussed in Deliverable 1) and a mobility management approach, whilst perhaps providing the best outcome in the longer term, is the most difficult to implement and may be better developed as part of a longer term co-ordination between operators holding separate contracts for FTS and fixed route services.

Conclusions

Part I identifies the opportunities to be gained from addressing legislative barriers to provide a regulatory framework predicated on the service type of public transport, rather than being determined by the vehicle type. Whilst the regulatory focus is clearly on providing a safe environment for passengers, there is no need to distinguish between what sort of operators provide what sort of service to the passenger.

This approach of addressing legislative barriers first has the advantage of providing the opportunity to maximise use of the existing capacity in the regional areas from the different operators that exist and permits operators to be present in more than one public transport market simultaneously.

Network planning opportunities arise from a more holistic approach to planning in regional NSW and in particular contracting for services that are provided, rather than relying on services provided by operators as part of their commitment to providing school services. In low density areas it would appear that gross cost contracts do not provide the same incentive to innovate as in higher density, metropolitan areas.

Fares and funding are an important part of the design of a FTS and must be related to the objectives for FTS in the area under consideration. If FTS services are provided as access to fixed route services then a public transport fare is appropriate. Revenues from FTS services are likely to grow slowly and take longer to reach maturity because FTS services are less visible to the travelling public and this must form part of the business plan.

Part II concentrates on the constraints and highlights how understanding the nature of fleet composition is key to the design and operation of a new network. No one size fits all is a clear message from the research underpinning this report. Technology can provide enormous help in the delivery of FTS but needs to be provided at a level appropriate to the scale of operation unless a state-wide approach is developed to exploit economies of scale. Part II also emphasises that it is important to understand the passenger’s potential resistance to using FTS and the constraints this may first play on the success of FTS and the need to provide a significant marketing budget in the business plan.

Part III presents an exploratory investigation of the evidence provided by the Regional and Rural Service Delivery Review in respect of three potential pilot areas – Coffs Harbour, Orange and Wagga Wagga. This reveals a mismatch between the exiting fixed route services and journeys to work and proposes initial pilot schemes should concentrate on providing higher quality fixed route services on the key journey to work corridors which offer the potential to grow patronage, complemented by FTS to provide access to these services.

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Investigation of the potential to develop flexible or on-demand transport solutions for regional NSW

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Deliverable 3: Demand and supply for FTS in Regional NSW and a Business Case Framework for FTS implementation.

Introduction and Scope

This report builds on the reports providing a state of the art evaluation of relevant practices in Australia and internationally in relation to the successful implementation of flexible transport services (FTS) (Deliverable 1) and the identification of legislative and other policy barriers to the successful implementation of FTS in regional areas of NSW (Deliverable 2).

This report assumes that the FTS under consideration are 'open to all' or 'open access' including more 'cross-cutting' where there is a mix of travellers, both special needs (including passengers with lower mobility) and 'regular' public transport travellers. This report assumes, as identified and agreed as a result of Deliverable 2, that FTS services would be integrated into the public transport offer with view to meeting the accessibility needs of citizens and closing an accessibility gap (or gaps) left by the existing conventional fixed route services network. This would provide a network plan where fixed, timetabled services between major settlements provide the backbone of the network in regional and rural NSW which, when elevated to give a better quality of service could grow patronage (particularly on the journey to work), complemented by FTS to provide access to these service corridors.

TfNSW identified three possible pilot areas for FTS, centred on Coffs Harbour, Orange and Wagga Wagga. Part III of Deliverable 2 gave an initial assessment of these areas' suitability for the introduction of FTS. The next section of this deliverable recaps the issues raised in relation to these three areas, relevant to an investigation of demand and supply of FTS.

This is followed by a detailed section on Methodology with step by step discussion of the various steps taken in the investigation of an area's potential for FTS introduction, the establishment of demand and the costs of supply. This methodology is applied systematically to each of the three areas, identified by TfNSW as possible areas for FTS introduction, in each of three Appendices. The final sections of this Deliverable brings together the information from these Appendices to provide a synthesis and summary Business case followed by conclusions and recommendations.

Recap from Deliverable 2, Part III

Part III of Deliverable 2 identified the servicing of the journey to work by public transport as the journey purpose most likely to mitigate social exclusion whilst other journey purposes (shopping, social and access to health care facilities) are important in ameliorating transport disadvantage. In this context, The Rural and Regional Service Review (2013) showed an apparent mismatch between the origins and destinations in the journey to work data and the existing public transport networks for each of the three areas, identified as possible pilot areas for FTS by TfNSW (Deliverable 2, Figures 1-3, pages 15-17).

This is the starting point for the analysis presented in this report. It is predicated on the provision of FTS to access higher frequency trunk scheduled routes linking major settlements. The FTS as an access service also provides the opportunity for public transport access for members of the community not able to access a scheduled route service in the existing network. Using FTS as an access service also provides the opportunity to improve the fixed route services on key corridors by making the overall journey faster with bigger distances between stops.

Methodology

The analysis in this Deliverable is done at the most detailed level of spatial geography, the Statistical Area 1 (SA1). The boundaries of the SA1 level are set by the ABS in reference to a number of criteria. Information on the ABS website explains that generally, an SA1 level will be either urban or rural in character and capture a population of between 200 and 800 people with an average of 400 people. SA1 populations tend to be smaller in rural areas where the spatial boundaries of the SA1 are clustered around settlements exceeding 180 people. Importantly for this analysis, SA1s are designed to cluster discrete indigenous populations exceeding 90 people (ABS 2011).

Scoring system

The definition of potential FTS demand is critical in the construction of the methodology for this project. In the context of regional and rural areas of NSW it is understood that FTS services are likely to be of particular benefit, and provide higher levels of demand, when providing access to areas:

- which are particularly rural,
- have a higher incidence of deprivation, and
- which have reduced options for travelling distances to access services/jobs.

The methodology for this analysis therefore involved using Australian Bureau of Statistics census data (listed in Table 1) to capture these features for each of the possible pilot areas. Data about existing transport network, the travel times along the road network, and information about journey to work trips were sourced from TfNSW (2013) and incorporated into the analysis. This is explained in greater detail in the methodology used for ranking settlements below.

Table 1: Definition of variables sourced from the ABS

Variable	Definition (source)	ABS Catalogue
Density	People per hectare is used as a measure of rurality, with lower density areas having a higher potential demand for FTS.	2011.0.55.001
Remoteness	The Remoteness structure is a different measure of rurality devised by the ABS to divide Australian into broad geographic regions with common characteristics.	1270.0.55.005
SEIFA IRSD	The Socio-Economic Indexes for Areas (SEIFA) Index of Relative Socio-Economic Disadvantage (IRSD) score takes a basket of goods approach to ranking relative socio-economic disadvantage with lower values f the index having a higher potential demand for FTS.	2033.0.55.001
Car ownership	Percentage of dwellings with 0 or 1 car is used to identify households with low access to goods and services and areas with a higher percentage of dwellings with low car ownership having a higher potential demand for FTS.	2011.0.55.001
ATSI	Percentage of population that is Aboriginal and/or Torres Strait Islander. Higher percentages of ATSI populations are expected to have a higher potential demand for FTS.	2011.0.55.001
Unemployment	Percentage of population unemployed and looking for work where areas with a higher percentage having a higher potential demand for FTS.	2011.0.55.001

The six variables shown in Table 1 have been divided into bands with a score attached for use in weighting regimes. The boundaries of each class are matched by natural breaks in the data and shown in Table 2.

Table 2: Scoring system used to assess areas of potential FTS demand

Level of Demand	Density (pp/sqkm)	Remoteness Areas (index)	SEIFA IRSD	Dwellings with 0-1 cars (%)	ATSI Population (%)	Population Unemployed (%)	Score
High potential demand	<3.2	Very Remote	<340	>=0.64	>=0.4	>=0.5	5
	<9.2	Remote	<800	<0.64	<0.4	<0.5	4
	<15.6	Outer Regional	<930	<0.5	<0.2	<0.15	3
	<23	Inner Regional	<1015	<0.37	<0.09	<0.05	2
	>=23	Major Cities	>=1015	<0.23	<0.04	<0.02	1
Low potential demand	no population	-	no score	0	0	0	0

Initially, each of the three areas identified by TfNSW as potential pilot areas is mapped for each of the six variables presented in Figures 1 to 6 of each Appendix. In very general terms, these maps show a considerable overlap of need as might be expected with the lower density areas also being shown as being relatively more remote etc. However, it is clear that this is not uniformly the case over all three of the areas selected as potential pilot areas (nor necessarily the case more generally).

Weighting Regimes

The next stage of the analysis involves weighting the variables used in the identification of the different potential needs for FTS services so that the analysis can be informed by multiple variables simultaneously.

Four possible weighting regimes are considered, recognising the close relationship between density and remoteness on the one hand and the ATSI population and unemployment on the other. These are shown in Table 3, as defined by Table 2 above.

Table 3: Weighting regimes of variables identifying different levels of potential demand for FTS

Weighting regime	Sum of variables included in the regime
1	Density, SEIFA IRSD, Car Ownership, ATSI, Unemployed
2	Density, SEIFA IRSD, Car Ownership, Unemployed
3	Remoteness, SEIFA IRSD, Car Ownership, ATSI, Unemployed
4	Remoteness, SEIFA IRSD, Car Ownership, Unemployed

It is acknowledged that a simple sum of the variables equally weights each element in the weighting regime. However the weighting regimes are easily adjusted to reflect policy goals with different weights being applied to each of the variables which in turn are likely to generate different outcomes. Moreover, whilst it is likely that the variables used to identify potential demand might be generally reinforcing (e.g. density and remoteness), this methodology can be transferred to other areas where this assumption might be more finely attenuated.

Using the weighting regimes to rank settlements

As this investigation is predicated on the journey to work being facilitated by public transport with FTS being an access service to these corridors of scheduled public transport services, it is necessary to identify the key settlements through which the scheduled public transport services would pass. In each of the three areas identified by TfNSW as potential pilot areas, the major settlements were identified as potential 'depots' for FTS. A depot in this context is simply a spatial base where a vehicle or vehicles might be located. Using a GIS layer, the distance and speed limits for travelling along the road network were measured from these 'depots' in order to identify two catchment areas which, under different weighting regimes, would have different potential demand for a FTS service.

A common aspect of FTS is that it is easier to ask for a FTS service that starts from the home location than one which starts from the activity (or destination on the outward journey). In order to facilitate timetabling of return home journeys, a regular cycle of availability from the 'depot' must be possible. A 10 minute travel distance and a 20 minute travel distance from the depot were used to define the two catchment areas. Assuming a distance of 10 minutes travel on the road network from a depot would allow a scheduling of a vehicle at a depot at least once each half hour for the return journey. A distance of 20 minutes from a depot would allow a scheduling of a vehicle at a depot at least once per hour for the return journey. Clearly the less frequently these are timetabled, the more flexibility is inbuilt into supplying FTS but it may detract from the attractiveness of FTS from the passenger perspective.

In order to rank the major settlements in each of the three areas identified by TfNSW as potential pilot areas, the weighting regimes were applied to the two catchment areas. For ranking, the scores for the SA1 geographies which had a centroid within the 10 or 20 minute catchment area were averaged and then summed as a basis for ranking under each regime. These are shown in each of the Appendices and summarised in the Business Case Summary below.

Potential Supply and Savings from Fixed timetabled routes

As identified above, Deliverable 2 showed the way in which FTS services can be used to access fixed route, timetabled services. An implication of this is that if FTS services are to be introduced then some existing fixed route, timetabled services can be removed as they would be covered by the change in emphasis from coverage to frequency (consistent with expectations identified in NSW's Bus Future 2013 for the Metropolitan area) and thereby provide some funding towards the provision of FTS. In terms of service design, the fixed route services on key corridors, identified by the journey to work data, could also be re-designed for faster services with bigger distances between stops to provide an overall faster service. Some of these corridors are of the order of 40-60km and these might require intermediate hubs for transfer from the FTS to the fixed route service.

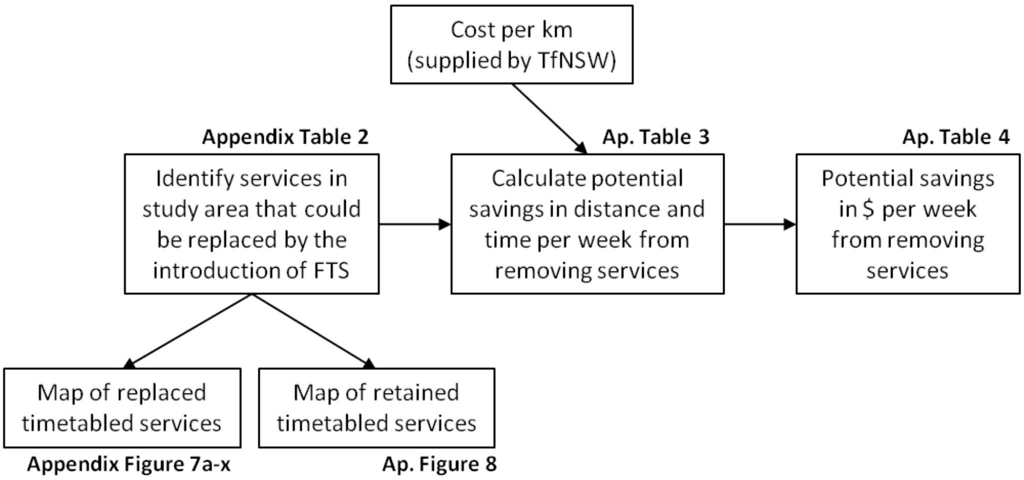

Figure 1: Methodology for determining potential savings if FTS replaces scheduled services

To demonstrate the potential supply savings offered by FTS, a number of steps were taken and these are illustrated in Figure 1. The results are documented in the Appendices, where Table 2 identifies the potential services that could be withdrawn with the introduction of FTS services. Table 3 shows the km and minutes of operation that can then be saved per week of operation together with the weekly saving, based on cost per km from information provided by TfNSW being presented in Table 4 in each appendix. These savings are likely to be conservative in respect of savings since they are based on a category 4 vehicle rather than a full size bus and assume an eight hour operating day. Maps of the services that could be potentially removed upon the introduction of FTS (centred on each of the major settlements) are then mapped in Figure 7 of each appendix.

The services identified in Table 2 of each appendix have not been checked against services which are currently operated as schools services (i.e. scheduled services for school children which also accept non-school passengers). It is expected that these services would be <u>retained</u>, irrespective of the network which is planned to include FTS. The services in Table 2 of each appendix have also not been compared against their existing patronage for establishing the suitability of retention as a scheduled service, because of current levels of patronage indicates viability.

The core services to be retained in each of the three areas identified by TfNSW as possible pilots for FTS introduction are those services which link the major settlements. These are mapped as Figure 8 in each appendix (together with an alternative permutation as Figure 9 in each appendix).

Potential Demand and Revenue

Demand

People that are “vulnerable” to social exclusion because of transport disadvantage are a group that could benefit from FTS, and therefore should be incorporated into estimations of demand. This deliverable considers four groups. Those that are already eligible for community transport, such as older people aged 75 and over, are excluded. The four groups are:

1. Older people between 65-74 years old.

2. Members of households where there is little access to a private car (identified by dwellings with access to 0 or 1 cars).
3. Young people 15 years and below.
4. People needing access to employment (i.e. labour force)

Using the 10 and 20 minute catchment areas identified above, a count is established for each of these categories using the 2011 Census at the SA1 level. If the centroid of the SA1 was within the 10/20min catchment, the count from the SA1 was included. These counts are presented as Table 5 in each appendix and mapped for each variable in turn (Figures 10-12 of each appendix).

Whilst it is clear that there is overlap between these categories, census data does not provide information on household composition at this level of disaggregation. For example an older person may live in a household without a car, as may a young person aged 15 or below. Moreover, using a count for each household assumes that only one person from that household is in the category and this is likely to underestimate need. Taking account of these aspects, only a proportion of the identified or targeted populations will be assumed to form potential demand. The impact of this assumption can be tested through sensitivity analysis based on a comparison between actual demand on existing services as compared to the potential demand identified through this methodology. The base case assumes only 10% of the count will result in the demand for FTS trips and these are shown in Table 6 of each appendix.

Revenue

Estimating the potential revenue, involves a number of considerations. Fares, as identified in Deliverable 1 and Deliverable 2, are a key policy decision and need to be determined as either public transport fares or fares, with a premium attached, to reflect the higher level of service.

There are, however a number of considerations that point towards the implementation of fares that are aligned with public transport fares. First, as identified above, this Deliverable is predicated on facilitating journeys to work by public transport with FTS as access services to scheduled services linking the major settlements. The market segment of employed people willing to use FTS to access higher frequency public transport routes would not only help to establish the FTS and increase its acceptance as transport for all but would also expect to pay a public transport fare as part of an overall public transport journey. Second, also identified above, a motivation of FTS introduction is to widen access to reduce social exclusion and transport disadvantage. Willingness or ability to pay by this market segment is likely to be limited and setting fares too high will prevent the objective of greater social inclusiveness being achieved.

An analysis of the fares between major centres for each of the catchments by the regional network of trains and coaches, also known as NSW TrainLink, identifies that the fare per (travelled) kilometre for a single journey ranges from $0.12 to $0.21 for an adult. Bus fares within a major centre are structured similarly as those in metropolitan areas (see Table 4 below). As a section is approximately 1.6km, the cost per (travelled) kilometre for a single journey ranges from $0.64 to $1.40. However, many of the journeys which combine FTS and timetabled services are likely to exceed the 9.6km of 6 stages and integrating the payment of fares across these services would be beneficial and expected by users.

Table 4: Sample fares of Train/Coach and Local Bus

	Sample TrainLink Fares[1] (between major centres)			Sample Local Bus Fares[2] (within major centre)	
Km	**Adult**	**Child / Concession**	**Sections**	**Adult**	**Child / Concession**
39.4km	$4.84	$2.42	1	$2.30	$1.10
47.4km	$8.30	$4.15	2	$3.40	$1.70
53.3km	$6.45	$3.23	3	$4.20	$2.10
85.1km	$19.37	$9.69	4	$4.90	$2.40
111km	$22.15	$11.08	5	$5.60	$2.80
147km	$33.09	$16.55	6 or more	$6.20	$3.10
196km	$42.89	$21.45			
233km	$56.73	$28.37	Pensioner	$2.50	

[1] Fares sourced from www.nswtrainlink.info
[2] Fares sourced from Orange BusLines www.orangebuslines.com.au/orange/fares.php

These considerations about fares suggest that it would be inappropriate for this Deliverable to implement a Business Case analysis on a particular fare level which is a policy decision. In the section below, the Business case proceeds on the basis of identifying the costs of provision, thus identifying the gap to be met by subsidy and through the fare box.

Costs of meeting demand

The costs of meeting demand will depend on the vehicle used at each depot. Vehicle type choice requires a trade-off between the size and carrying capacity of the vehicle and the trip duration for passengers. In addition, the need to provide a regular cycle time so that passengers can return home provides some constraints on vehicle operation.

Bertocchi (2009) investigated the relationship between cycle time, patronage and vehicle size for FTS using simulations of different FTS designs. These simulations take account of the greater occupancy of bigger vehicles but also the way in which collecting additional passengers adds to the journey time for all involved in the round trip. Table 5 shows the potential carrying capacity of different vehicles with different cycles in which the 30 minute cycle is associated with the 10 minute catchment and the 60 minute cycle is associated with the 20 minute catchment area. Whilst these numbers are achieved through a simulation analysis they are consistent with the upper end of the FTS experience in Denver and Dallas in the US (Teal and Becker 2011).

Table 5: Passengers per hr by vehicle size, cycle time and length of maximum length of journey

	Car (4 seats)		**Maxi-taxi (8 seats)**		**Minibus (16 seats)**	
	Maximum number of passenger trips	Maximum length of journey	Maximum number of passenger trips	Maximum length of journey	Maximum number of passengers	Maximum length of journey
30 minute cycle	9.0	20 km	18.4	20 km	36.0	17.5 km
60 minute cycle	4.5	40 km	9.2	40 km	18.0	35 km

Source: Adapted from Bertocchi (2009), p 68.

Using data provided by TfNSW on km and hourly costs, the *average* cost per passenger, if these maximum passenger numbers can be achieved is $5.50 per passenger on the basis that a car equates to a category 1 vehicle, a maxi-taxi to a category 3 vehicle and a minibus to a category 4 vehicle. However, as Table 6 shows, there is a considerable range.

Table 6: Cost per passenger by vehicle size, cycle time and length of maximum length of journey

	Car (4 seats) Cost per passenger	Maxi-taxi (8 seats) Cost per passenger	Minibus (16 seats) Cost per passenger
30 minute cycle	$3.32	$2.16	$1.08
60 minute cycle	$13.30	$8.66	$4.33

Table 6 shows that there are significant additional costs to moving from a 30 minute cycle (with the 10 minute catchment area) to the 60 minute cycle (20 minute catchment area). However, the numbers of potential passengers is also increasing, to varying degrees by the extension of the catchment around the depot. It is therefore a policy decision together with budgetary considerations that will determine the essential network plan and which catchment area might apply for each depot.

Different groups within the community are likely to make a different number of trips per week for which transport is needed. For the purposes of this study, it is assumed households with one or no car will take 10 trips (one-way) per week, older people will take 6 trips, young people aged 15 or below will take 2 trips per week (outside their school trips) and those utilising FTS to access jobs will take 10 trips per week. This estimation of the number of trips can be varied and tested through sensitivity analysis if required.

To calculate the cost of meeting demand in each of the three areas which have been identified by TfNSW as possible pilot areas for the introduction of FTS, a number of steps are taken as shown by Figure 2.

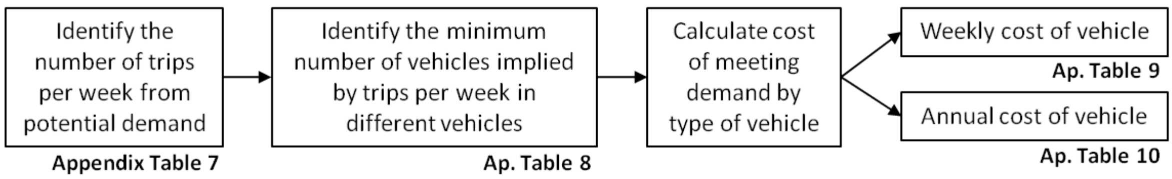

Figure 2: Methodology for determining costs of meeting potential demand

Table 7 of each appendix converts the potential demand into trips per week, using the above assumptions about the different number of trips needed by different groups. Table 8 in each appendix converts these to the minimum number of vehicle loads using Table 5 above, selecting a car and a minibus as giving the extremes of cost and loading opportunities. This allows an estimation of how many vehicles in total will be needed to meet supply on the basis of an even spread of patronage over an operating period of 8 hours for 7 and 6 day operations. The assumption of an 8 hour operating day can be varied using sensitivity analysis whereas the impact of uneven demand will require simulation analysis to see the impact of different demand profiles. Tables 9 and 10 of each appendix turn the vehicle requirements into weekly and annual costs respectively. Each appendix identifies these calculations for each depot and the Business Case Summary (below) brings together the information from the three case study areas.

Tables 9 and 10 of the appendices show the provision of FTS using cars rather than minibuses is always more costly. This is the case for any depot serving a major settlement where there is sufficient patronage for a single minibus. However, even in those cases, supply by a car-sized vehicle needs to be considered in the context of the network plan and the road layout as, for example, 3 cars may be able to cover a wider geographical area than a single minibus and thus provide a superior service. Moreover, as the population served by a depot increases, it may be more efficient to serve the depot's population by a mix of vehicles although this could add to holding costs if the FTS operation is provided by a single entity (carrying more vehicle spares as the vehicle types increase in the fleet etc).

Other supporting infrastructure

Additional supporting infrastructure will be required to put into place a FTS as part of the network plan. In particular, decisions need to be made as to the appropriate means of dispatching trips and whether, at least initially, this can be carried out with low technology (e.g. telephone call to driver). More understanding of a chosen area and the way in which FTS fits into this network plan needs to be in place before these issues can be addressed as it was clearly identified in Deliverable 2 that technology can provide enormous help in the delivery of FTS but needs to be provided at a level appropriate to the scale of operation.

The introduction of FTS also provides an opportunity to provide a mobility management approach to public transport journeys in the chosen area. This approach would effectively put a mobility office at the centre of the providers of all public transport services and operate as a clearing house for passengers seeking journeys and those providing the journeys. This would allow FTS as an access service to be linked to the provision of other FTS services in the area, particularly those for special education, health and community transport with the potential for savings overall. Moreover, any technology system used for dispatch would benefit from economies of scale.

It is also possible that the choice of site will be influenced by the existence, currently, of vehicles suitable for implementation of FTS. At the small vehicle end this might be by taxi: as Deliverable 2 identified, Coffs Harbour provides the largest population of accessible taxis of the three areas, identified by TfNSW as potential pilot sites for FTS.

Business Case Summary

This section brings together the information provided in the appendices to give an overview of the different case study areas and recommendations for identifying the best areas for a pilot of FTS in regional and rural NSW.

Ranking settlements

Table 7 shows the ranking of the major settlements using the weighting regimes described above in Table 3, across all study areas for the 10 minute catchment, whilst Table 8 shows the ranking for the 20 minute catchment. Information about how each of the major settlements rank within a given case study area can be found in Table C 1 in each appendix. This is useful information for prioritising major settlements within the case study.

However, given three case study areas have been identified, showing the combined rankings for all major settlements in the three case study areas by the two catchment areas allows a view as to how the major settlements over the three case study areas might compare.

It should be noted that the comparison of the rankings are subject to the commentary discussed in the section Scoring System, page 3 above.

Table 7: Weighted sums and rankings of the different scoring regimes across all major settlements within the study areas for the 10 minute catchment areas

		Regime 1		Regime 2		Regime 3		Regime 4	
Depot	Study area	Weighted sum	Rank	Weighted sum	Rank	Weighted sum	Rank	Weighted sum	Rank
Bathurst	Orange	10.77	15	9.32	15	9.99	13	8.54	14
Blayney	Orange	11.42	11	10.25	12	9.50	17	8.33	17
Coffs Harbour	Coffs Harbour	11.21	12	9.88	13	10.64	8	9.31	8
Cootamundra	Wagga Wagga	11.89	9	10.56	8	10.61	9	9.28	9
Forbes	Orange	13.52	2	10.95	5	12.67	2	10.10	3
Grafton	Coffs Harbour	13.18	3	11.23	3	11.89	5	9.95	4
Junee	Wagga Wagga	12.27	7	10.87	6	10.13	12	8.73	12
Kempsey	Coffs Harbour	15.69	1	12.77	1	13.77	1	10.86	1
Lithgow	Orange	12.12	8	10.74	7	10.53	10	9.15	11
Nambucca	Coffs Harbour	13.12	4	11.35	2	12.62	3	10.85	2
Orange	Orange	10.74	16	9.21	16	9.96	14	8.42	15
Parkes	Orange	12.41	6	10.38	10	11.90	4	9.86	6
SW Rocks	Coffs Harbour	11.06	14	9.65	14	11.29	6	9.88	5
Temora	Wagga Wagga	11.19	13	10.38	11	10.38	11	9.56	7
Tumut	Wagga Wagga	11.72	10	10.52	9	9.88	15	8.68	13
Wagga Wagga	Wagga Wagga	10.36	17	8.94	17	9.76	16	8.34	16
Woolgoolga	Coffs Harbour	12.65	5	11.12	4	10.74	7	9.21	10

As can be seen from this, Kempsey in the Coffs Harbour study area achieves the highest ranking, irrespective of regime over all the major settlements for the 10 minute catchment area. This suggests that on the basis of meeting need (see discussion under Scoring System page 3 and Weighting Regimes, page 4), Kempsey will provide the highest potential demand that reduces social exclusion and transport disadvantage.

Table 7 can be used to identify settlements within the study areas which could be prioritised for the introduction of FTS. Table 7 also suggests that, if the yardstick for introduction is to enhance social inclusion and minimise transport disadvantage, then better outcomes can be achieved by selecting settlements for FTS rather than a single case study area. This has, of course, to be qualified by the nature of the case study area, the opportunity to make savings through a movement from coverage with timetabled services to concentration of resources on timetabled services alongside FTS for access.

Clearly, access can be extended by promoting a larger catchment area from the depots, although this has significant cost implications as demonstrated in the appendices and is further discussed below. Table 8 shows the rankings for each of the major settlements for the 20 minute catchment and shows that Nambucca Heads and SW Rocks as scoring highly on all the weighting regimes.

Table 8: Weighted sums and rankings of the different scoring regimes across all major settlements within the study areas for the 20 minute catchment areas

		Regime 1		Regime 2		Regime 3		Regime 4	
Depot	**Study area**	**Weighted sum**	**Rank**	**Weighted sum**	**Rank**	**Weighted sum**	**Rank**	**Weighted sum**	**Rank**
Bathurst	Orange	9.67	15	8.67	16	6.67	17	5.67	17
Blayney	Orange	10.43	13	9.43	12	7.57	14	6.57	14
Coffs Harbour	Coffs Harbour	11.76	7	10.56	7	10.19	7	8.98	5
Cootamundra	Wagga Wagga	12.33	6	10.67	6	9.67	10	8.00	11
Forbes	Orange	11.43	10	9.71	11	9.71	9	8.00	10
Grafton	Coffs Harbour	12.94	4	11.50	3	10.31	6	8.88	7
Junee	Wagga Wagga	11.60	8	10.08	9	10.45	5	8.93	6
Kempsey	Coffs Harbour	12.96	3	11.26	4	10.83	3	9.13	4
Lithgow	Orange	11.46	9	10.25	8	9.21	12	8.00	9
Nambucca	Coffs Harbour	13.64	2	11.93	1	12.46	1	10.75	1
Orange	Orange	9.47	17	8.47	17	6.67	16	5.67	16
Parkes	Orange	11.33	11	9.33	13	9.33	11	7.33	12
SW Rocks	Coffs Harbour	14.00	1	11.80	2	12.20	2	10.00	2
Temora	Wagga Wagga	9.67	16	9.00	14	7.67	13	7.00	13
Tumut	Wagga Wagga	12.67	5	11.00	5	10.00	8	8.33	8
Wagga Wagga	Wagga Wagga	9.77	14	8.69	15	7.08	15	6.00	15
Woolgoolga	Coffs Harbour	11.20	12	9.89	10	10.72	4	9.41	3

Identifying Demand

In terms of trips, Table 9 shows how the Coffs Harbour study area is likely to generate more trips than the other study areas as a result of its demographics and populations in the key groups considered (low car ownership, older and younger people and the employed). Table 9 also shows the way in which moving from a 10 to a 20 minute catchment area does not double the potential trips although the percentage increase is greater for the Coffs Harbour study area than others. The appendices show clearly what is driving the increase in trips which varies by major settlement with, for example, the change in Coffs Harbour town being driven by low car ownership and employed persons whereas in Blayney (Orange case study area) it is being driven by the number of older and young people. This leads to further considerations in the choice of pilot area as to which particular segment of the population it is hoped to increase accessibility through the implementation of FTS.

Table 9: Potential demand for the 10 minute and 20 minute catchment areas by study area

	Study Area	Number of potential trips identified as demand	% increase over 10 minute catchment
10 minute catchment	Coffs Harbour	72,229	
	Orange	52,072	
	Wagga Wagga	55,113	
20 minute catchment	Coffs Harbour	123,639	71.2
	Orange	65,045	24.9
	Wagga Wagga	60,805	10.3

Costs of meeting demand

The cost of meeting the demand is based on a number of assumptions that will need further testing before implementation. The costs of vehicle provision are based on an eight hour day of operation. Longer daily operation will reduce the per passenger cost (Table 6) as the fixed elements will be spread over a longer period with the reverse being the case for shorter daily operation. In order to serve employed person access to timetabled services, it is likely that longer operation will be required. A further assumption of an even demand profile over the hours of operation will also need exploration through simulation.

Table 10: Costs of meeting demand for the 10 minute and 20 minute catchment areas by study area

	Study Area	Car based supply, 7 days a week	Minibus based supply, 7 days a week
10 minute catchment	Coffs Harbour	$13,070,655	$4,536,191
	Orange	$9,410,872	$3,402,143
	Wagga Wagga	$10,107,973	$3,628,953
20 minute catchment	Coffs Harbour	$85,917,774	$28,578,004
	Orange	$45,485,880	$15,196,240
	Wagga Wagga	$21,435,875	$7,257,906

Table 10 suggests that the implementation of FTS on a case study wide basis might only be affordable with minibus operation and a 10 minute catchment. Table 10 also shows clearly that moving from a 10 minute to 20 minute catchment does not simply double costs and suggests a separate evaluation of the benefits of the extra journeys needs to be taken as this clearly significantly extends accessibility, but at a significant cost.

Potential savings

As identified in the introduction, introducing FTS is predicated on ensuring the services linking the major settlements are strengthened to at least two hourly regular services, including services operating at times when employed people can use public transport to access jobs. The costs of this are unknown. School services which are timetabled can contribute to providing capacity during the morning peak demand for employed people. Strengthening the timetabled services then allows FTS to act as access services and also permits some of the very irregular services currently providing coverage to be withdrawn. Table 11 brings together this information, showing the annual savings possible by case study area for the 'standard' and 'alternative' plans shown by Figures 8 and 9 in each appendix. This shows that the introduction of FTS will be a net cost to the budget and FTS is unlikely to be introduced in a cost neutral fashion on a case study area basis.

Table 11: Summary of annual savings for each case study area

Case Study Area	Potential savings from removing fixed route services ‘Standard’	Potential savings from removing fixed route services ‘Alternative’	+	Potential additional costs from improving timetabled services between major settlements
Coffs Harbour	$1,635,762	$6,444,226		
Orange	$848,120	$920,712		
Wagga Wagga	$1,019,732	$1,019,732		

Conclusions and recommendations

This Deliverable assumes that the FTS under consideration are ‘open to all’ or ‘open access’ including more ‘cross-cutting’ where there is a mix of travellers, both special needs (including passengers with lower mobility) and ‘regular’ public transport travellers.

The analysis presented assumes that FTS services would be integrated into the public transport offer where a network plan provides fixed, timetabled services between major settlements as the backbone of the network in regional and rural NSW, complemented by FTS to provide access to these corridors.

The Deliverable concentrates on the analysis of the three possible pilot areas identified by TfNSW, centred on Coffs Harbour, Orange and Wagga Wagga. Detailed step by step methodology to establish an area’s potential for FTS introduction which could also be applied to other areas. The methodology includes steps to:

1. Create a scoring system that can be used to provide a weighted sum which in turn can be used to identify areas which are most likely to have accessibility needs which can be met by FTS.
2. Identify potential demand through the identification of ‘depots’ at major settlements and the identification of catchment areas based on travel time to these ‘depots’
3. Identify potential supply savings from the reduction of fixed timetabled routes upon the introduction of FTS
4. Identify potential demand
5. Identify the cost of meeting this potential demand.

This methodology is implemented at a detailed spatial level in the appendices and synthesised to give a high level business case analysis. This synthesis highlights a number of recommendations which need further consideration at a policy and operational level as follows:

1. If the yardstick for introduction is to enhance social inclusion and minimise transport disadvantage, then better outcomes are likely to be achieved by selecting settlements for FTS rather than a single case study area.
2. Choice of settlement on which to base a FTS ‘depot’ will be critically dependent on the particular segment of the population it is hoped to increase accessibility through the implementation of FTS. (Table 9)
3. The catchment area (whether 10 minute or 20 minute) significantly affects the number of potential trips demanded but not uniformly either within or between case study areas. Moving from a 10 minute to 20 minute catchment does not simply double cost (Table 10). A separate evaluation of the benefits of the extra journeys

using literature based benefits would identify whether the costs exceed the benefits of so extending accessibility.

4. The introduction of FTS is predicated on ensuring the services linking the major settlements are strengthened to at least two hourly regular services, including services operating at times when employed people can use public transport to access jobs. The costs of this are unknown although school services which are timetabled and operate at peak times will provide some capacity for these job related trips.
5. The introduction of FTS as access services to services linking major settlements allow existing services, providing low (or very low) frequency coverage to be removed when FTS is introduced. The $ saving of this is not unsubstantial but overall, introducing FTS is unlikely to be cost neutral.

Acknowledgements

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Structure of the Appendices

Each Appendix has a standard structure shown below.

	Figure	Table	
Weighting Regimes	1		Population density in the study area
	2		Remoteness index in the study area
	3		SEIFA IRSD index in the study area
	4		Car ownership (% dwellings with zero or 1 car) in the study area
	5		Percentage ATSI population in the study area
	6		Percentage unemployment in the study area
		1	Rankings of the major settlements in study area against each weighting regime
Potential Supply and Savings from Fixed timetabled routes		2	Services in study area that could be replaced by the introduction of FTS
	7a-x		Potential timetabled services to be replaced when FTS introduced in a-x
		3	Potential savings in distance and time per week from removing scheduled services identified in Table 2 upon the introduction of FTS
		4	Potential savings in $ per week from removing services identified in Table 2 upon the introduction of FTS
	8		Regional routes retained to provide connections between major settlements in the study area
	9		Alternative scenario for retained regional routes to provide connections between major settlements in the study area
Potential Demand and Revenue		5	Numbers of vulnerable people, by category, in the depot catchment areas
		6	Total population of vulnerable people and potential demand for each depot catchment area
	10		Distribution of dwellings with none or 1 car in the study area
	11		Distribution of the older and young population in the study area
	12		Distribution of the employed population in the study area
Costs of Meeting Demand		7	The number of trips per week by different groups in the community
		8	The number of car and minibus trips per week and the number of vehicles required.
		9	Weekly cost of meeting demand by car and minibus (in $)
		10	Annual cost of meeting demand by car and minibus (in $)

Appendix 1: Coffs Harbour study area

Coffs Harbour study area is one of three areas identified by TfNSW as a potential pilot area for the introduction of FTS into regional and rural NSW.

This appendix contains the detailed information identified in the Methodology section of Deliverable 3 (here forward referred to as the Methodology section) together with commentary relating specifically to the Coffs Harbour study area. The appendices relating to the other two study areas are similarly ordered, according to the methodology and to facilitate reading, tables and figures in this appendix are prefixed by 'C' to denote the Coffs Harbour study area.

Major Settlements

In the Coffs Harbour study area, Kempsey, Grafton, Nambucca, Woolgoolga, Coffs Harbour and SW Rocks are identified as the major settlements.

Weighting Regimes

As identified in the methodology, the identification of the major centres likely to give most benefit from the introduction of FTS *within* this study area is undertaken using weighting regimes including the variables of population density, SIFA, car ownership, the ATSI population and unemployment as described by the methodology of the main report. The definitions for each variable are defined in the Methodology, Table 1, with the scores associated with the values of these variables in Table 2 forming the key to these maps.

Figure C 1 to Figure C 6 show the distribution of values for each variable used in the ranking. The definitions for each variable is defined in the Methodology, Table 1, with the scores associated with the values of these variables in Table 2 forming the key to these maps.

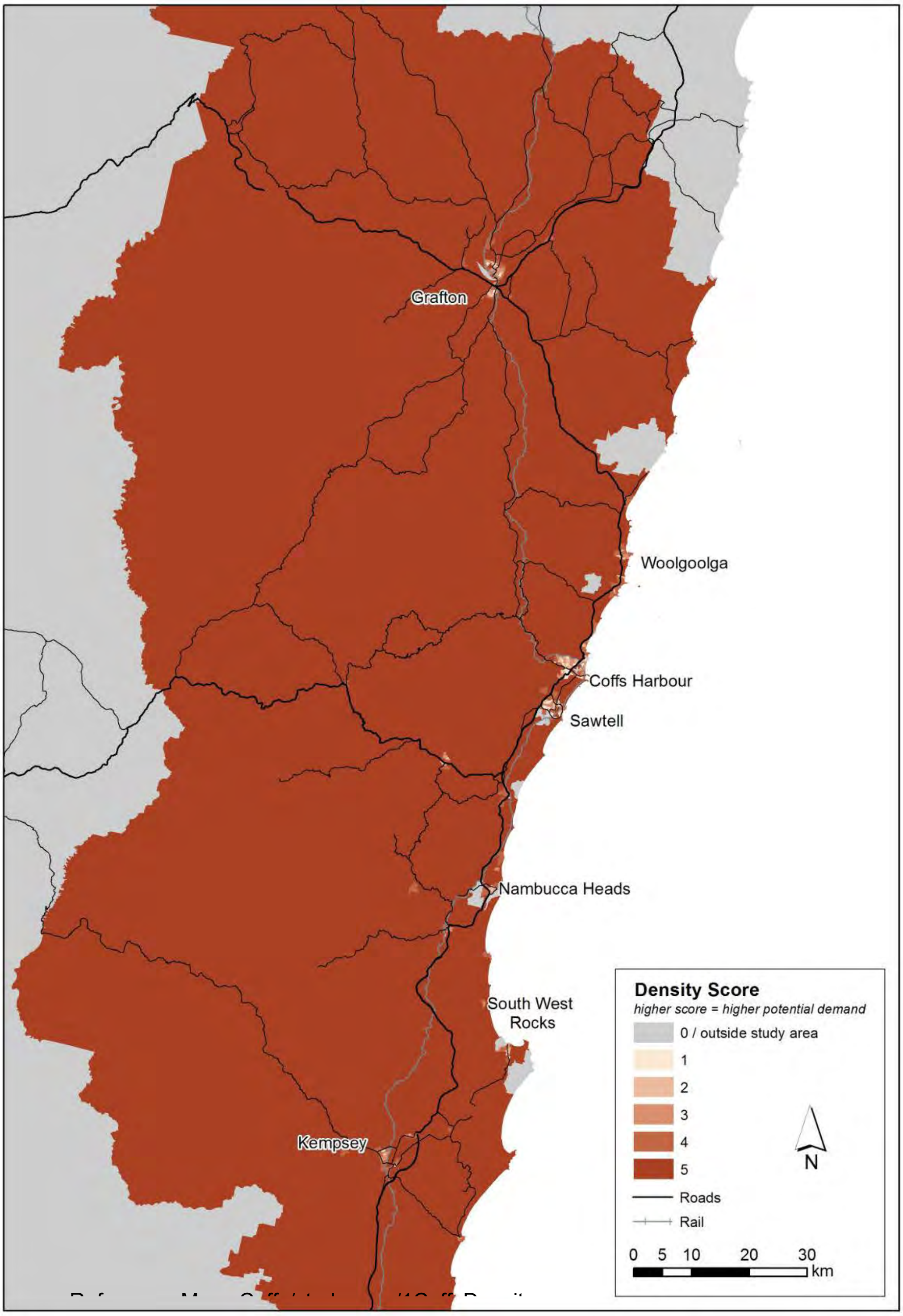

Figure C 1: Population density in the Coffs Harbour study area

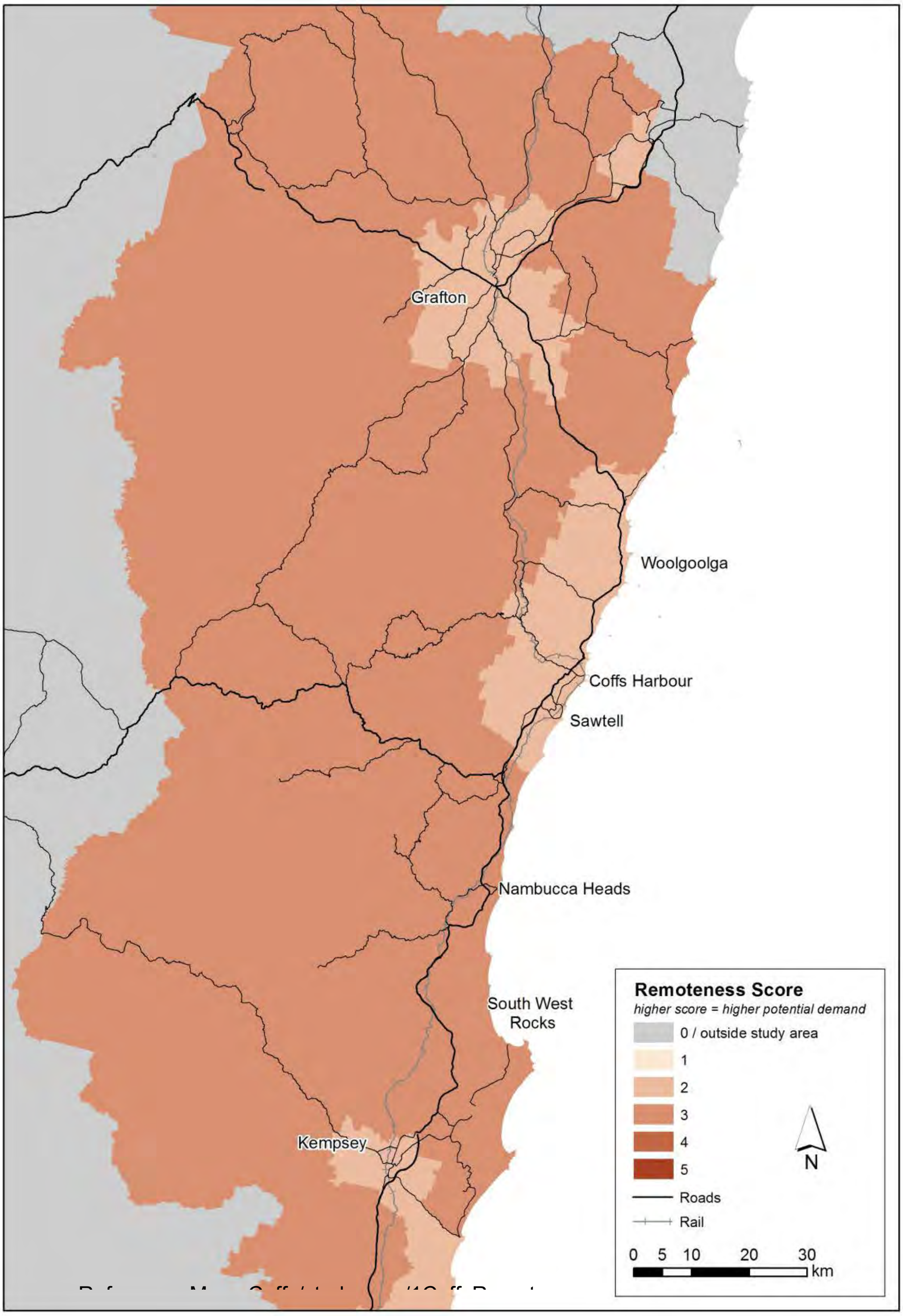

Figure C 2: Remoteness index in the Coffs Harbour study area

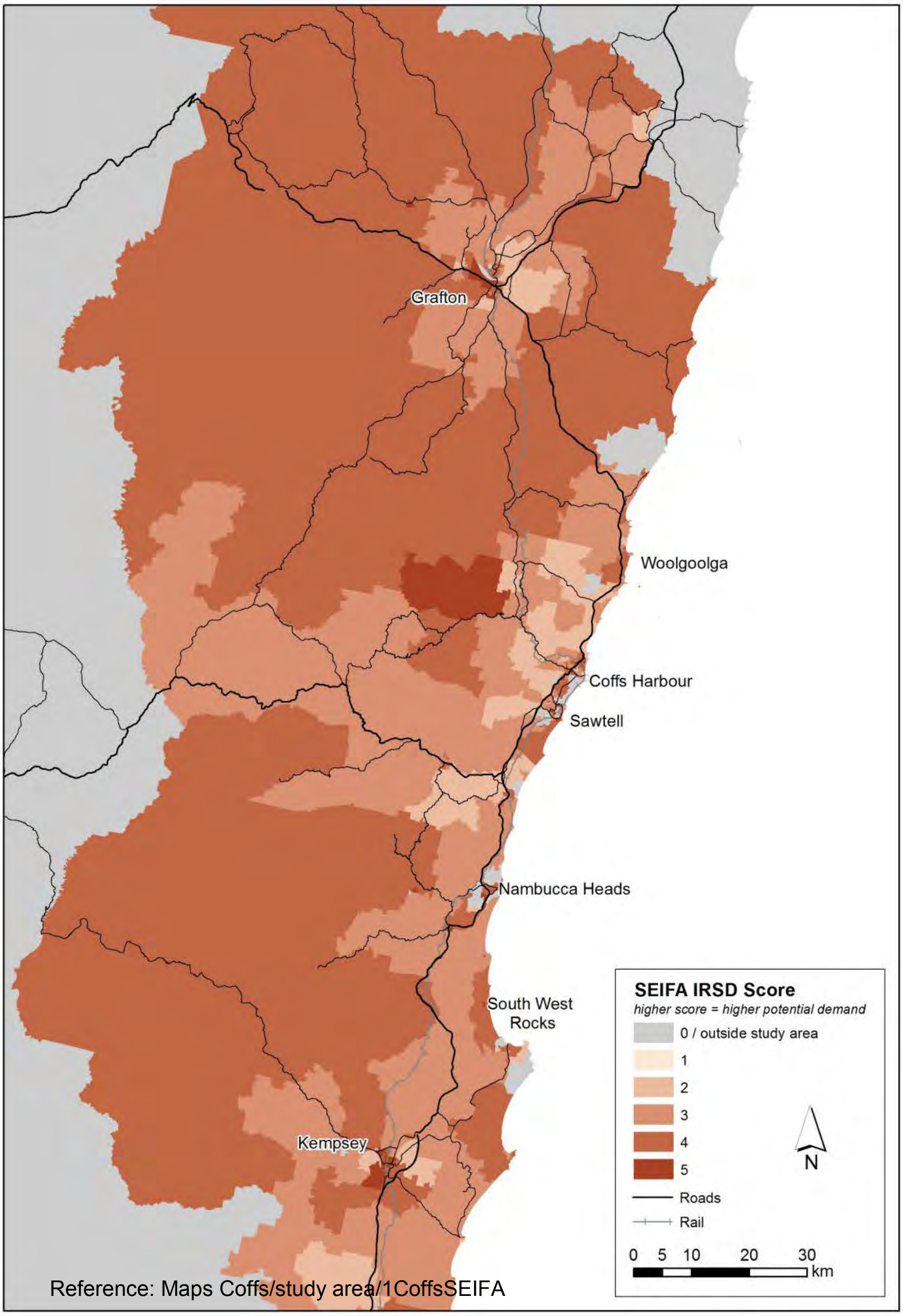

Figure C 3: SEIFA IRSD index in the Coffs Harbour study area

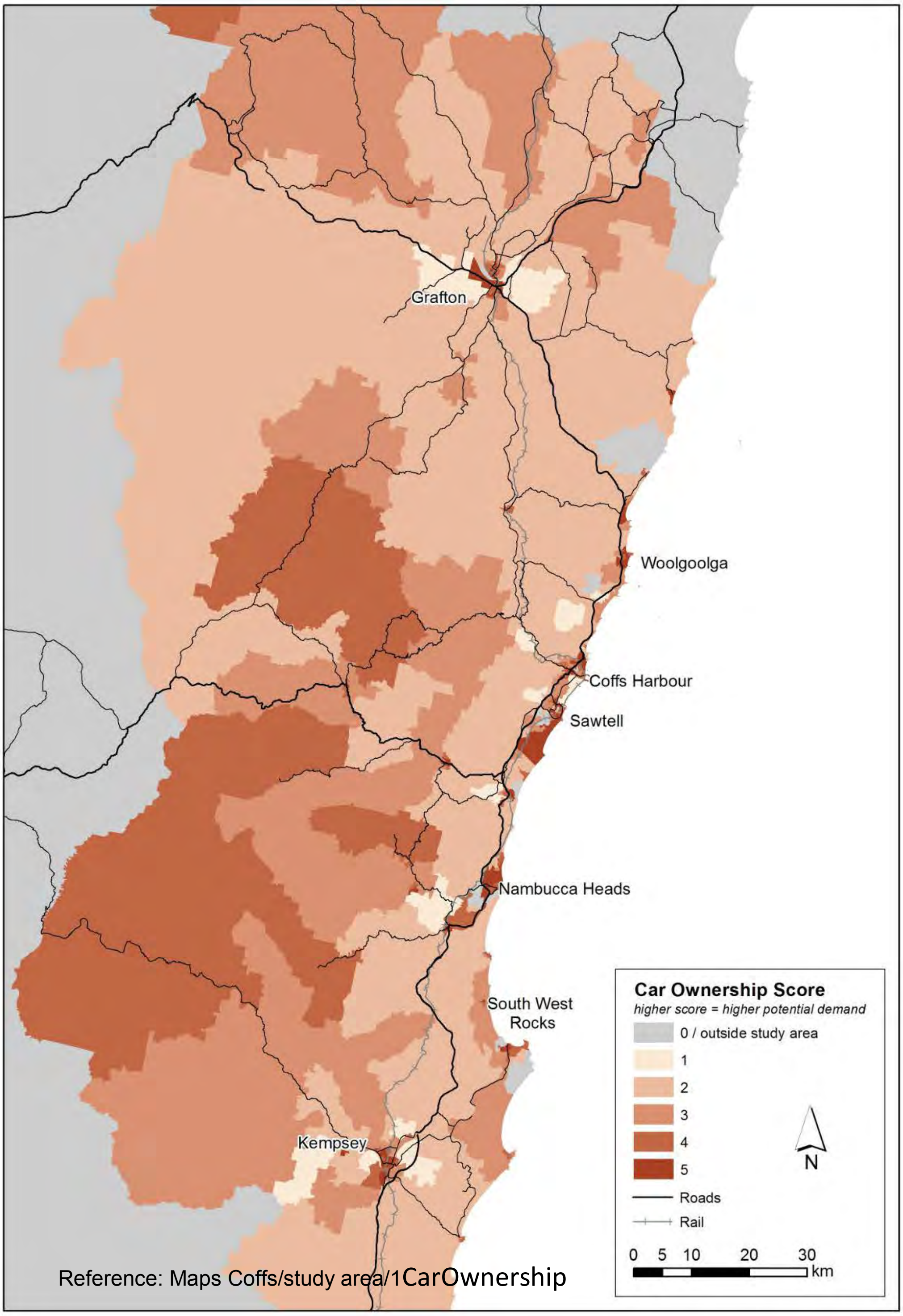

Figure C 4: Car Ownership (% dwellings with zero or 1 car) in the Coffs Harbour study area

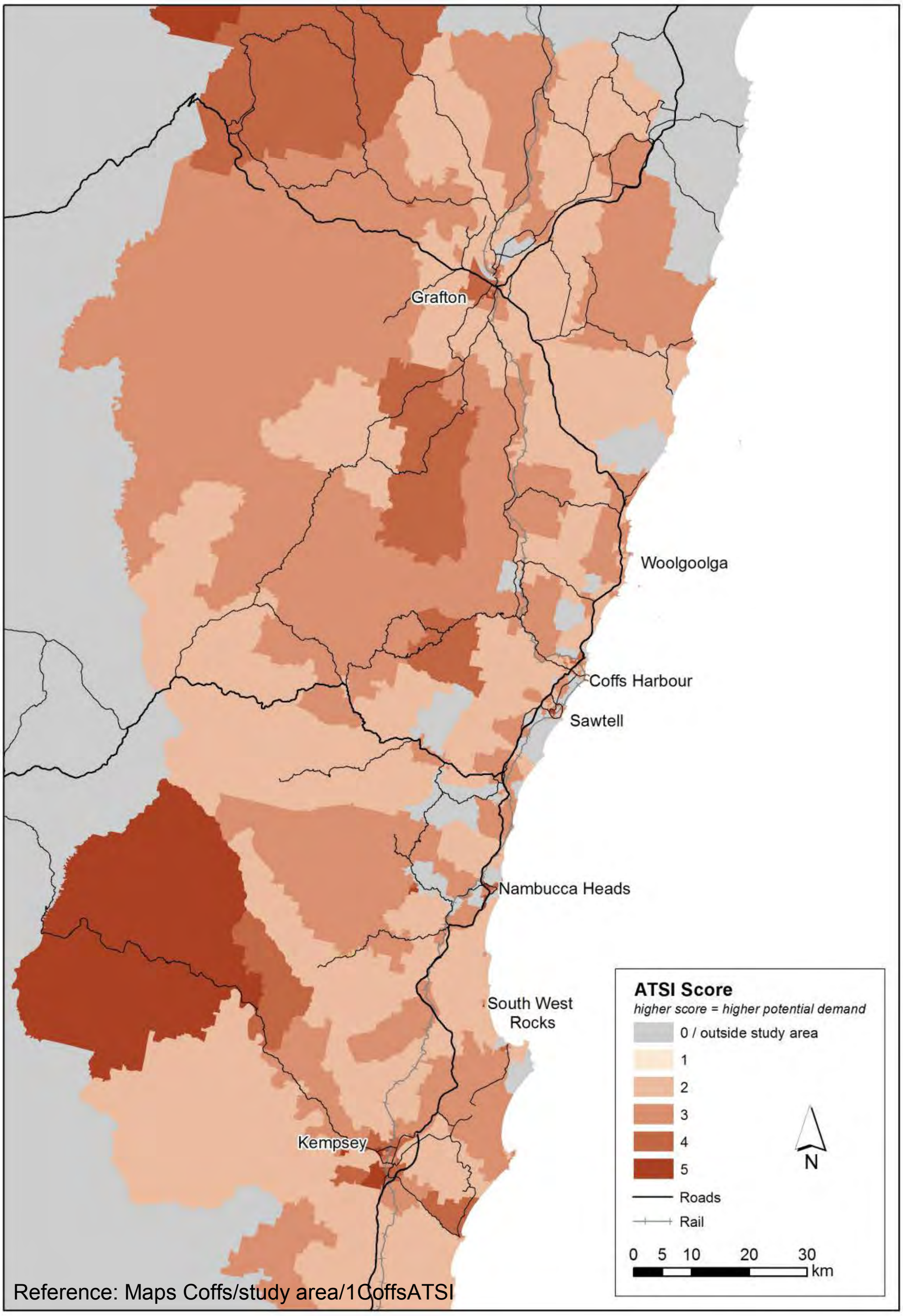

Figure C 5: Percentage of ATSI population in the Coffs Harbour study area

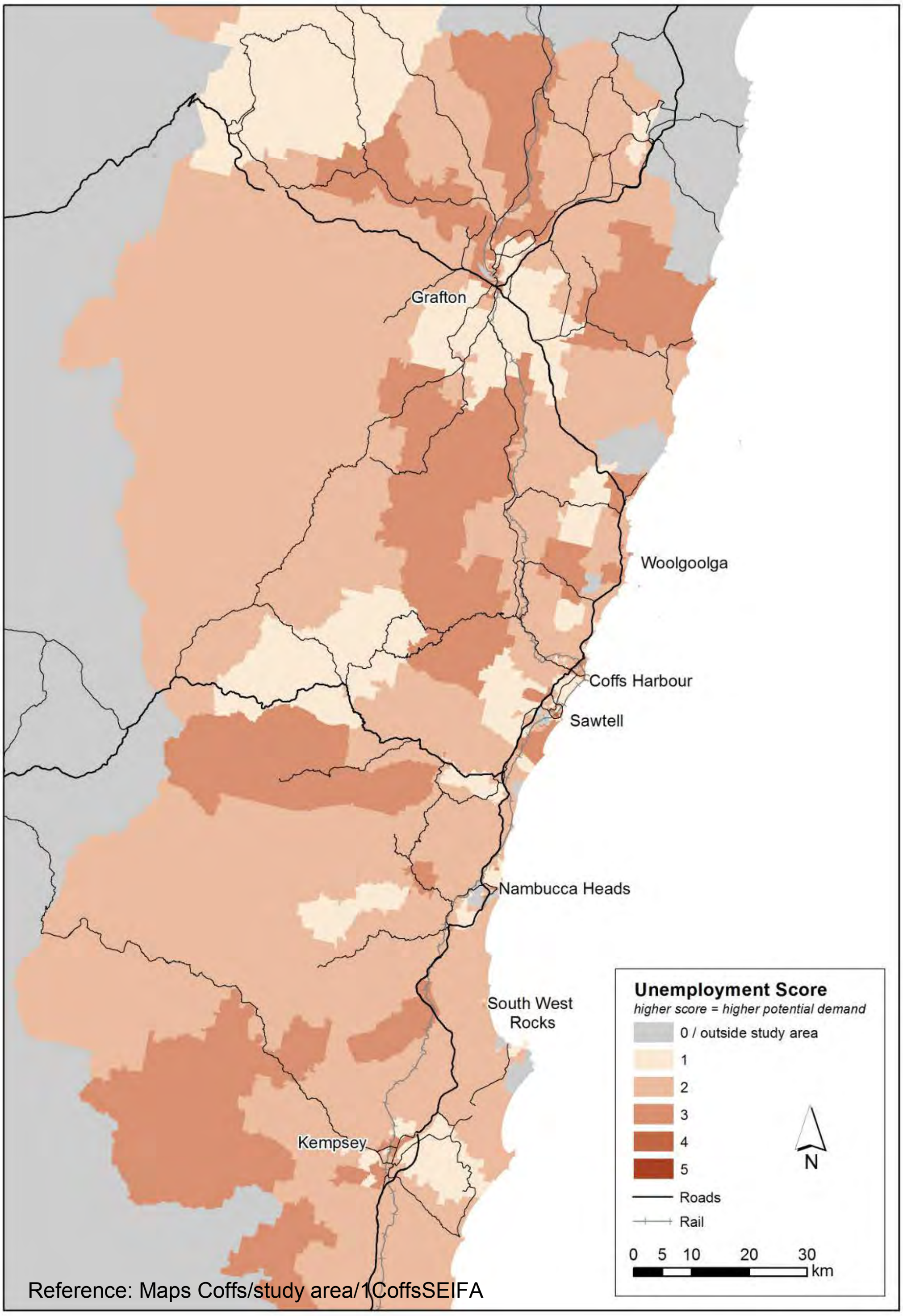

Figure C 6: Percentage of unemployment in the Coffs Harbour study area

The application of the weighting regimes to achieve a ranking of the major settlements in the Coffs Harbour study area is summarised in the Methodology, Table 3. These are presented in Table C 1 to rank the major settlements for the 10 minute catchment area (in green) and 20 minute catchment area (in blue).

Table C 1: Rankings of major settlements in Coffs Harbour against each weighting regime

	Depot	Rank in Regime 1	Rank in Regime 2	Rank in Regime 3	Rank in Regime 4	Potential Demand
10min	Coffs Harbour	5	5	6	5	
	Grafton	2	3	3	3	
	Kempsey	1	1	1	1	Highest
	Nambucca	3	2	2	2	
	SW Rocks	6	6	4	3	
	Woolgoolga	4	4	5	6	
20min	Coffs Harbour	5	5	6	5	
	Grafton	4	3	5	6	
	Kempsey	3	4	3	4	
	Nambucca	2	1	1	1	Highest
	SW Rocks	1	2	2	2	
	Woolgoolga	6	6	4	3	

Table C 1 shows for the 10 minute catchment, Kempsey is likely to provide the highest potential demand, whichever weighting regime is used, although Nambucca is a close second. For the 20 minute catchment Nambucca is most consistently achieving the highest rank although in each weighting regime there is a distinct gap between the scores for Nambucca and SW Rocks and the other four areas.

This suggests that if Coffs Harbour is chosen as the study area in which to undertake the pilot introduction of FTS, and only one major settlement was to be chosen for FTS, Kempsey should be chosen for the 10 minute catchment and for a 20 minute catchment, either Nambucca or SW Rocks. However, this is on the basis of deriving the highest potential demand and achieving greatest access to reduce social exclusion and transport disadvantage.

Potential Supply and Savings from Fixed timetabled routes

As identified in the Methodology, FTS becomes a substitute for some services within the study area if treated as an access service to timetabled services. Table C 2 shows the potential services that could be withdrawn, although this table needs to be considered along with the commentary expressed in the Methodology about the circumstances under which particular routes should be retained. Table C 2 is followed by maps showing these services Figure C 7a to Figure C 7d.

It should be noted that in this study area, Sawtell forms part of the 10 minute catchment area for the Coffs Harbour 'depot' and, for this reason, is not identified as a separate 'depot' in the preceding or following sections.

Table C 2: Services that could be replaced by the introduction of FTS

Depot/Town	Town Services
Grafton	373, 374, 375A/C, 376, 377, 379
Coffs Harbour (town)	365, 366, 367, 368
Coffs Harbour (Sawtell)	362, 362w, 363, 364
Kempsey	354, 353, East1, South1, West1, West2, West3

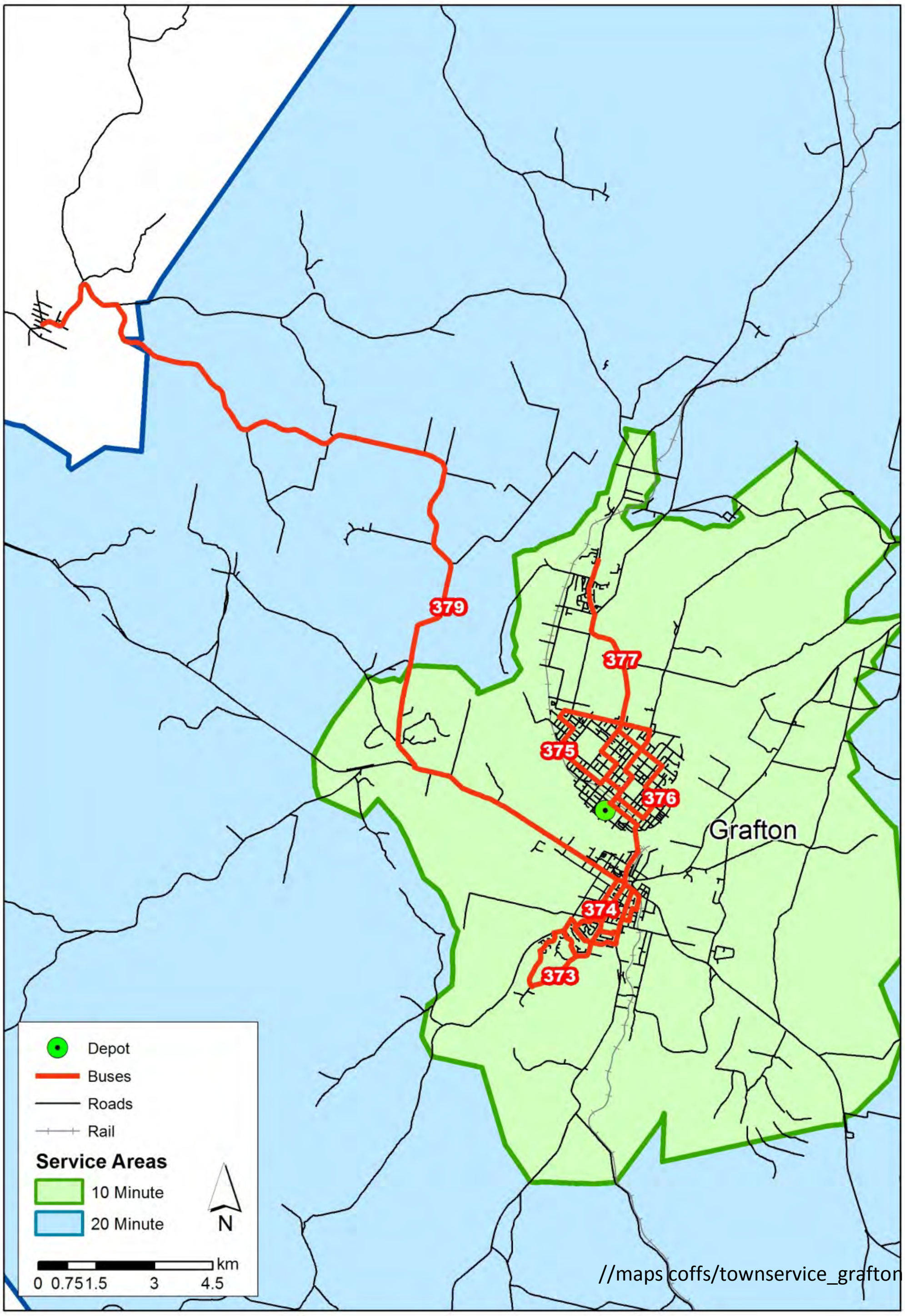

Figure C 7a: Potential timetabled services to be replaced when FTS introduced in Grafton

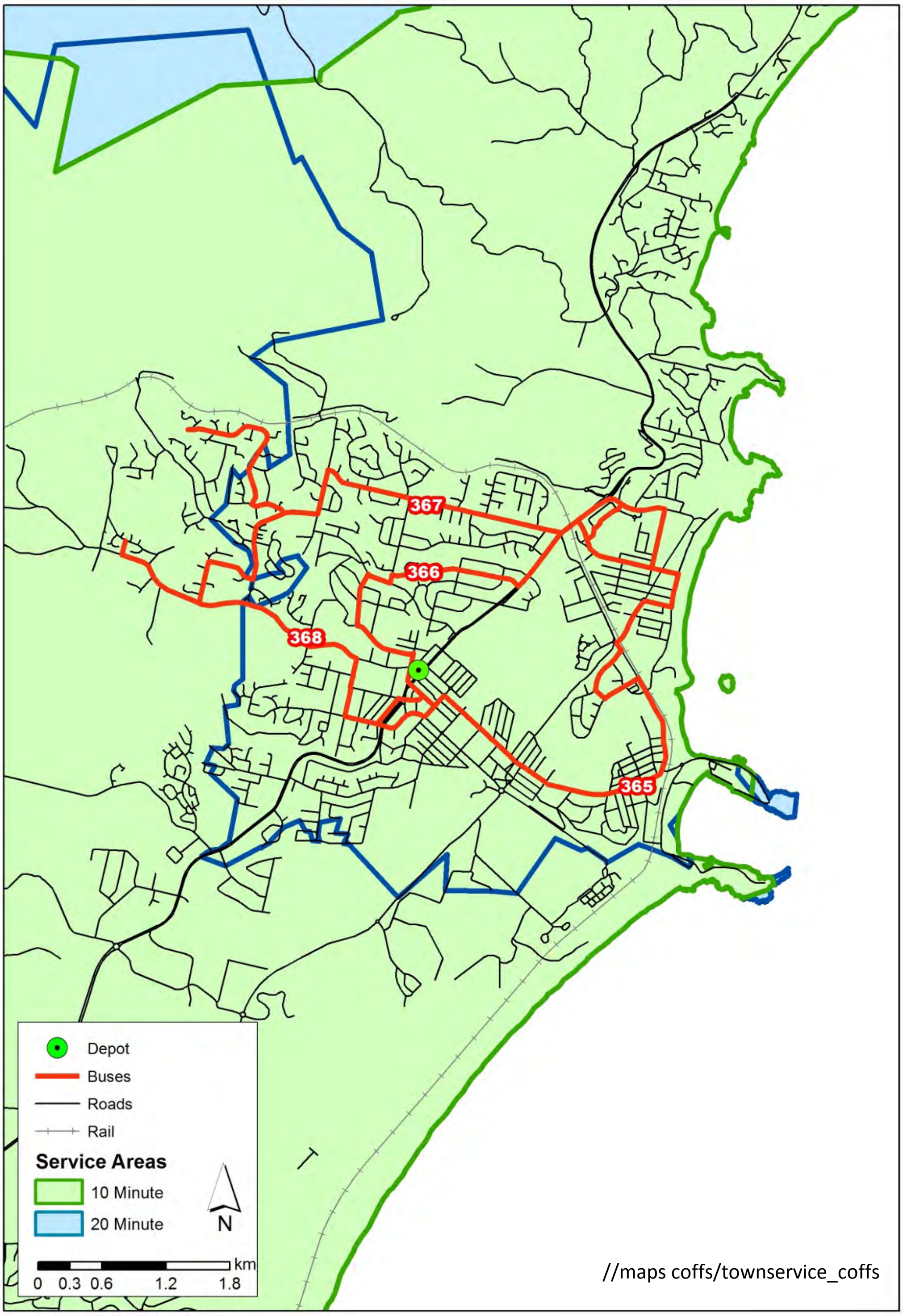

Figure C 7b: Potential timetabled services to be replaced when FTS introduced in Coffs Harbour (town)

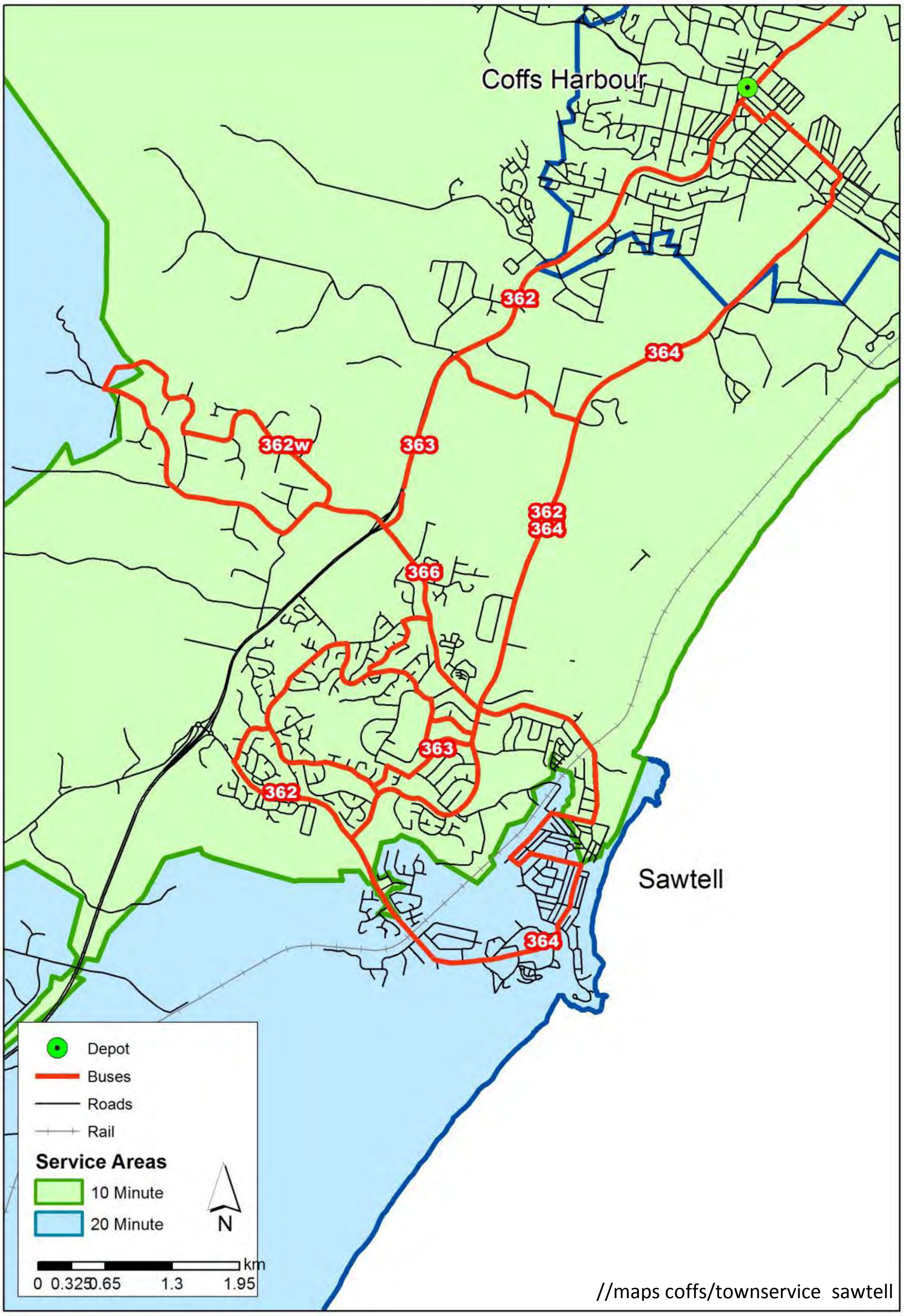

Figure C 7c: Potential timetabled services to be replaced when FTS introduced in Coffs Harbour (Sawtell)

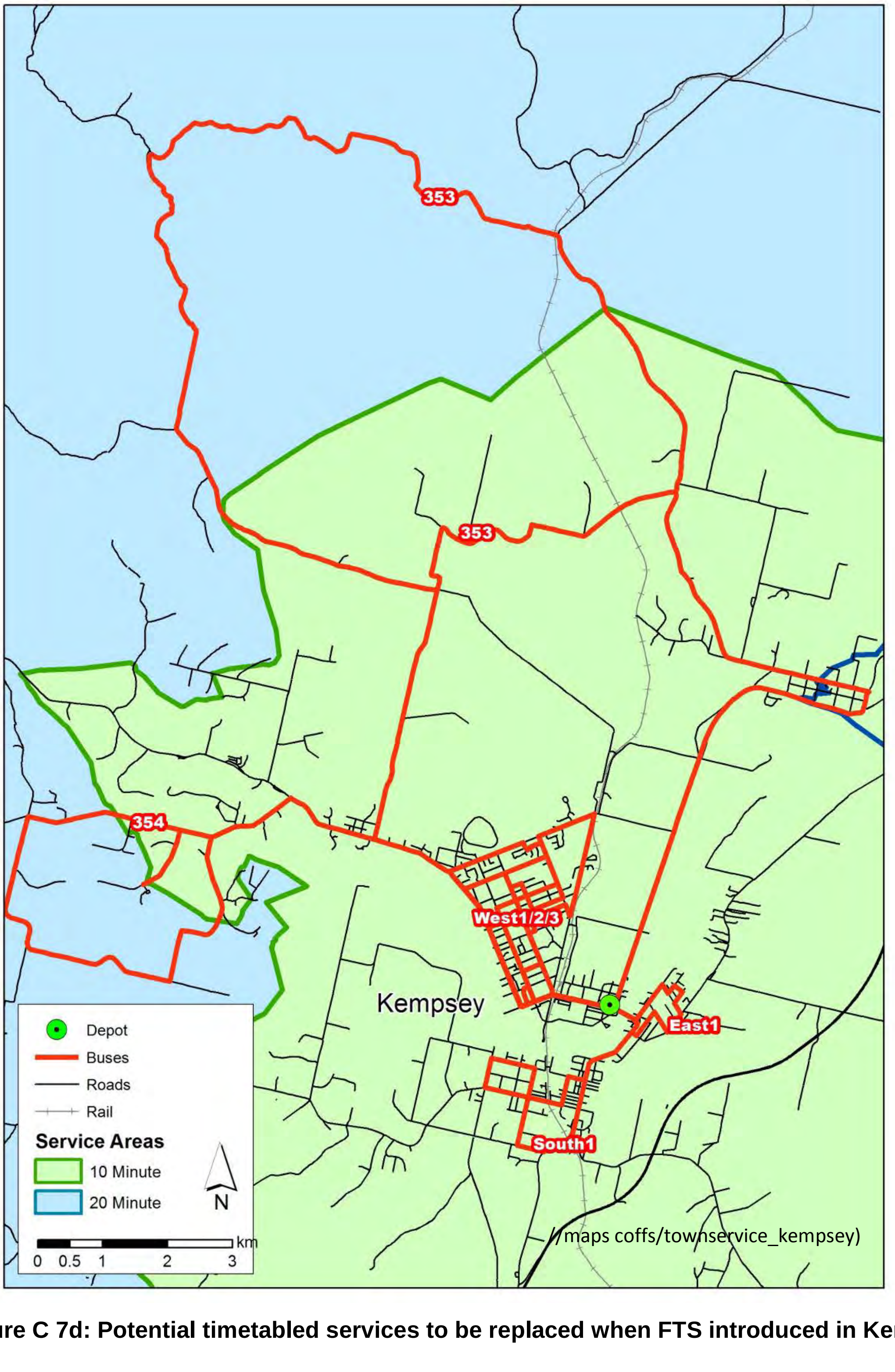

Figure C 7d: Potential timetabled services to be replaced when FTS introduced in Kempsey

Table C 3 shows the timetable kilometres and timetabled minutes that are saved if the services shown in Table C 2 (and mapped above) are removed upon the introduction of FTS to the relevant depot. Table C 4 converts the kilometres saved into a weekly dollar savings for the services as shown in Figure C8 with a summary for the services shown in Figure c9 below.

Table C 3: Potential savings in distance and time per week from removing scheduled services identified in Table 2 upon the introduction of FTS

Depot/Town	Weekday km saved	Weekday minutes saved	Saturday km saved	Saturday minutes saved	Sunday km saved	Sunday minutes saved
Grafton	643	2,099	276	784	90	368
Coffs Harbour (town)	880	2,104	660	1,374	234	506
Coffs Harbour (Sawtell)	1,092	2,028	0	0	0	0
Kempsey	364	782	0	0	0	0
Total	**3,509**	**7,608**	**1,077**	**2,342**	**324**	**874**

Table C 4: Potential savings in $ per week from removing services identified in Table C 2 upon the introduction of FTS

Depot/Town	Weekday $	Saturday $	Sunday $	Total $ per week
Grafton	$1,252.05	$537.43	$175.25	$6,972.91
Coffs Harbour (town)	$1,713.53	$1,285.15	$455.64	$10,308.46
Coffs Harbour (Sawtell)	$2,126.34	$0	$0	$10,631.70
Kempsey	$708.78	$0	$0	$3,543.90
Totals	**$5,800.70**	**$1,822.58**	**$630.89**	**$31,456.97**

For the whole of this study area, assuming a 52 week operation, this represents a saving of $1,635,762

The services that would be retained to provide the links between the major settlements are shown in Figure C 8. Figure C 9 shows an alternative scenario in which additional routes around Nambucca Heads are removed (348, 350, 345, 357, 356, 384 and some portion of 358) which would provide additional savings of $4,808,464 per year which represents a considerable additional saving if FTS is planned to provide at least equivalent if not better accessibility).

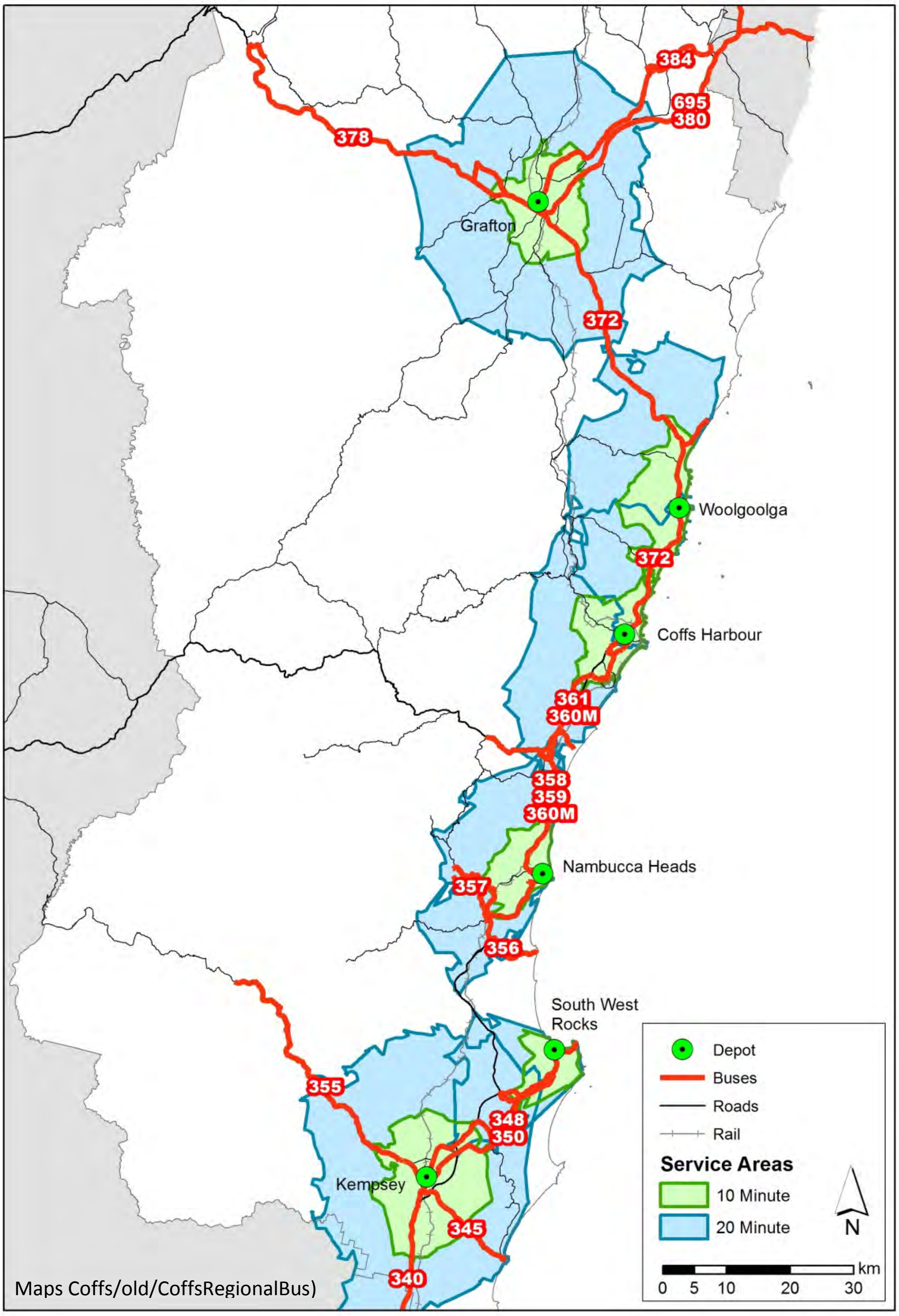

Figure C 8: Regional routes retained to provide connections between major settlements in the Coffs Harbour study area

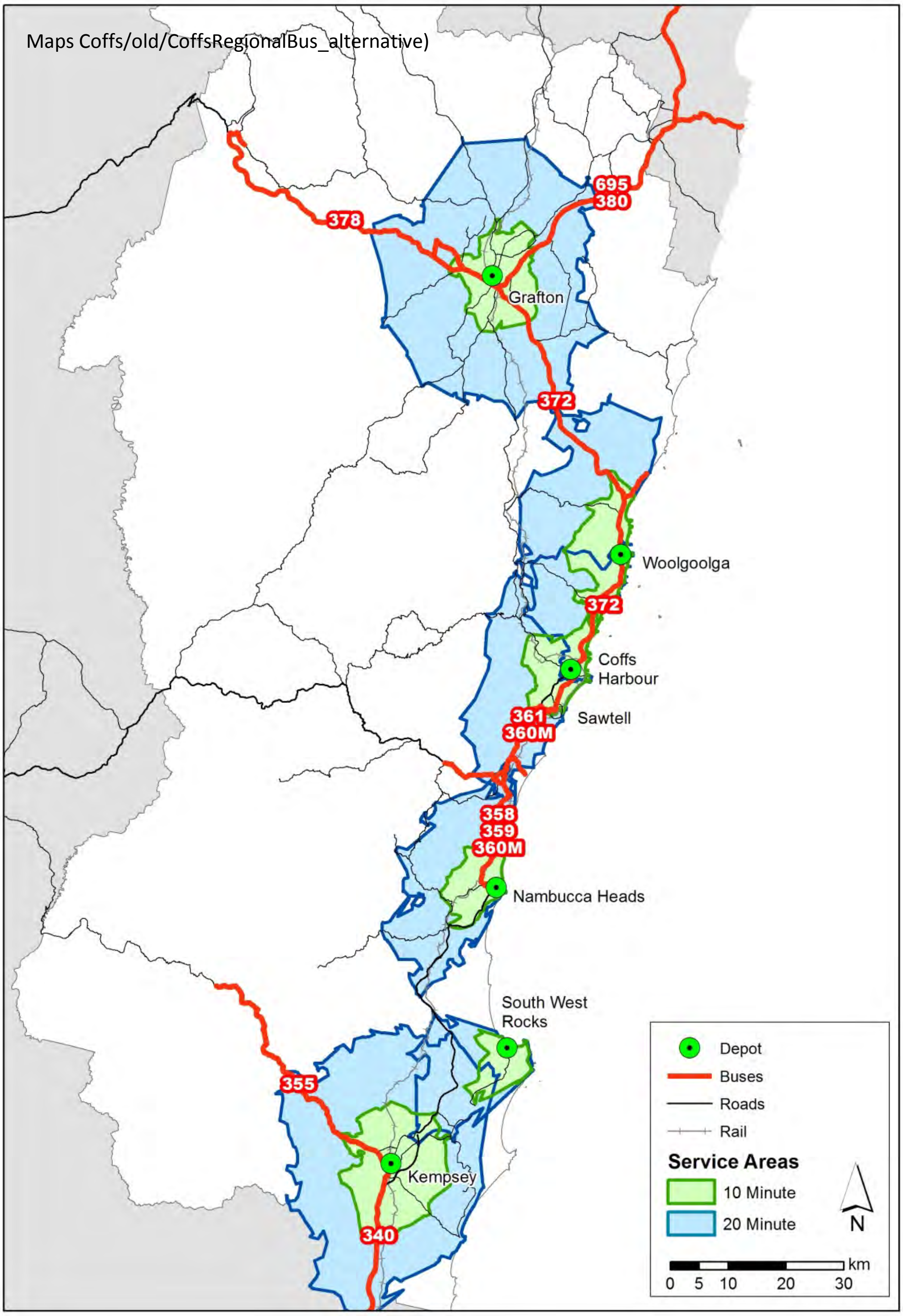

Figure C 9: Alternative scenario for retained regional routes to provide connections between major settlements in the Coffs Harbour study area

Potential Demand and Revenue

Demand

As described in the Methodology, Table C 5 shows the number of people in each of the vulnerable people categories for each of the depot areas.

Table C 5: Numbers of vulnerable people, by category, in the depot catchment areas

	Depot	0 or 1 car in the household	Older people	Young people	Employed
10min	Coffs Harbour	8,614	1,852	11,388	19,035
	Grafton	3,911	866	5,410	8,049
	Kempsey	2,408	540	3,970	4,284
	Nambucca	2,365	659	2,137	3,272
	SW Rocks	1,117	370	1,092	1,710
	Woolgoolga	2,350	612	4,102	6,555
20min	Coffs Harbour	12,275	2,780	1,7463	29,176
	Grafton	4,524	1,082	6,896	10,380
	Kempsey	3,422	845	6,056	7,623
	Nambucca	4,172	1,163	4,616	6,727
	SW Rocks	1,392	446	1,645	2,462
	Woolgoolga	8,203	1871	11,027	18,830

Table C 6 adjusts the total of the counts of vulnerable populations identified in Table C 5 to the base potential demand that would need to be met by FTS per week, using the 10% assumption of potential demand and the ranking of each major settlement, where 1 identifies the highest potential demand.

Table C 6: Total population of vulnerable people and potential demand for each depot catchment area

	Depot	Total vulnerable population count	Potential demand (10% of total)	Rank
10min	Coffs Harbour	40,889	4,089	1
	Grafton	18,236	1,824	2
	Kempsey	11,202	1,120	4
	Nambucca	8,433	843	5
	SW Rocks	4,289	428	6
	Woolgoolga	13,619	1,362	3
20 min	Coffs Harbour	61,694	6,169	1
	Grafton	22,882	2,288	3
	Kempsey	17,946	1,794	4
	Nambucca	16,678	1,668	5
	SW Rocks	5,945	595	7
	Woolgoolga	39,931	3,993	2

The distribution of population, according to these variables, in the 10 minute and 20 minute catchment areas is shown by Figure C 10 to Figure C 12.

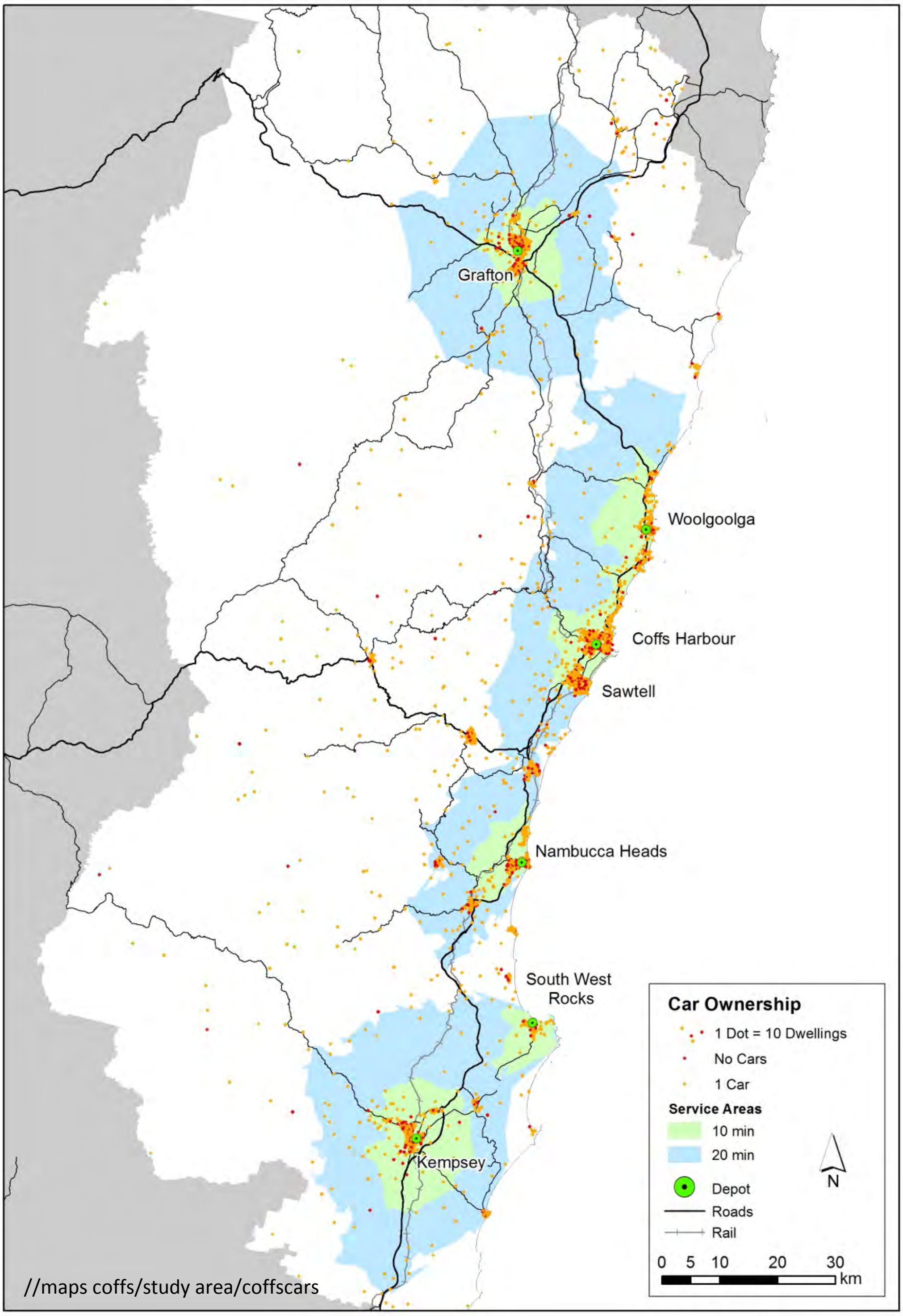

Figure C 10: Distribution of dwellings with none or one car in the Coffs Harbour study area

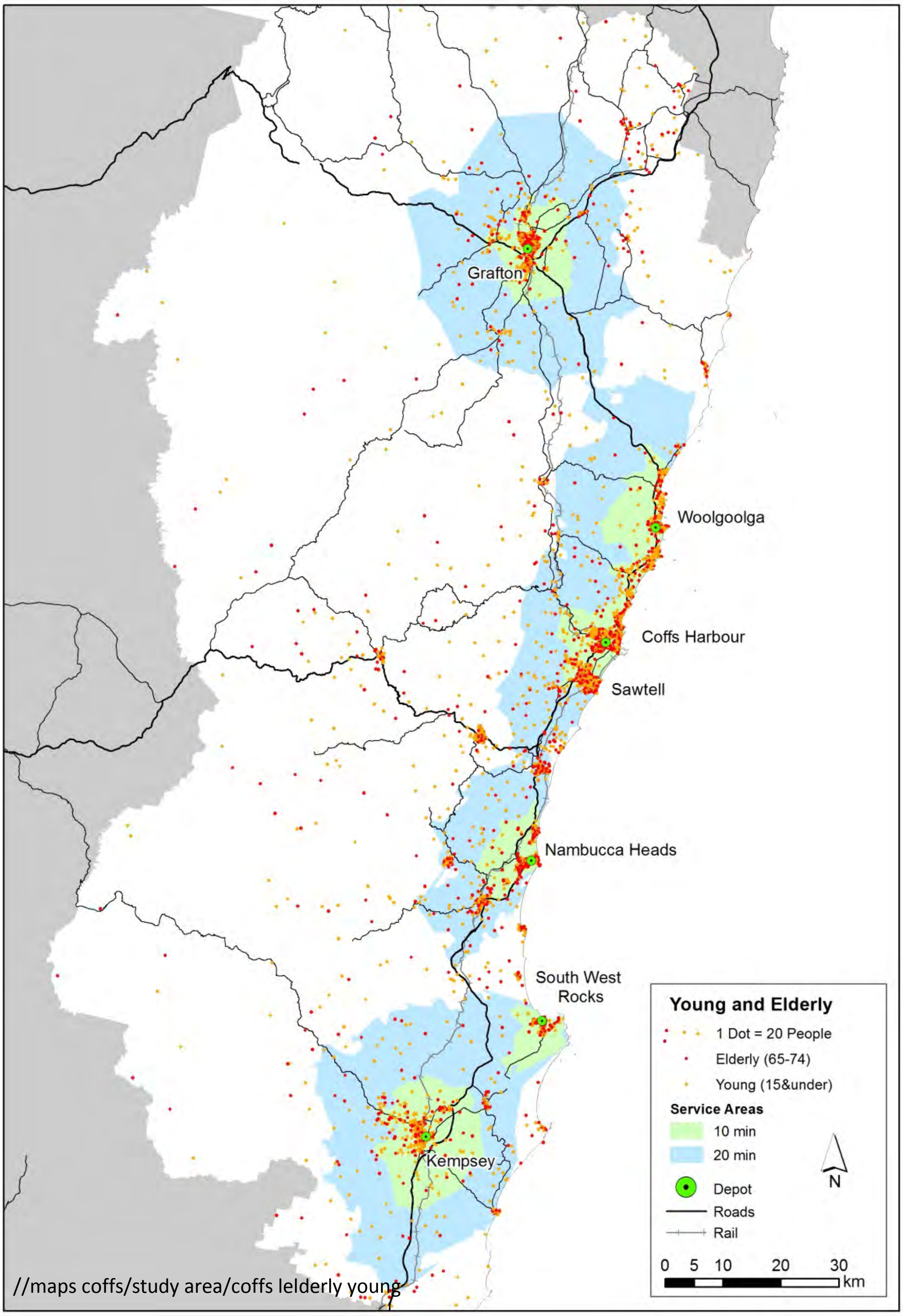

Figure C 11: Distribution of the older and young population in the Coffs Harbour study area

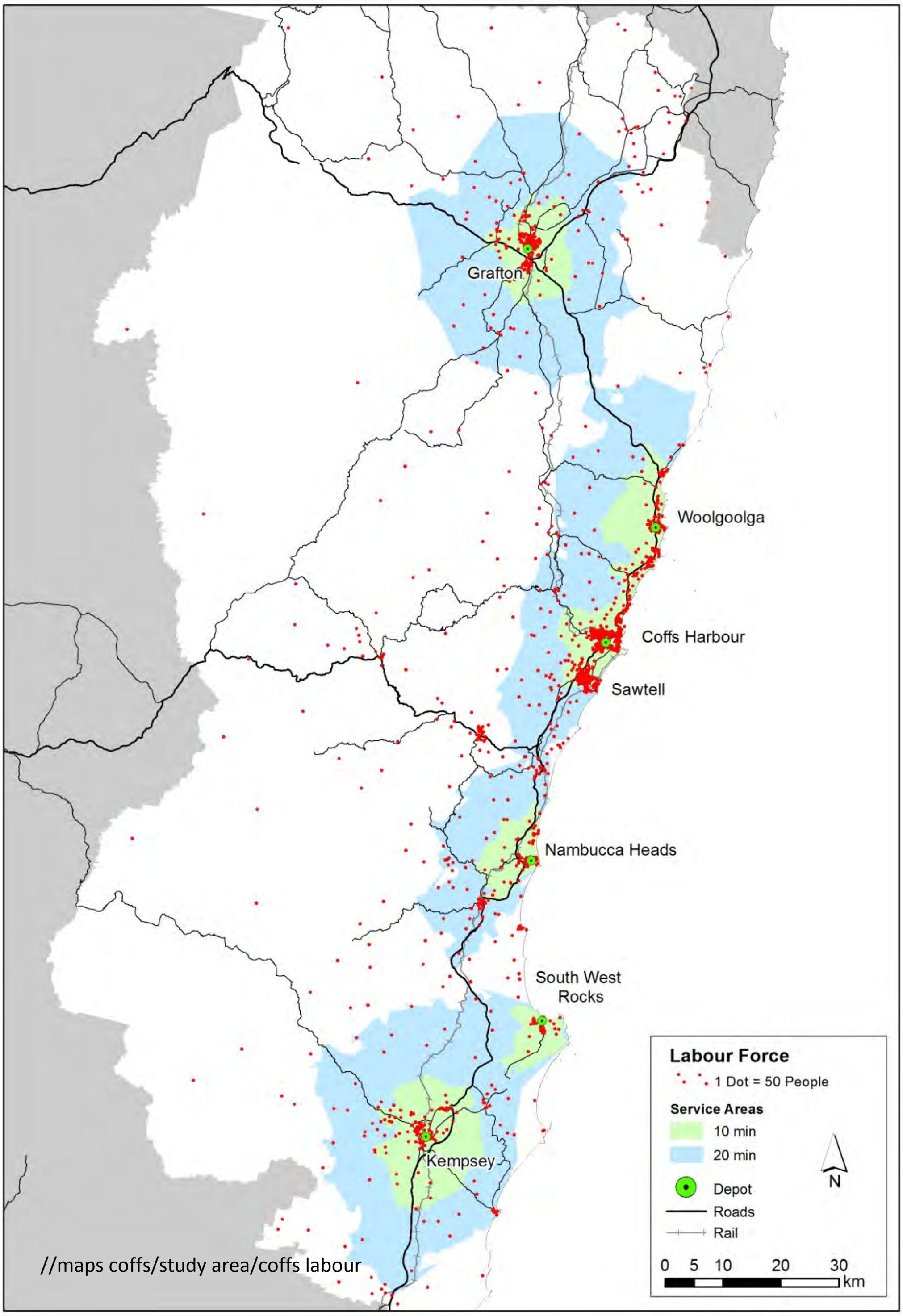

Figure C 12: Distribution of the employed population in the Coffs Harbour study area

Costs of Meeting Demand

As discussed in the Methodology, different groups within the community are likely to make a different number of trips per week for which transport is needed. For the purposes of this study, it is assumed households with one or no car will take 10 trips (one-way) per week, older people will take 6 trips, young people aged 15 or below will take 2 trips per week (outside their school trips) and those utilising FTS to access jobs will take 10 trips per week.

Table C 7 presents the number of trips per week from converting the potential demand of 10 per cent of the vulnerable population (Table C 6) by reference to the assumptions of the number of trips by different groups.

Table C 7: The number of trips per week by different groups in the community

	Depot	0 or 1 car in the household	Older people	Young people	Employed	Total
10min	Coffs Harbour	8,614	1,111	2,278	19,035	31,038
	Grafton	3,911	520	1,082	8,049	13,562
	Kempsey	2,408	324	794	4,284	7,810
	Nambucca	2,365	395	427	3,272	6,460
	SW Rocks	1,117	222	218	1,710	3,267
	Woolgoolga	2,350	367	820	6,555	10,093
20min	Coffs Harbour	12,275	1,668	3,493	29,176	46,612
	Grafton	4,524	649	1,379	10,380	16,932
	Kempsey	3,422	507	1,211	7,623	12,763
	Nambucca	4,172	698	923	6,727	12,520
	SW Rocks	1,392	268	329	2,462	4,451
	Woolgoolga	8,203	1,123	2,205	18,830	30,361

Table C 8 converts these trips to a minimum number of car and minibus trips using the information presented in the Methodology, Table 5 and the number of vehicle trips assuming 7 and 6 day operation with an even profile of demand (giving rise to more vehicles on a 6 day operation as the given demand is spread over a smaller number of hours). It must be acknowledged that an even profile of demand is unlikely but this approach gives a baseline range to the number of vehicles to meeting demand.

This table identifies where minibus or car operation may be more suitable. For example, for the 10 minute catchment area cars would be more suitable for SW Rocks than a single minibus whereas in Coffs Harbour or Grafton, a minibus operation would be more suitable. This table also identifies that the 20 minute catchment area in Coffs Harbour and Grafton would not be sensible, given the number of vehicles required.

Table C 8: The number of car and minibus trips per week and the number of vehicles required

	Depot	Number of car trips	Number of minibus trips	Number of cars	Number of minibuses	Number of cars	Number of minibuses
				7 day operation		6 day operation	
10min	Coffs Harbour	3,449	862	31	8	36	9
	Grafton	1,507	377	14	4	16	4
	Kempsey	868	217	8	2	10	3
	Nambucca	718	179	7	2	8	2
	SW Rocks	363	91	4	1	4	1
	Woolgoolga	1,121	280	11	3	12	3
20min	Coffs Harbour	10,358	2,590	185	47	216	54
	Grafton	3,763	941	68	17	79	20
	Kempsey	2,836	709	51	13	60	15
	Nambucca	2,782	696	50	13	58	15
	SW Rocks	989	247	18	5	21	6
	Woolgoolga	6,747	1,687	121	31	141	36

The costs of providing the number of vehicles identified in Table C 8 is calculated by reference to the km and hourly costs provided by TfNSW. These are presented in Table C 9 and

Table C 10 below for weekly costs and annual costs where the annual costs are based on 52 week operation. In the calculations, the number of vehicles required is always rounded up so that if the number of trips requires 2.1 cars per day, for example, this is rounded up to a daily requirement of 3 cars per day for costing purposes. This drives some of the differences between the weekly and annual costs for six and seven day operation. It should be noted that, because costs are built on the daily cost of providing a vehicle, these are the same for 6 or 7 day operation. In practical terms, 7 day operation is likely to be greater cost per vehicle supplied than seven times a weekday cost because of weekend loadings for staff.

Table C 9: Weekly cost of meeting demand by car and minibus (in $)

	Depot	car	minibus	car	minibus
		7 day operation		6 day operation	
10min	Coffs Harbour	$103,895	$34,894	$103,416	$33,648
	Grafton	$46,920	$17,447	$45,963	$14,954
	Kempsey	$26,812	$8,723	$28,727	$11,216
	Nambucca	$23,460	$8,723	$22,981	$7,477
	SW Rocks	$13,406	$4,362	$11,491	$3,739
	Woolgoolga	$36,866	$13,085	$34,472	$11,216
20min	Coffs Harbour	$620,018	$205,001	$620,497	$201,885
	Grafton	$227,899	$74,149	$226,941	$74,772
	Kempsey	$170,924	$56,702	$172,360	$56,079
	Nambucca	$167,573	$56,702	$166,615	$56,079
	SW Rocks	$60,326	$21,809	$60,326	$22,432
	Woolgoolga	$405,525	$135,213	$405,047	$134,590

Table C 10: Annual cost of meeting demand by car and minibus (in $)

	Depot	car	minibus	car	minibus
		7 day operation		6 day operation	
10min	Coffs Harbour	$5,402,537	$1,814,476	$5,377,641	$1,749,674
	Grafton	$2,439,856	$907,238	$2,390,063	$777,633
	Kempsey	$1,394,203	$453,619	$1,493,789	$583,225
	Nambucca	$1,219,928	$453,619	$1,195,031	$388,816
	SW Rocks	$697,102	$226,810	$597,516	$194,408
	Woolgoolga	$1,917,029	$680,429	$1,792,547	$583,225
20min	Coffs Harbour	$32,240,950	$10,660,049	$32,265,846	$10,498,042
	Grafton	$11,850,727	$3,855,762	$11,800,934	$3,888,164
	Kempsey	$8,888,046	$2,948,524	$8,962,735	$2,916,123
	Nambucca	$8,713,770	$2,948,524	$8,663,977	$2,916,123
	SW Rocks	$3,136,957	$1,134,048	$3,136,957	$1,166,449
	Woolgoolga	$21,087,324	$7,031,096	$21,062,427	$6,998,695

Appendix 2: Orange study area

The Orange study area is one of three areas identified by TfNSW as a potential pilot area for the introduction of FTS into regional and rural NSW.

This appendix contains the detailed information identified in the Methodology section of Deliverable 3 (here forward referred to as the Methodology section) together with commentary relating specifically to the Orange study area. The appendices relating to all study areas are similarly ordered, according to the methodology and to facilitate reading, tables and figures in this appendix are prefixed by 'O' to denote the Orange study area.

Major Settlements

In the Orange study area, Forbes, Parkes, Lithgow, Blayney, Bathurst and Orange town are identified as the major settlements.

Weighting Regimes

As identified in the methodology, the identification of the major centres likely to give most benefit from the introduction of FTS *within* this study area is undertaken using weighting regimes including the variables of population density, SIFA, car ownership, the ATSI population and unemployment as described by the methodology of the main report. The definitions for each variable are defined in the Methodology, Table 1, with the scores associated with the values of these variables in Table 2 forming the key to these maps.

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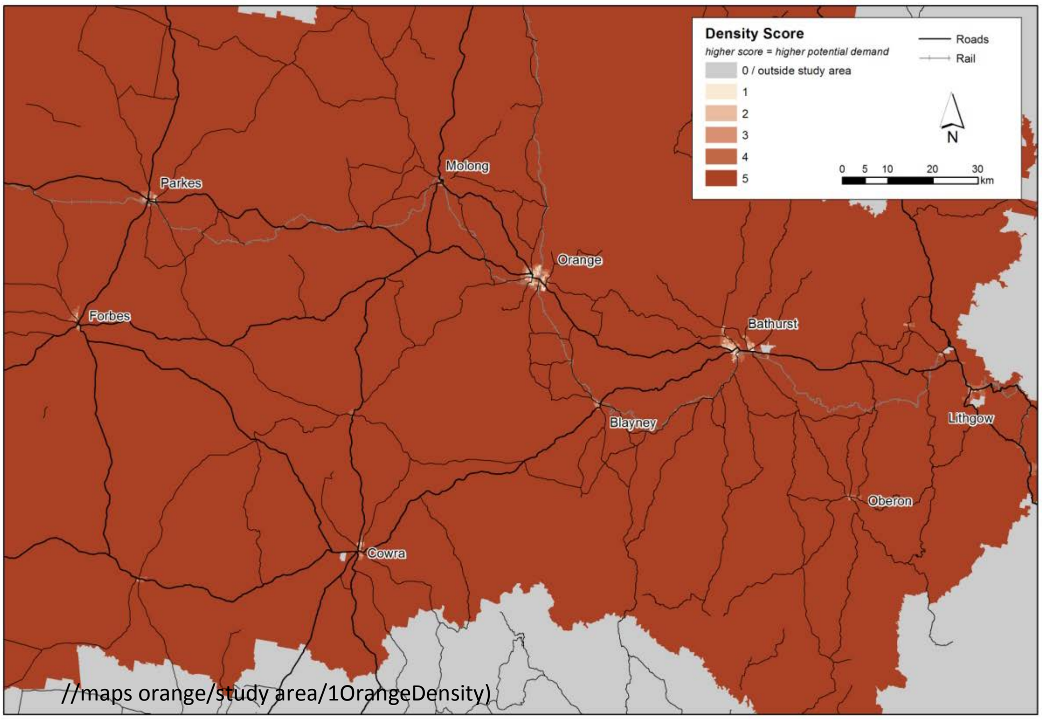

Figure O 1: Population density in the Orange study area

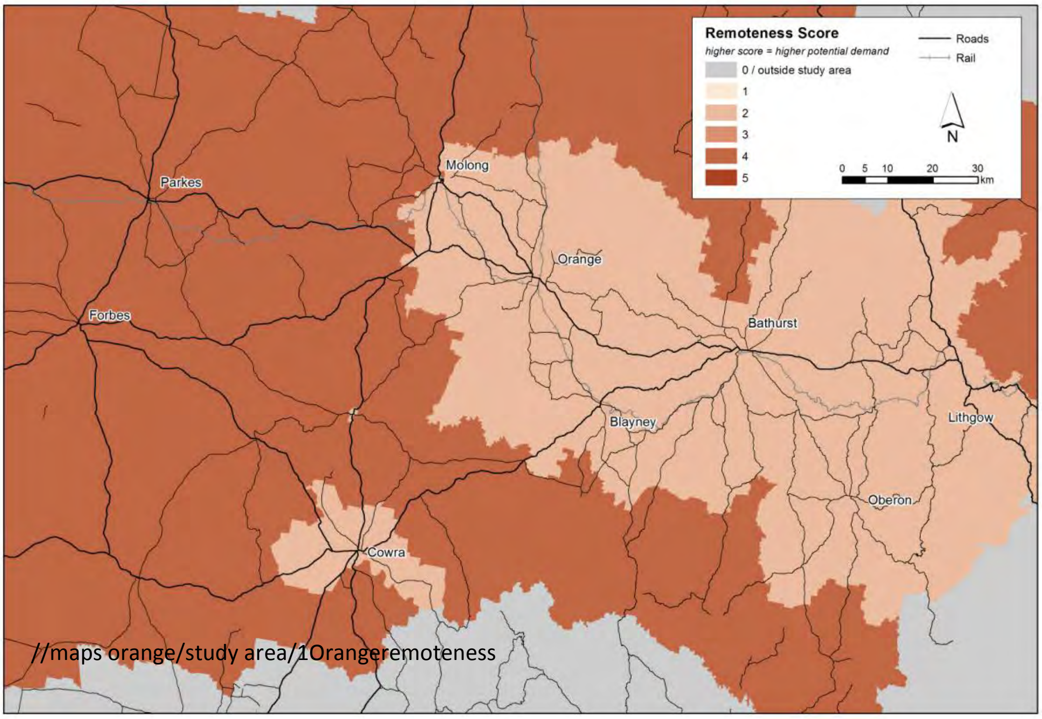

Figure O 2: Remoteness index in the Orange study area

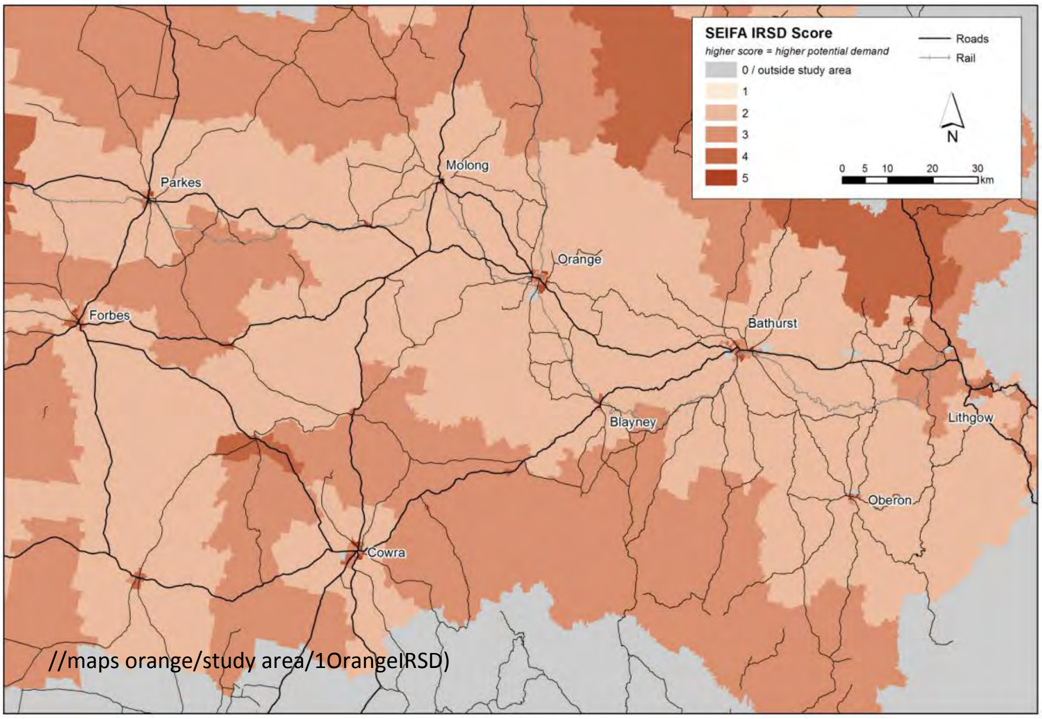

Figure O 3: SEIFA IRSD index in the Orange study area

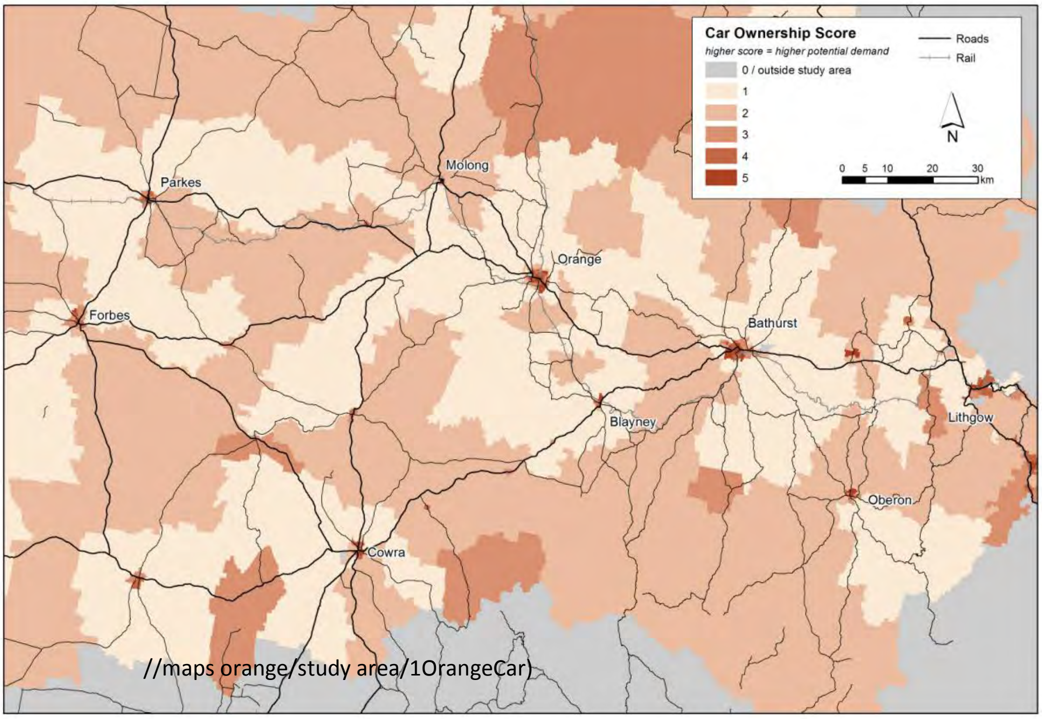

Figure O 4: Car Ownership (% dwellings with zero or 1 car) in the Orange study area

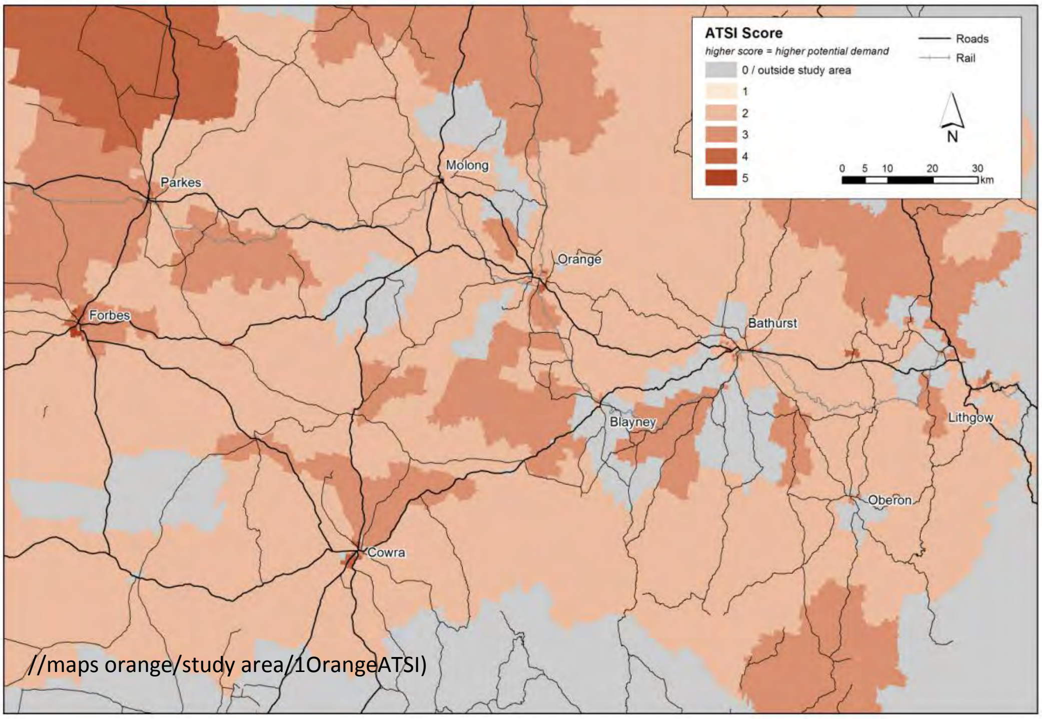

Figure O 5: Percentage of ATSI population in the Orange study area

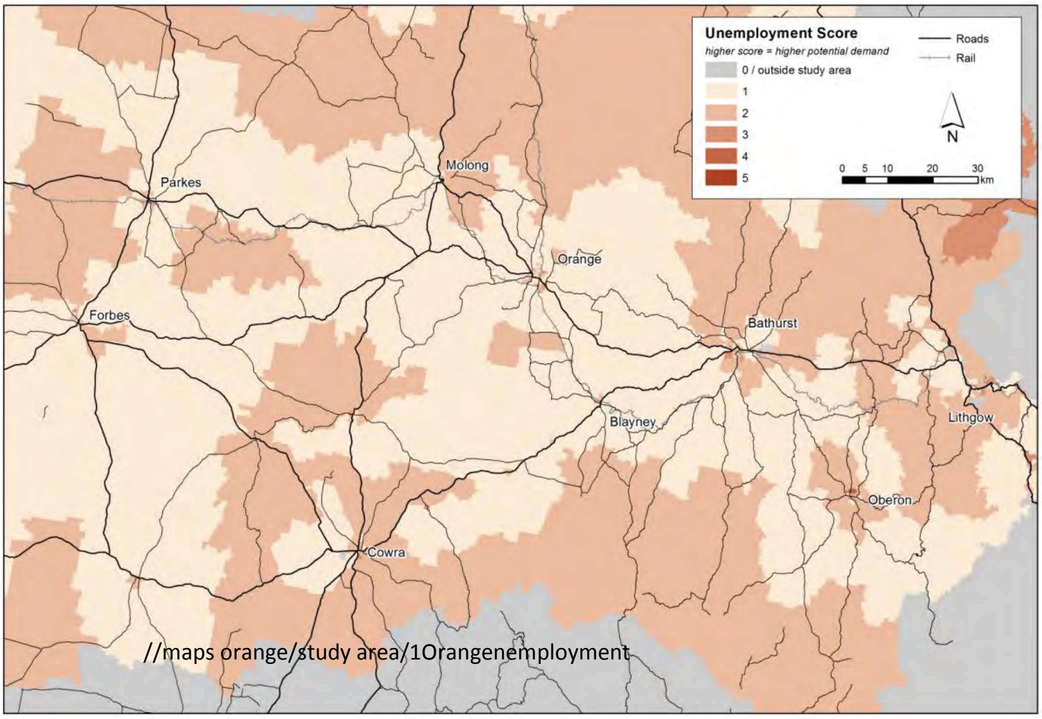

Figure O 6: Percentage of unemployment in the Orange study area

The application of the weighting regimes to achieve a ranking of the major settlements in the Orange study area is summarised in the Methodology, Table 3. These are presented in Table O 1 to rank the major settlements for the 10 minute catchment area (in green) and 20 minute catchment area (in blue).

Table O 1: Rankings of major settlements in Orange against each weighting regime

	Depot	Rank in Regime 1	Rank in Regime 2	Rank in Regime 3	Rank in Regime 4	Potential Demand
10min	Bathurst	5	5	4	4	
	Blayney	4	4	6	6	
	Forbes	1	1	1	1	Highest
	Lithgow	3	2	3	3	
	Orange	6	6	5	5	
	Parkes	2	3	2	2	
20min	Bathurst	5	5	6	6	
	Blayney	4	3	4	4	
	Forbes	2	2	1	1	
	Lithgow	1	1	3	1	Highest
	Orange	6	6	5	5	
	Parkes	3	4	2	3	

Table O 1 shows for the 10 minute catchment, Forbes is likely to provide the highest potential demand, whichever weighting regime is used, with Lithgow and Parkes being second on some criterion but not systematically so. For the 20 minute catchment Lithgow is most consistently achieving the highest rank although there is not much difference in the raw scores for Forbes, Parkes and Lithgow in all the weighting regimes. This can be explained by the way in which each of the major settlements have very little population in the 20 minute catchment area, over and above what is captured in the 10 minute catchment area.

This suggests that if Orange is chosen as the study area in which to undertake the pilot introduction of FTS, and only one major settlement was to be chosen for FTS then if there was to be a 10 minute catchment area, this should be Forbes. But for a 20 minute catchment, close attention would need to be given to Forbes, Parkes and Lithgow. However, this is on the basis of deriving the highest potential demand and achieving greatest access to reduce social exclusion and transport disadvantage.

Potential Supply and Savings from Fixed timetabled routes

As identified in the Methodology, FTS becomes a substitute for some services within the study area if treated as an access service to timetabled services. Table O 2 shows the potential services that could be withdrawn, although this table needs to be considered along with the commentary expressed in the Methodology about the circumstances under which particular routes should be retained. Table O 2 is followed by maps showing these services Figure O 7a to Figure O 7d.

Table O 2: Services that could be replaced by the introduction of FTS

Depot/Town	Town Services
Forbes	556, 557, 558
Parkes	551, 552, 553, 554
Orange	531, 532, 533, 534, 535, 537, 538, 535A
Lithgow	100, 200, 304, 500

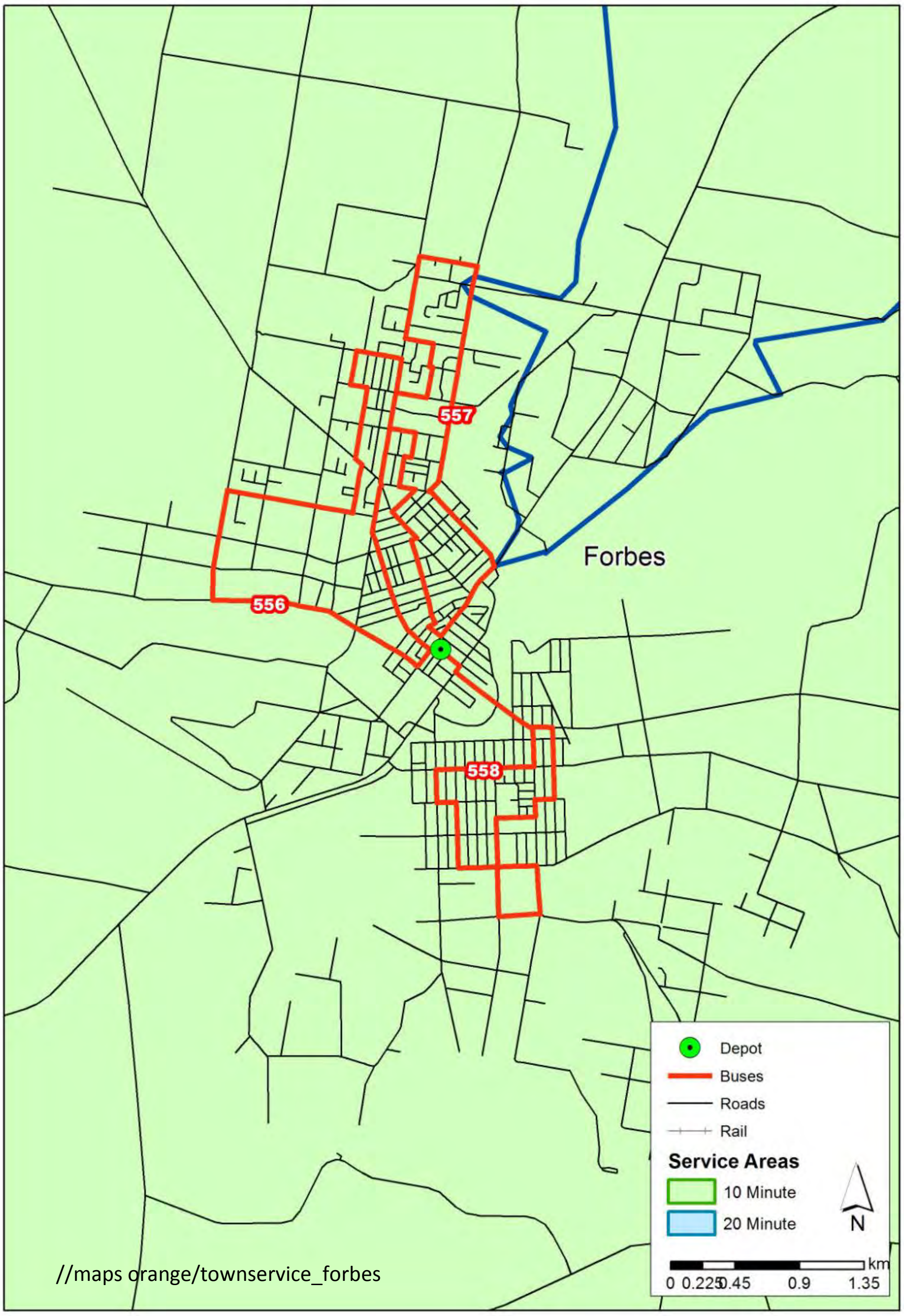

Figure O 7a: Potential timetabled services to be replaced when FTS introduced in Forbes

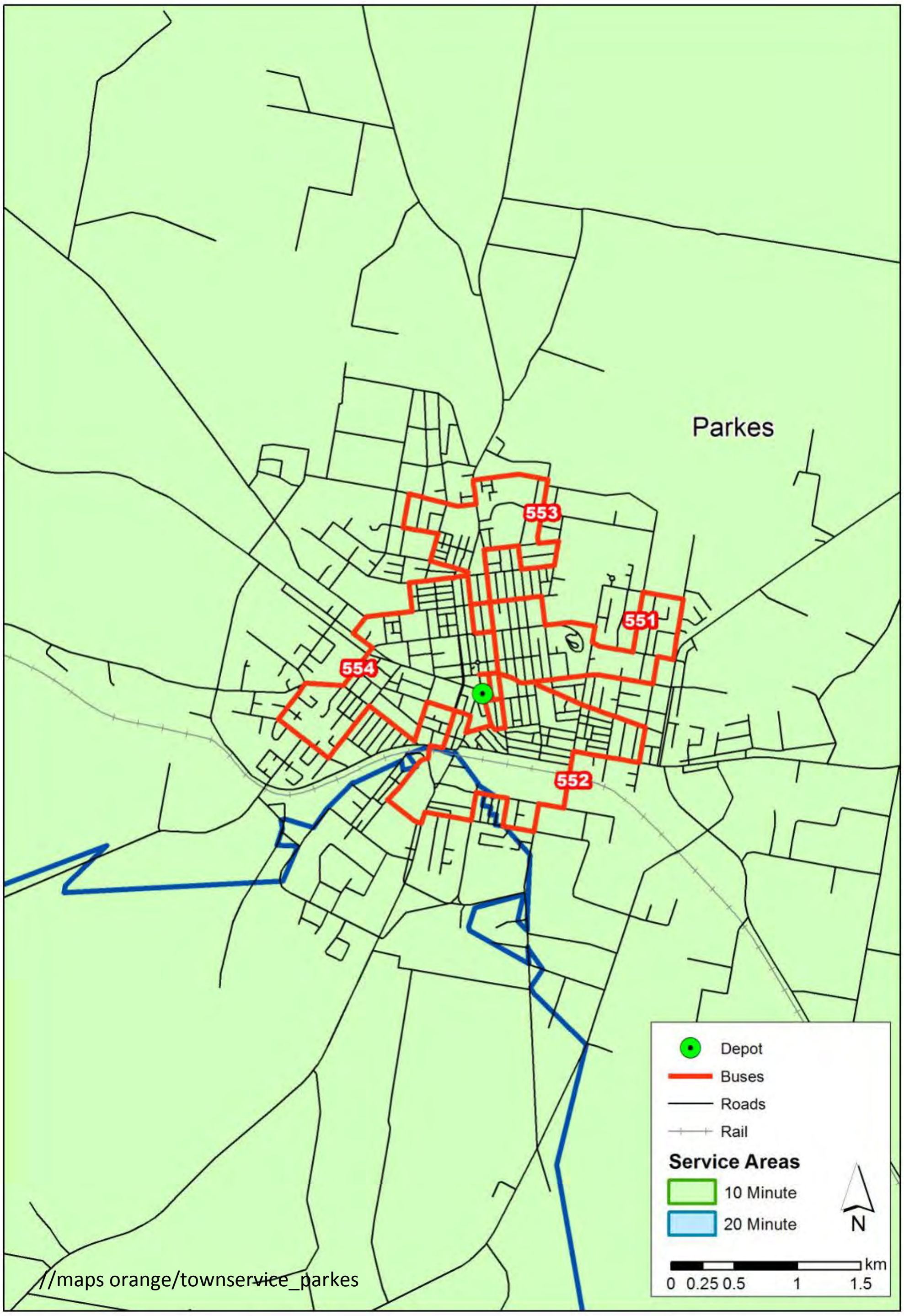

Figure O 7b: Potential timetabled services to be replaced when FTS introduced in Parkes

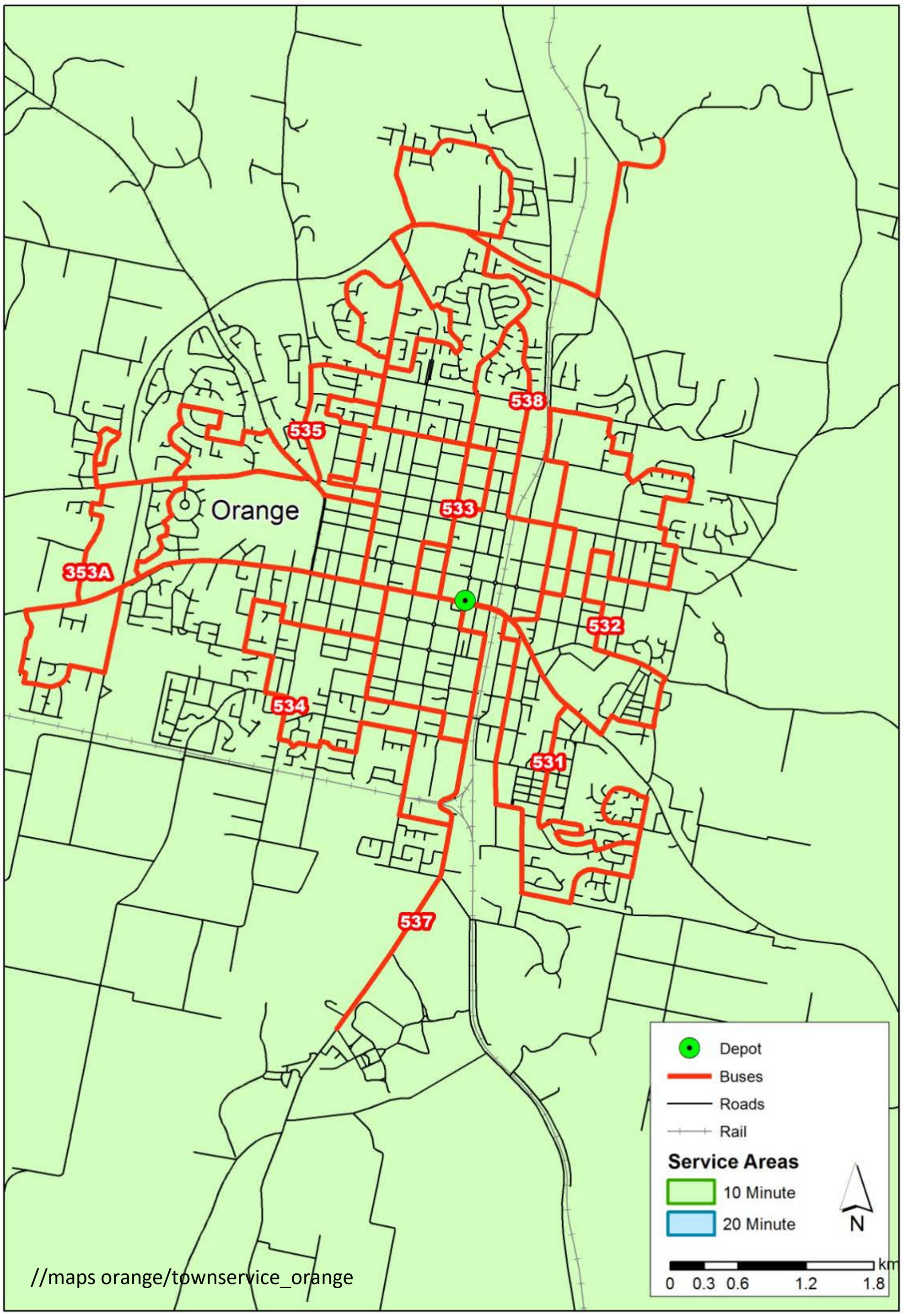

Figure O 7c: Potential timetabled services to be replaced when FTS introduced in Orange

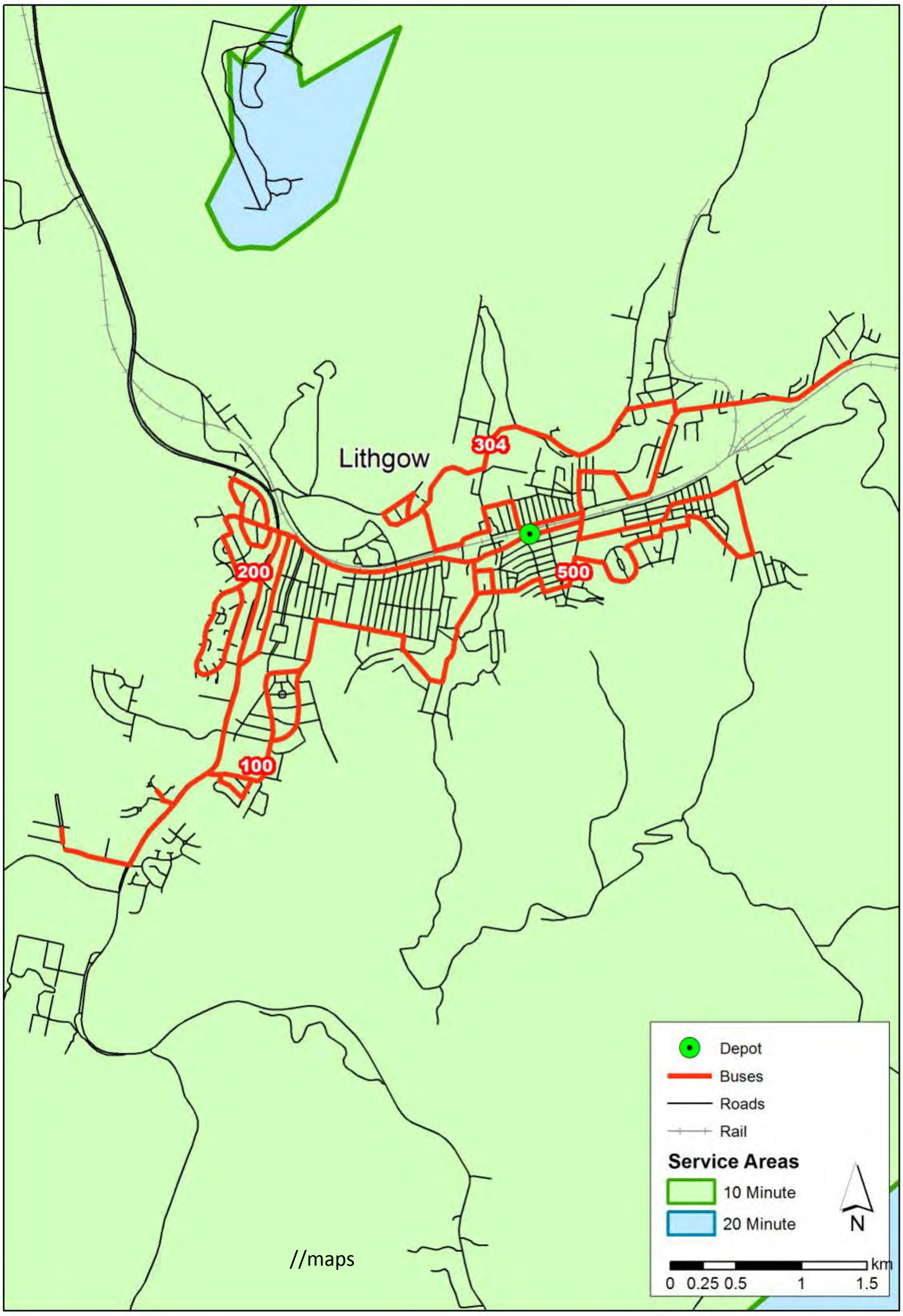

Figure O 7d: Potential timetabled services to be replaced when FTS introduced in Lithgow

Table O 3 shows the timetable kilometres and timetabled minutes that are saved if the services shown in Table O 2 (and mapped above) are removed upon the introduction of FTS to the relevant depot. Table O 4 converts the kilometres saved into a weekly dollar saving.

Table O 3: Potential savings in distance and time per week from removing scheduled services identified in Table 2 upon the introduction of FTS

Depot/Town	Weekday km saved	Weekday minutes saved	Saturday km saved	Saturday minutes saved	Sunday km saved	Sunday minutes saved
Forbes	80	189	0	0	0	0
Parkes	76	207	0	0	0	0
Orange	942	2,017	310	655	0	0
Lithgow	481	1,250	171	454	0	0
Total	**1,579**	**3,663**	**481**	**1,109**	**0**	**0**

Table O 4: Potential savings in $ per week from removing services identified in Table C2 upon the introduction of FTS

Depot/Town	Weekday	Saturday	Sunday	Total $ per week
Forbes	$156	$0	$0	$779
Parkes	$148	$0	$0	$740
Orange	$1,834	$604	$0	$9,775
Lithgow	$937	$333	$0	$5,016
Total	**$3,075**	**$937**	**$0**	**$16,310**

For the whole of this study area, assuming a 52 week operation, this represents a saving of $848,120.

The services that would be retained to provide the links between the major settlements are shown in Figure O 8. Figure O 9 shows an alternative scenario in which route 350 is streamlined and connections between Oberon and Bathurst are removed from timetabled services. This would provide additional savings of $72,592 per year or a further 9 per cent.

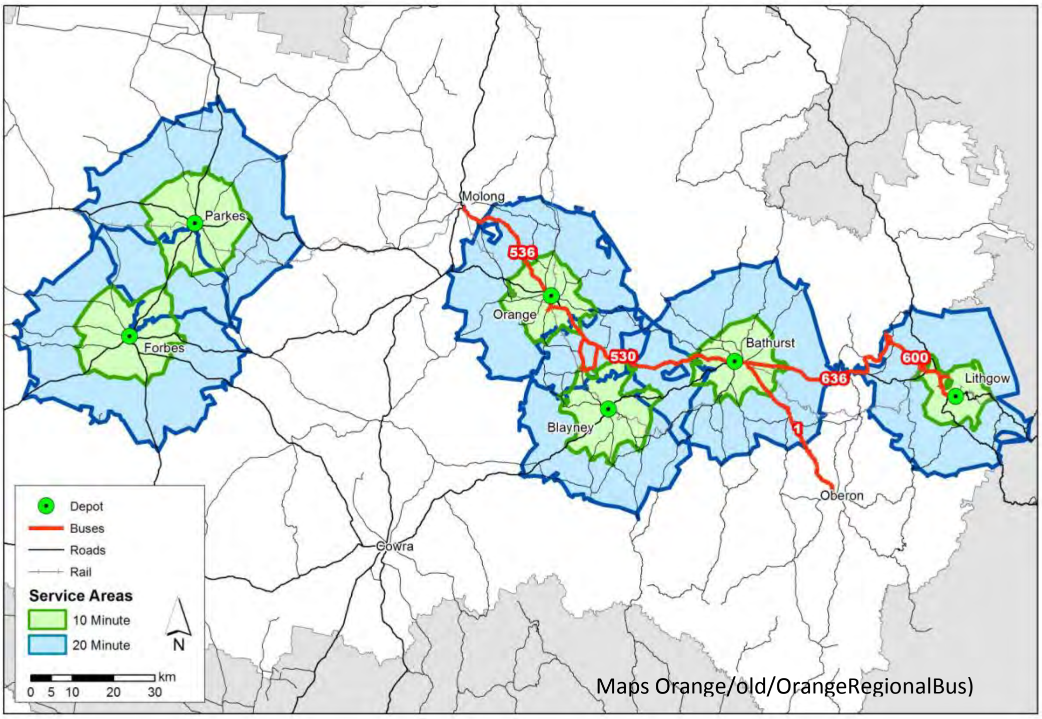

Figure O 8: Regional routes retained to provide connections between major settlements in the Orange study area

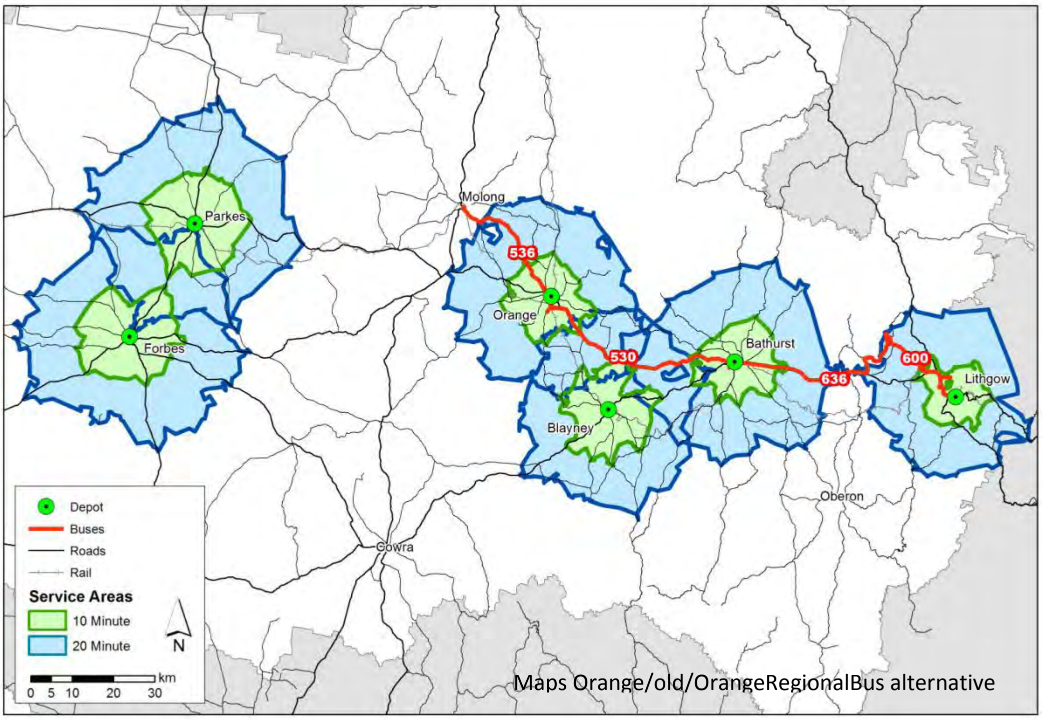

Figure O 9: Alternative scenario for retained regional routes to provide connections between major settlements in the Orange study area

Potential Demand and Revenue

Demand

As described in the Methodology, Table O 5 shows the number of people in each of the vulnerable people categories for each of the depot areas. The sum of these provides the base for potential demand that would need to be met by FTS per week.

Table O 5: Numbers of vulnerable people, by category, in the depot catchment areas

	Depot	0 or 1 car in the household	Older people	Young people	Employed
10min	Blayney	627	178	1,301	1,890
	Forbes	1,352	379	2,159	3,232
	Lithgow	2,620	589	3,232	5,419
	Orange	6,220	1,242	11,549	18,008
	Parkes	1,898	450	3,450	4,765
20min	Blayney	988	351	2,686	4,137
	Forbes	1,536	421	2,734	4,204
	Lithgow	3,542	854	5,081	8,404
	Orange	6,528	1,426	13,316	20,715
	Parkes	2,001	492	3,774	5,345

Table O 6 adjusts the total of the counts of vulnerable populations identified in Table O 5 to the base potential demand that would need to be met by FTS per week, using the 10% assumption of potential demand assumed in the Business case and the ranking of each major settlement, where 1 identifies the highest potential demand. It is worth noting that moving from a 10 minute catchment to a 20 minute catchment changes potential demand by different proportions: for the more populous areas such as Orange, potential demand increases very little whereas for Blayney, for example, it more than doubles.

Table O 6: Total population of vulnerable people and potential demand for each depot catchment area

	Depot	Total vulnerable population count	Potential demand (10% of total)	Rank
10min	Blayney	3,996	400	5
	Forbes	7,122	712	4
	Lithgow	11,860	1,186	2
	Orange	37,019	3,702	1
	Parkes	10,563	1,056	3
20min	Blayney	8,162	816	5
	Forbes	8,895	890	4
	Lithgow	17,881	1,788	2
	Orange	41,985	4,199	1
	Parkes	11,612	1,161	3

The distribution of population, according to these variables, in the 10 minute and 20 minute catchment areas is shown by Figure O 10 to Figure O 12.

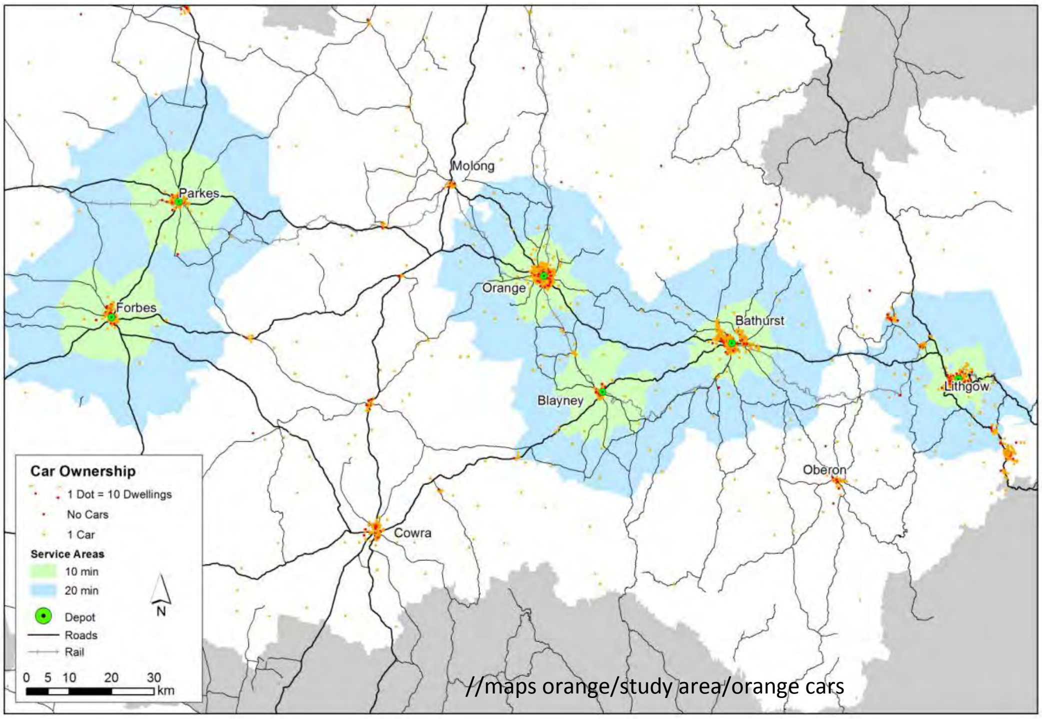

Figure O 10: Distribution of dwellings with none or one car in the Orange study area

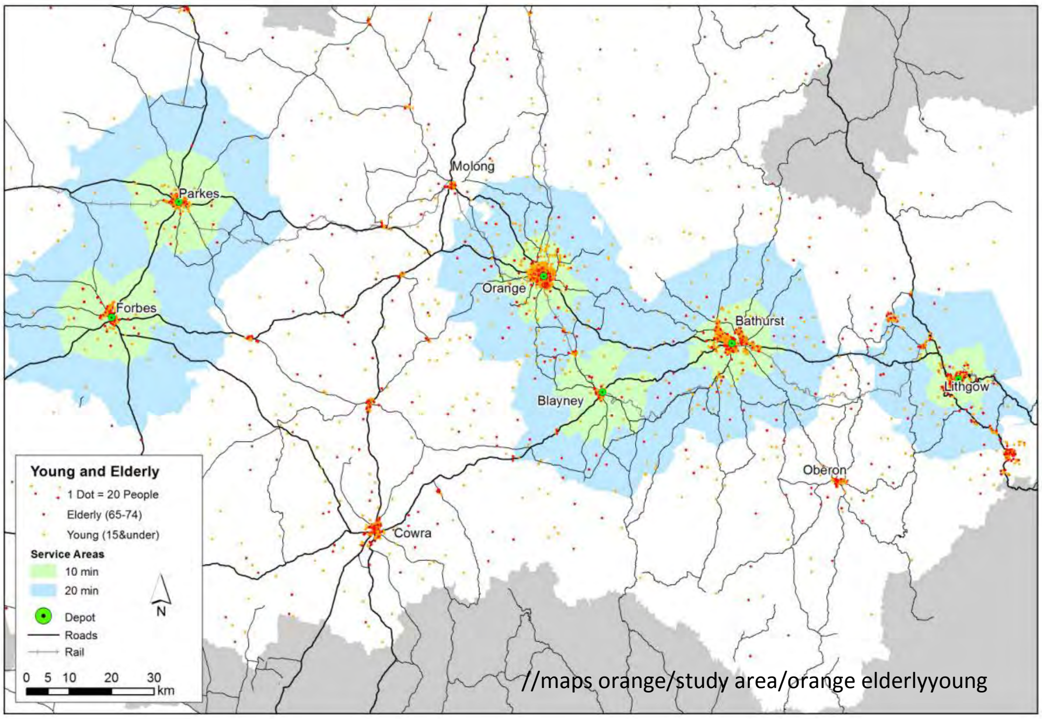

Figure O 11: Distribution of the older and young population in the Orange study area

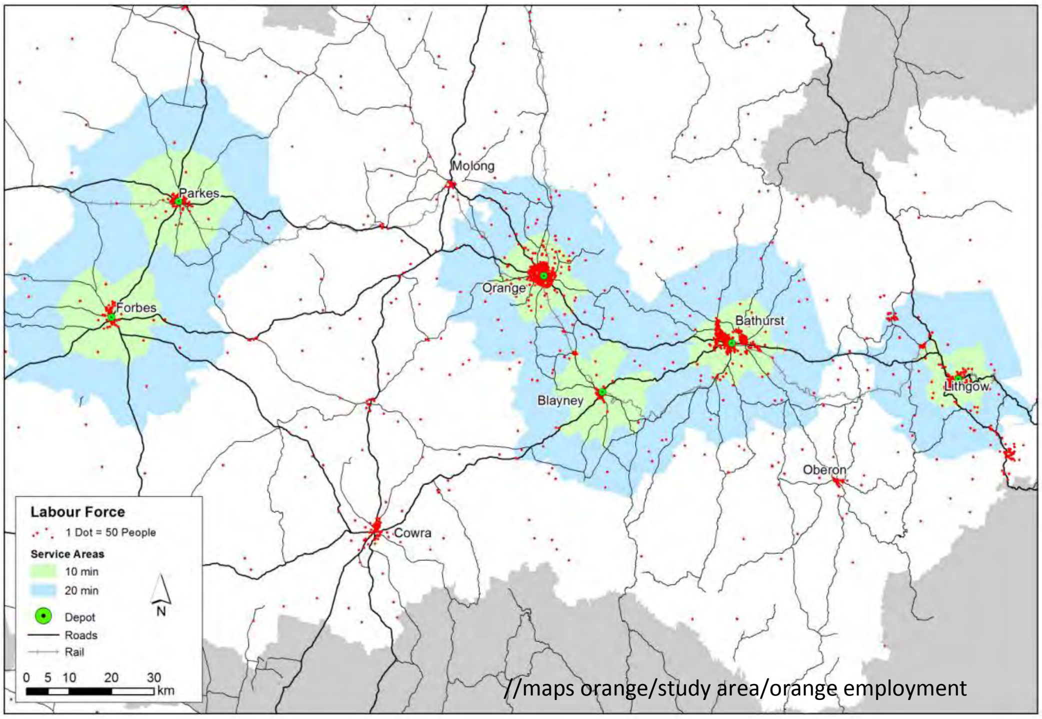

Figure O 12: Distribution of the employed population in the Orange study area

Costs of Meeting Demand

As discussed in the Methodology, different groups within the community are likely to make a different number of trips per week for which transport is needed. For the purposes of this study, it is assumed households with one or no car will take 10 trips (one-way) per week, older people will take 6 trips, young people aged 15 or below will take 2 trips per week (outside their school trips) and those utilising FTS to access jobs will take 10 trips per week.

Table O 7: The number of trips per week by different groups in the community

	Depot	0 or 1 car in the household	Older people	Young people	Employed	Total
10min	Blayney	627	107	260	1,890	2,884
	Forbes	1,352	227	432	3,232	5,243
	Lithgow	2,620	353	646	5,419	9,039
	Orange	6,220	745	2,310	18,008	27,283
	Parkes	1,898	270	690	4,765	7,623
20min	Blayney	988	211	537	4,137	5,873
	Forbes	1,536	253	547	4,204	6,539
	Lithgow	3,542	512	1,016	8,404	13,475
	Orange	6,528	856	2,663	20,715	30,762
	Parkes	2,001	295	755	5,345	8,396

Table O 7 presents the number of trips per week from converting the potential demand of 10 per cent of the vulnerable population (Table O 6) by reference to the assumptions of the number of trips by different groups.

Table O 8 converts these trips to a minimum number of car and minibus trips using the information presented in the Methodology, Table 5 and the number of vehicle trips assuming 7 and 6 day operation with an even profile of demand (giving rise to more vehicles on a 6 day operation as the given demand is spread over a smaller number of hours). It must be acknowledged that an even profile of demand is unlikely but this approach gives a baseline range to the number of vehicles to meeting demand.

This table identifies where minibus or car operation may be more suitable. For example, for the 10 minute catchment area cars would be more suitable for Blayney or Forbes than a single minibus whereas in Lithgow, a minibus operation would be more suitable. This table also identifies that the 20 minute catchment area in Lithgow and Orange would not be sensible, given the number of vehicles required.

Table O 8: The number of car and minibus trips per week and the number of vehicles required

	Depot	Number of car trips	Number of minibus trips	Number of cars (7 day operation)	Number of minibuses (7 day operation)	Number of cars (6 day operation)	Number of minibuses (6 day operation)
10min	Blayney	320	80	3	1	4	1
	Forbes	583	146	6	2	7	2
	Lithgow	1,004	251	9	3	11	3
	Orange	3,031	758	28	7	32	8
	Parkes	847	212	8	2	9	3
20min	Blayney	1,305	326	24	6	28	7
	Forbes	1,453	363	26	7	31	8
	Lithgow	2,994	749	54	14	63	16
	Orange	6,836	1,709	123	31	143	36
	Parkes	1,866	466	34	9	39	10

The costs of providing the number of vehicles identified in Table O 8 is calculated by reference to the km and hourly costs provided by TfNSW. These are presented in Table O 9 and Table O 10 below for weekly costs and annual costs where the annual costs are based on 52 week operation. In the calculations, the number of vehicles required is always rounded up so that if the number of trips requires 2.1 cars per day, for example, this is rounded up to a daily requirement of 3 cars per day for costing purposes. This drives some of the differences between the weekly and annual costs for six and seven day operation. It should be noted that because costs are built on the daily cost of providing a vehicle, these are the same for 6 or 7 day operation. In practical terms, 7 day operation is likely to be greater cost per vehicle supplied than seven times a weekday cost because of weekend loadings for staff

Table O 9: Weekly cost of meeting demand by car and minibus (in $)

		car	minibus	car	minibus
	Depot	**7 day operation**		**6 day operation**	
10min	Blayney	$10,054	$4,362	$11,491	$3,739
	Forbes	$20,109	$8,723	$20,109	$7,477
	Lithgow	$30,163	$13,085	$31,599	$11,216
	Orange	$93,841	$30,532	$91,925	$29,909
	Woolgoolga	$26,812	$8,723	$25,854	$11,216
20 min	Blayney	$80,435	$26,170	$80,435	$26,170
	Forbes	$87,138	$30,532	$89,053	$29,909
	Lithgow	$180,978	$61,064	$180,978	$59,818
	Orange	$412,228	$135,213	$410,792	$134,590
	Parkes	$113,949	$39,256	$112,034	$37,386

Table O 10: Annual cost of meeting demand by car and minibus (in $)

		car	minibus	car	minibus
	Depot	**7 day operation**		**6 day operation**	
10min	Blayney	$522,826	$226,810	$597,516	$194,408
	Forbes	$1,045,652	$453,619	$1,045,652	$388,816
	Lithgow	$1,568,479	$680,429	$1,643,168	$583,225
	Orange	$4,879,711	$1,587,667	$4,780,125	$1,555,266
	Woolgoolga	$1,394,203	$453,619	$1,344,410	$583,225
20 min	Blayney	$4,182,610	$1,360,857	$4,182,610	$1,360,857
	Forbes	$4,531,160	$1,587,667	$4,630,746	$1,555,266
	Lithgow	$9,410,872	$3,175,334	$9,410,872	$3,110,531
	Orange	$21,435,875	$7,031,096	$21,361,185	$6,998,695
	Parkes	$5,925,364	$2,041,286	$5,825,778	$1,944,082

Appendix 3: Wagga Wagga study area

Wagga Wagga study area is one of three areas identified by TfNSW as a potential pilot area for the introduction of FTS into regional and rural NSW.

This appendix contains the detailed information identified in the Methodology section of Deliverable 3 (here forward referred to as the Methodology section) together with commentary relating specifically to the Wagga Wagga study area. The appendices relating to the other two study areas are similarly ordered, according to the methodology and to facilitate reading, tables and figures in this appendix are prefixed by 'W' to denote the Wagga Wagga study area.

Major Settlements

In the Wagga Wagga study area, Cootamundra, Junee, Temora, Tumut and Wagga Wagga are identified as the major settlements.

Weighting Regimes

As identified in the methodology, the identification of the major centres likely to give most benefit from the introduction of FTS *within* this study area is undertaken using weighting regimes including the variables of population density, SIFA, car ownership, the ATSI population and unemployment as described by the methodology of the main report. The definitions for each variable are defined in the Methodology, Table 1, with the scores associated with the values of these variables in Table 2 forming the key to these maps.

Figure W 1 to Figure W 6 show the distribution of values for each variable used in the ranking. The definitions for each variable is defined in the Methodology, Table 1, with the scores associated with the values of these variables in Table 2 forming the key to these maps.

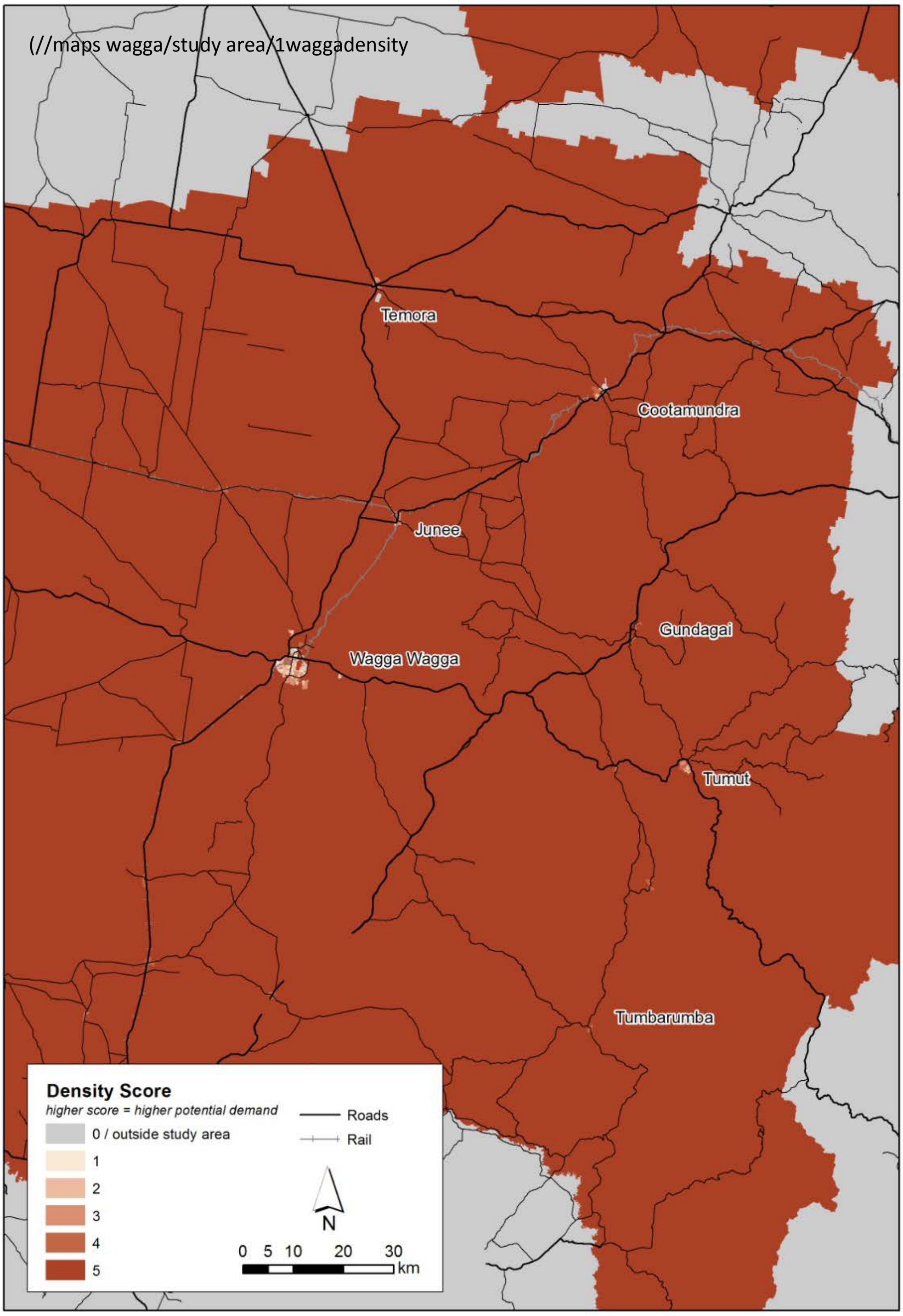

Figure W 1: Population density in the Wagga Wagga study area

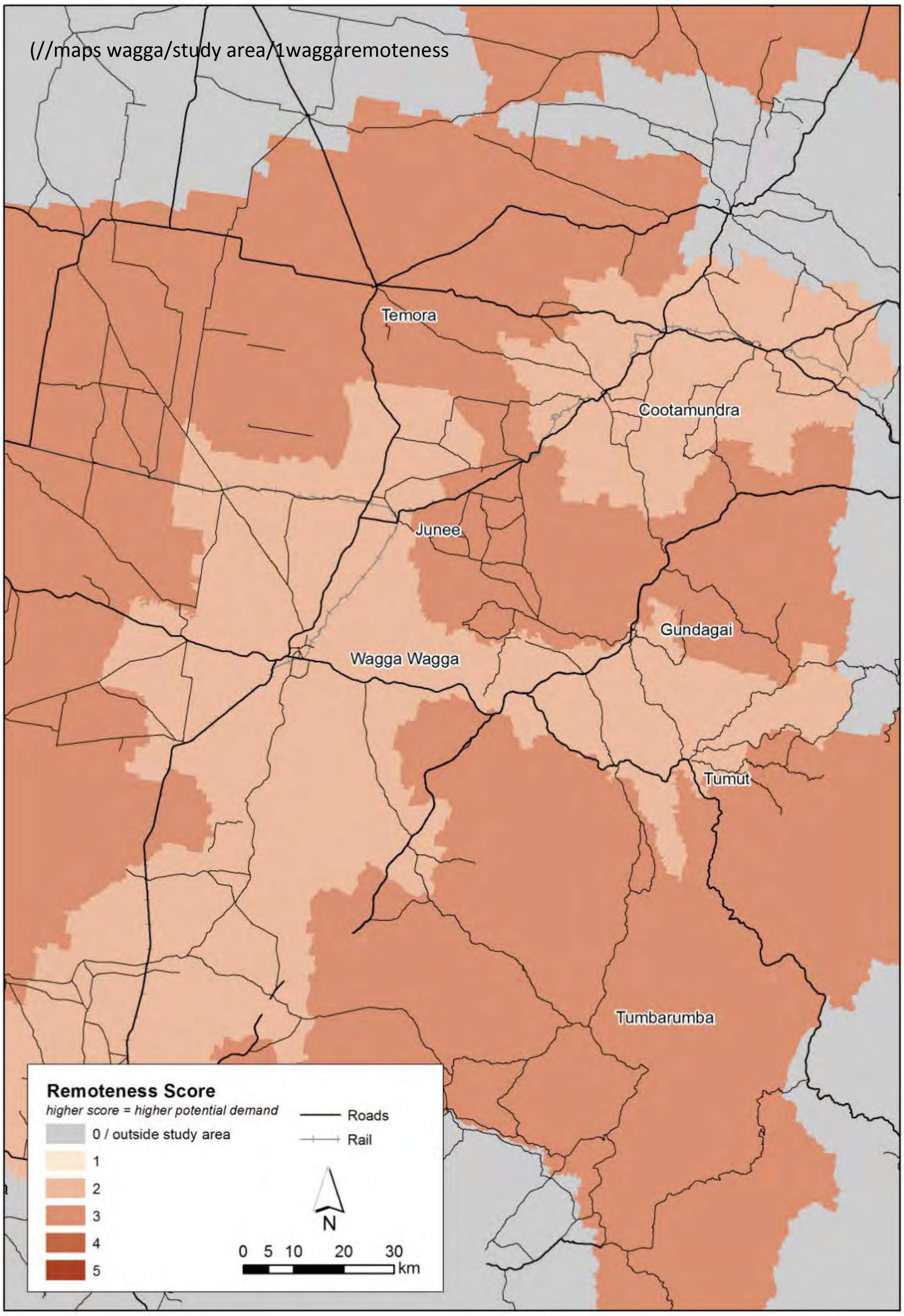

Figure W 2: Remoteness index in the Wagga Wagga study area

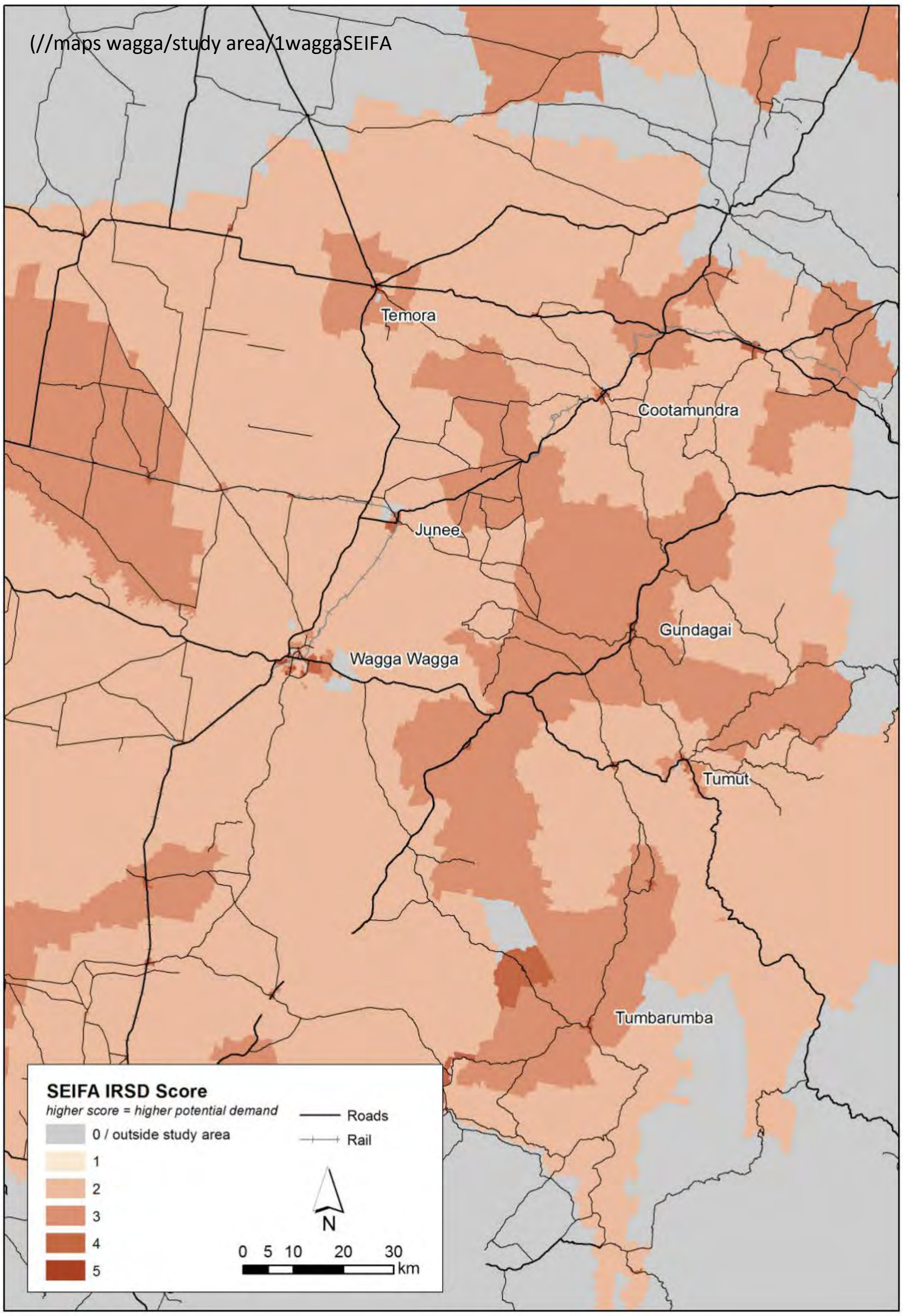

Figure W 3: SEIFA IRSD index in the Wagga Wagga study area

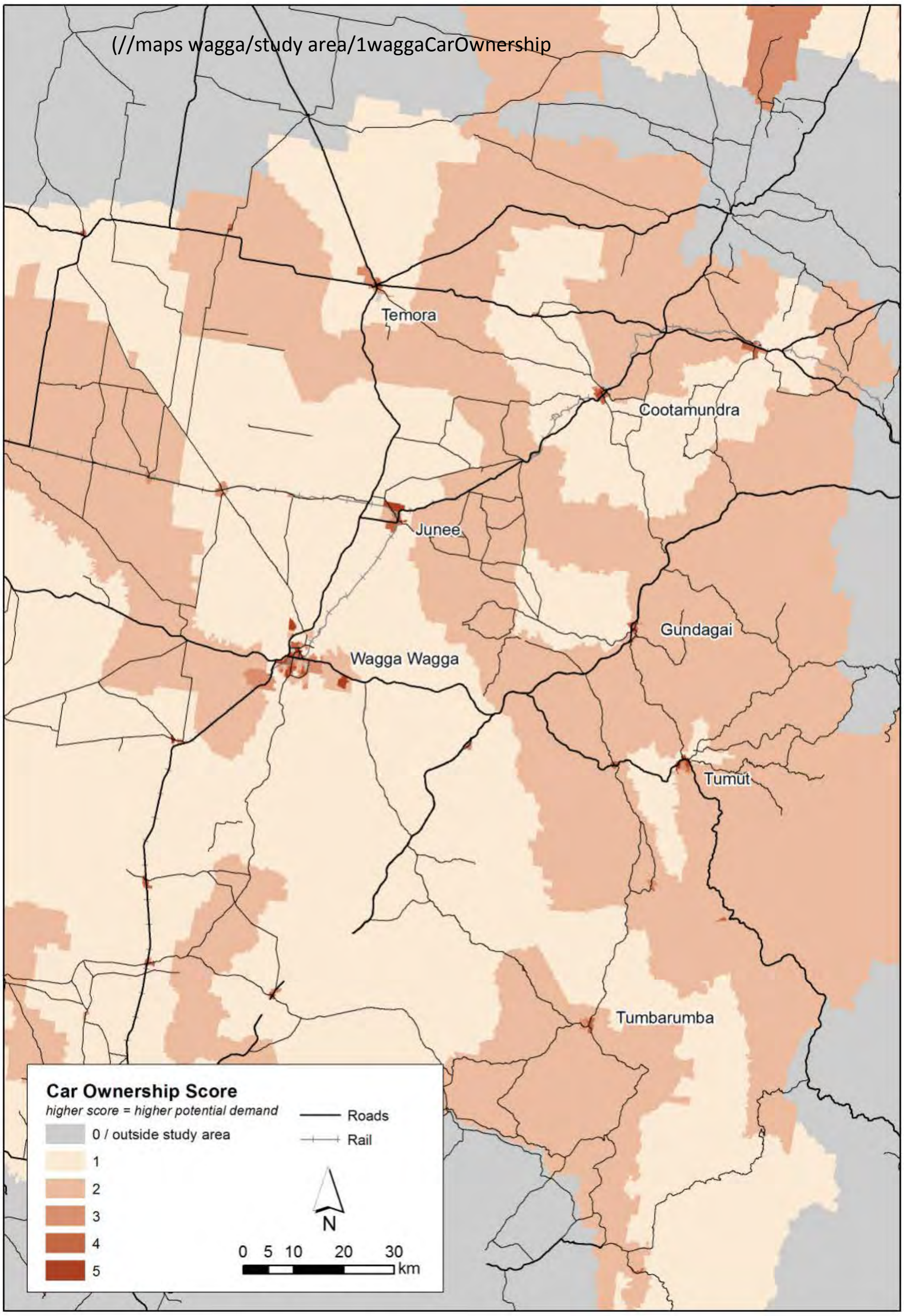

Figure W 4: Car Ownership (% dwellings with zero or 1 car) in the Wagga Wagga study area

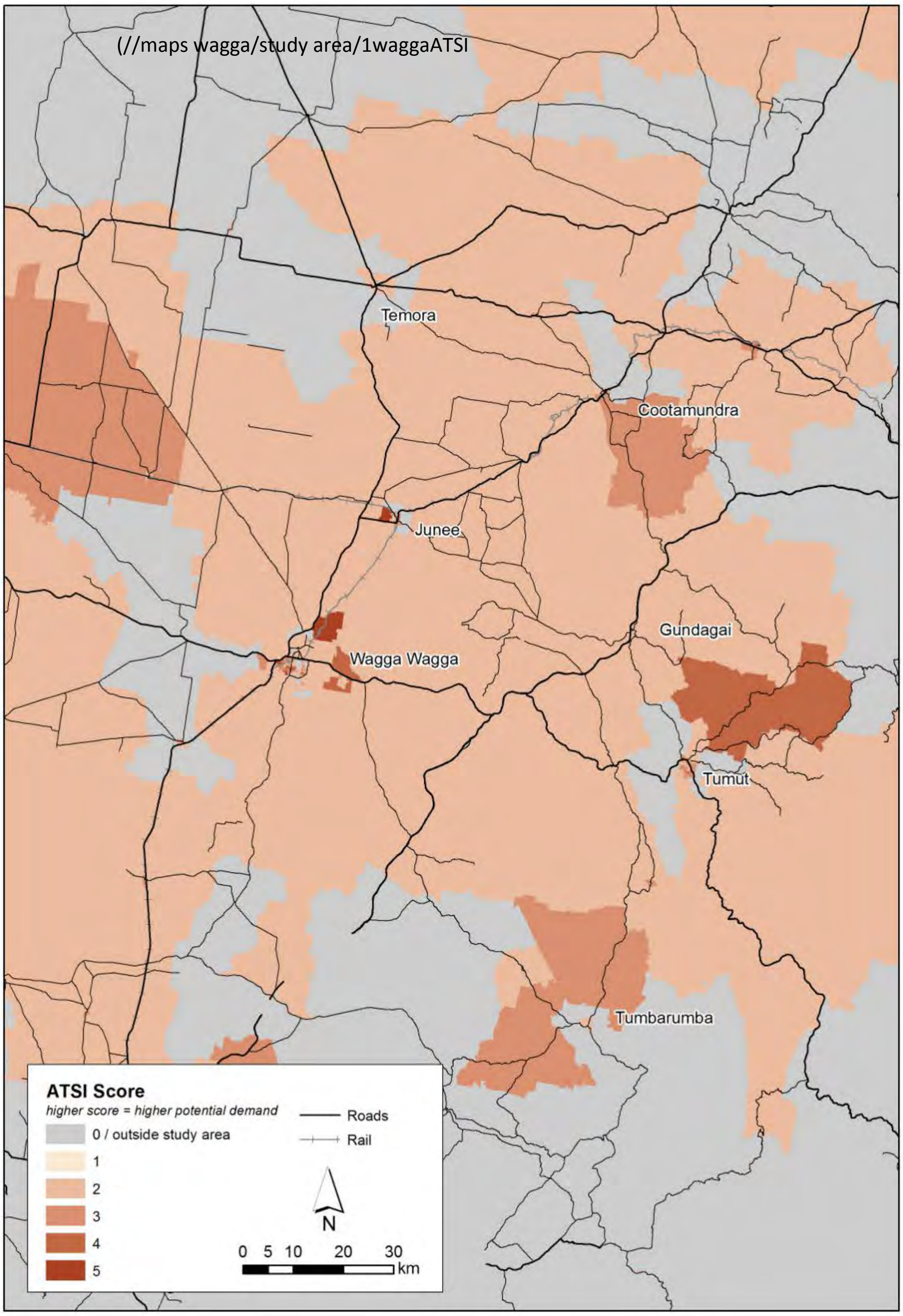

Figure W 5: Percentage of ATSI population in the Wagga Wagga study area

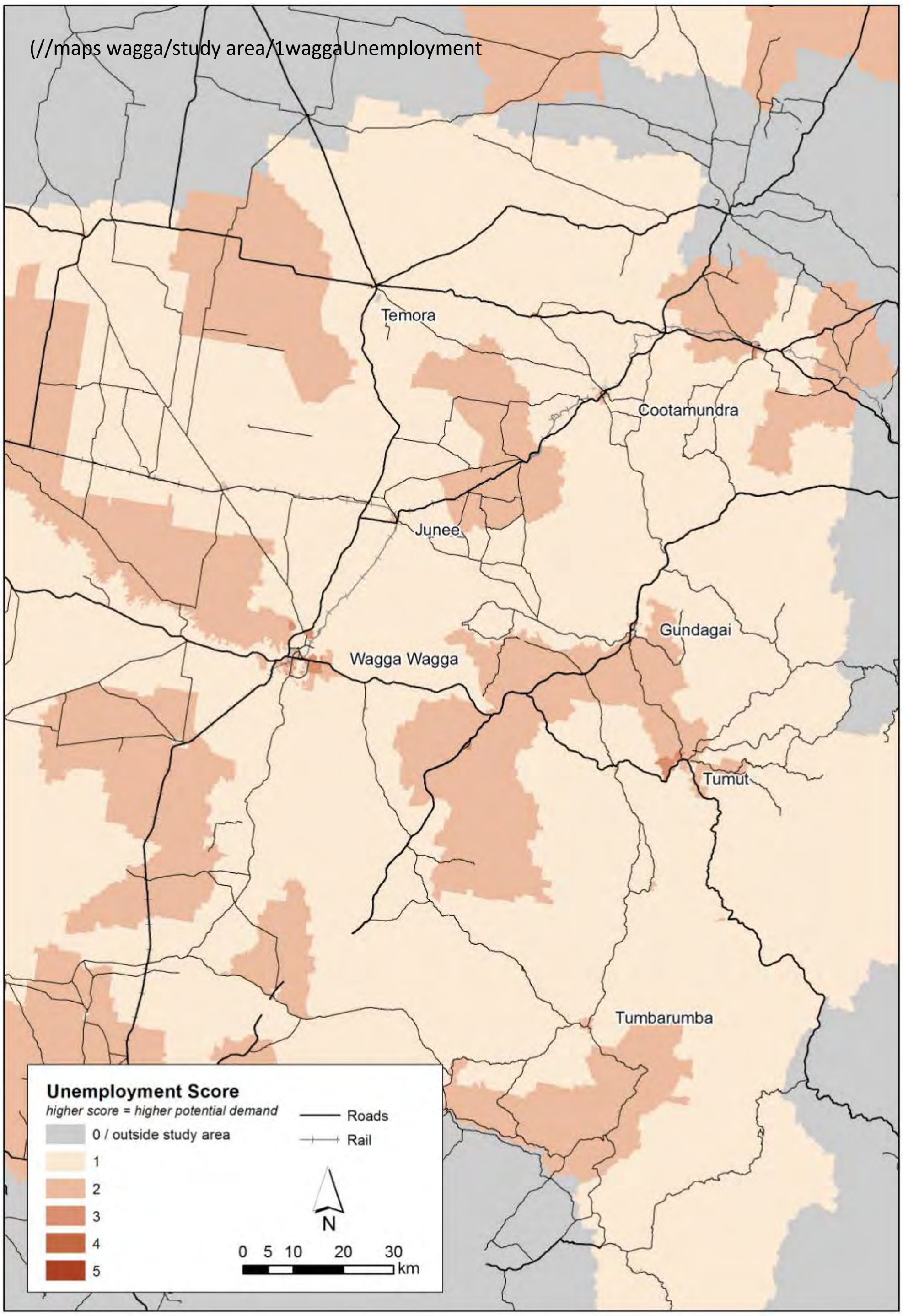

Figure W 6: Percentage of unemployment in the Wagga Wagga study area

The application of the weighting regimes to achieve a ranking of the major settlements in the Wagga Wagga study area is summarised in the Methodology, Table 3. These are presented in Table W 1 to rank the major settlements for the 10 minute catchment area (in green) and 20 minute catchment area (in blue).

Table W 1: Rankings of major settlements in Wagga Wagga against each weighting regime

	Depot	Rank in Regime 1	Rank in Regime 2	Rank in Regime 3	Rank in Regime 4	Potential Demand
10min	Cootamundra	2	2	1	2	High
	Junee	1	1	3	3	High
	Temora	4	4	2	1	High
	Tumut	3	3	4	3	
	Wagga Wagga	5	5	5	5	
20min	Cootamundra	2	2	3	3	
	Junee	3	3	1	1	High
	Temora	5	4	4	4	
	Tumut	1	1	2	2	High
	Wagga Wagga	4	5	5	5	

The Wagga Wagga study area, unlike the Coffs Harbour and Orange study areas, does not show such a consistent picture in terms of the rankings of the major settlements against 'need', broadly defined in terms of the elements of the weightings. The weighting regimes 1 and 2 which include population density and not remoteness work 'in favour' of the larger settlements such as Wagga Wagga because population density is low, almost uniformly so, across the study area (see Figure W 1). However, the weighting regimes 3 and 4 replace density with remoteness and for a large part of the study area (see Figure W 2) settlements are not so remote. This explains the switching of highest potential demand, on the basis of need, between the regimes based on density and remoteness. Inspection of the raw scores shows very little absolute difference between the scores for the 10 minute catchment areas and a pattern of a distinct gap in scores between Temora and Wagga Wagga and the other three major settlements for the 20 minute catchment areas.

This suggests that if Wagga Wagga was chosen as the study area in which to undertake the pilot introduction of FTS, and only one major settlement was to be chosen for FTS then any of the areas would be suitable for a 10 minute catchment area with Cootamundra or Junee being slightly better depending on the weighting of density to remoteness.

Potential Supply and Savings from Fixed timetabled routes

As identified in the Methodology, FTS becomes a substitute for some services within the study area if treated as an access service to timetabled services. Table W 2 shows the potential services that could be withdrawn in Wagga Wagga town centre, although this table needs to be considered along with the commentary expressed in the Methodology about the circumstances under which particular routes should be retained. Table W 2 is followed by a map showing these services Figure W 7.

Table W 2: Services that could be replaced by the introduction of FTS

Depot/Town	Town Services
Wagga Wagga	960, 961, 962, 963, 964, 965, 966, 967

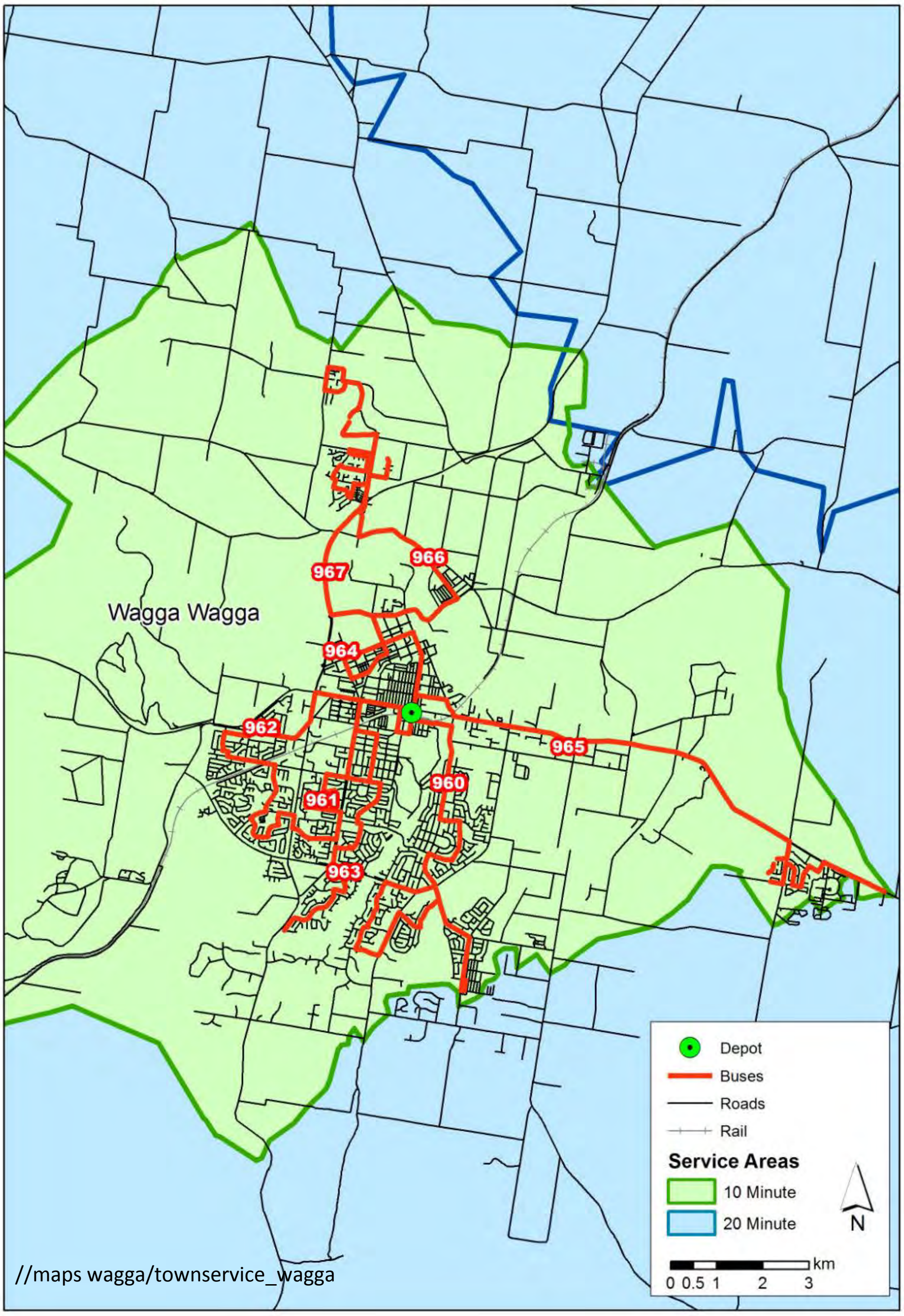

Figure W 7: Potential timetabled services to be replaced when FTS introduced in Wagga Wagga

Table W 3 shows the timetable kilometres and timetabled minutes that are saved if the services shown in Table W 2 (and mapped in Figure W 7) are removed upon the introduction of FTS to the relevant depot. Table W 4 converts the kilometres saved into a weekly dollar savings.

Table W 3: Potential savings in distance and time per week from removing scheduled services identified in Table W 2 upon the introduction of FTS

Depot/Town	Weekday km saved	Weekday minutes saved	Saturday km saved	Saturday minutes saved	Sunday km saved	Sunday minutes saved
Wagga Wagga	1746	4296	1341	3290	0	0

Table W 4: Potential savings in $ per week from removing services identified in Table W 2 upon the introduction of FTS

Depot/Town	Weekday	Saturday	Sunday	Total $ per week
Wagga Wagga	$43,400	$2,611	$0	$19,610

For the whole of this study area, assuming a 52 week operation, this represents a saving of $1,019,732.

The services that would be retained to provide the links between the major settlements are shown in Figure W 8. Figure W 9 shows an alternative scenario in which the route between Wagga to Junee is streamlined to a single route, thus providing enhanced frequency by the concentration of resources.

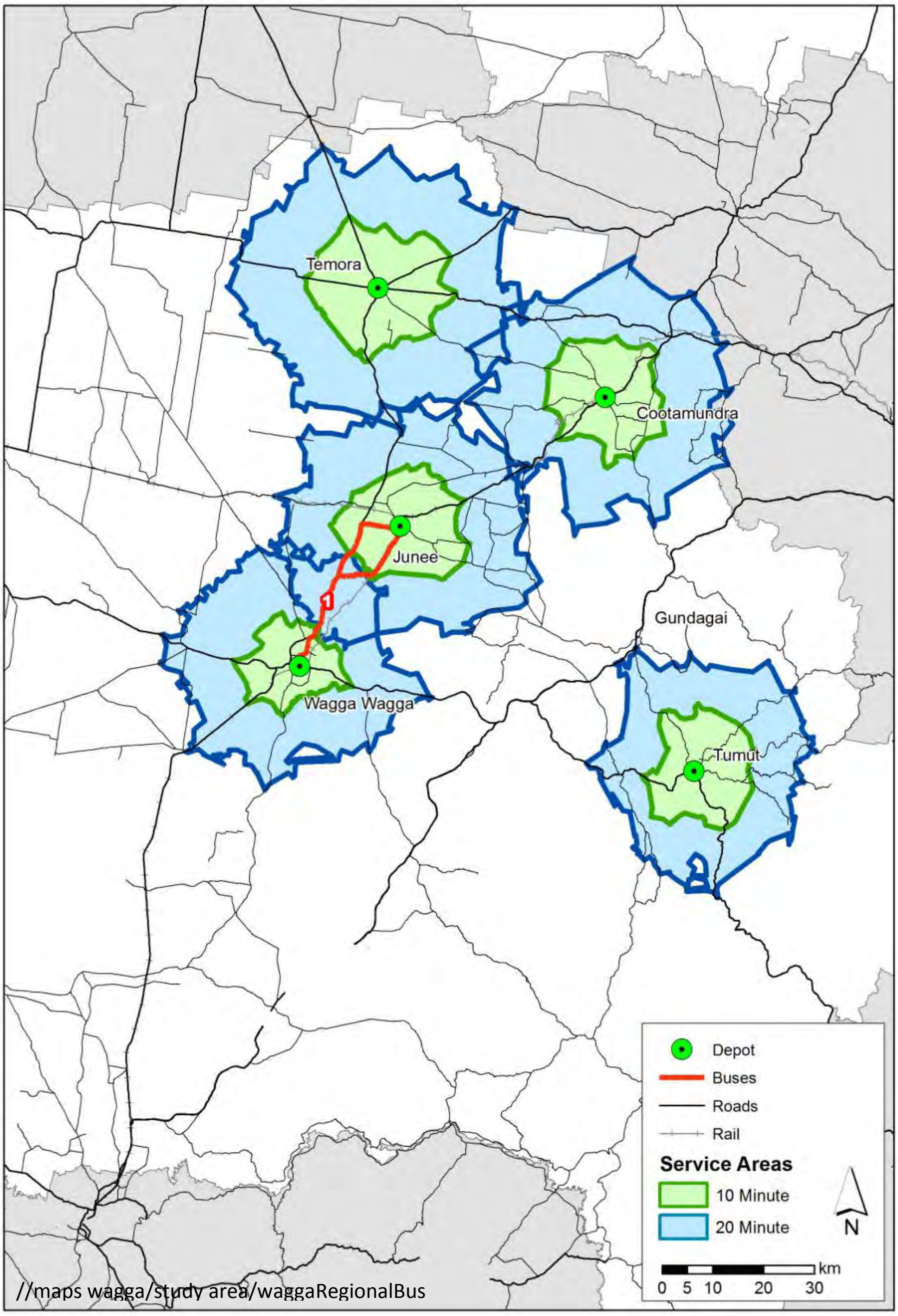

Figure W 8: Regional routes retained to provide connections between major settlements in the Wagga Wagga study area

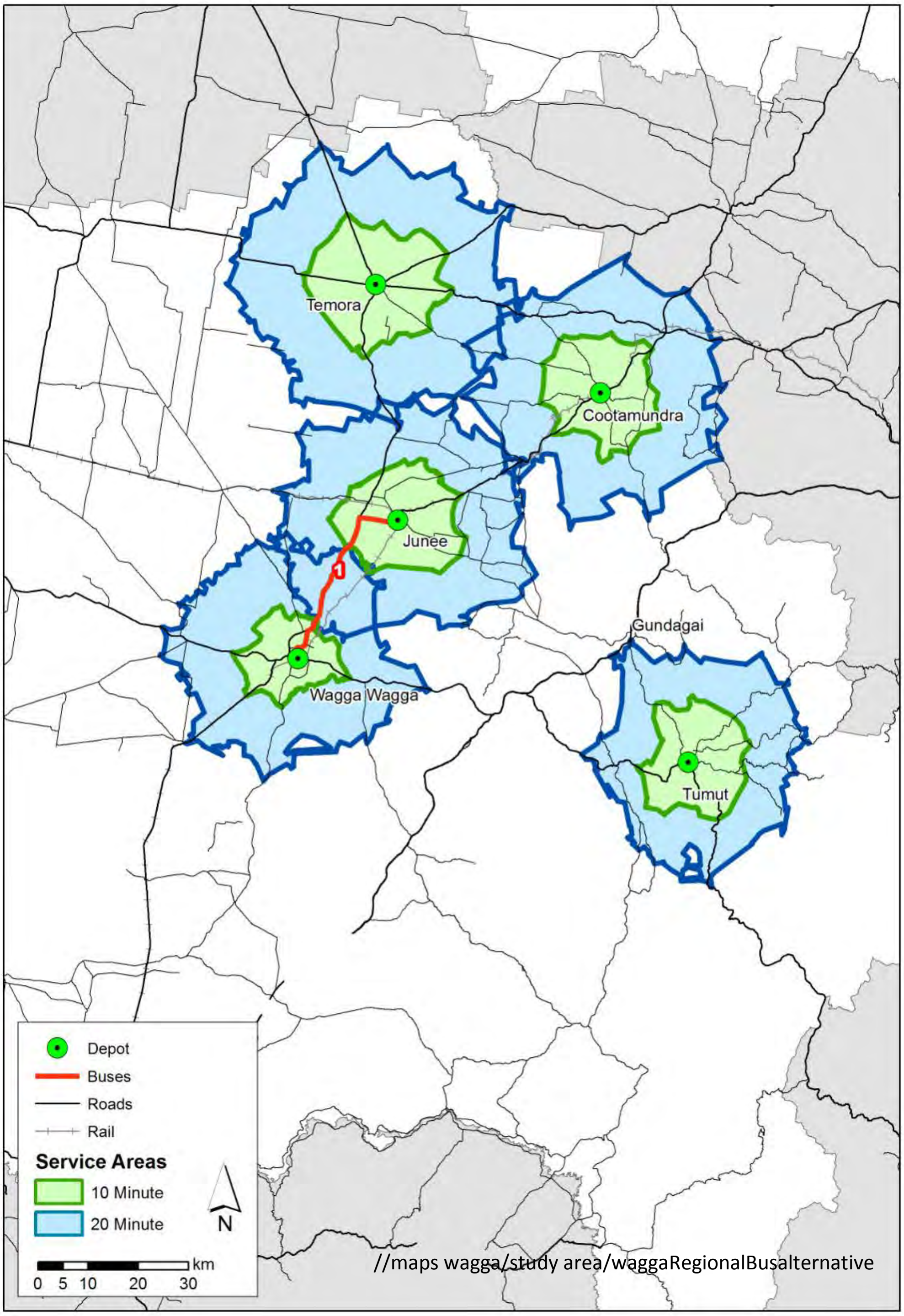

Figure W 9: Alternative scenario for retained regional routes to provide connections between major settlements in the Wagga Wagga study area

Potential Demand and Revenue

Demand

As described in the Methodology, Table W 5 shows the identification of the number of people in each of the vulnerable people categories for each of the depot areas. The sum of these provides the base for potential demand that would need to be met by FTS per week.

Table W 5: Numbers of vulnerable people, by category, in the depot catchment areas

	Depot	0 or 1 car in the household	Older people	Young people	Employed
10min	Cootamundra	1,317	389	1,732	2,571
	Junee	700	192	1,303	1,854
	Temora	850	238	1,128	1,867
	Tumut	1,197	314	2,061	3,416
	Wagga Wagga	8,558	1,607	15,495	26,795
20min	Cootamundra	778	220	1,632	2,334
	Junee	936	275	1,532	2,392
	Temora	1,374	375	2,458	3,950
	Tumut	1,415	449	1,992	2,923
	Wagga Wagga	8,826	1,725	16,682	29,191

Table W 6 adjusts the total of the counts of vulnerable populations identified in Table W 5 to the base potential demand that would need to be met by FTS per week, using the 10% assumption of potential demand and the ranking of each major settlement, where 1 identifies the highest potential demand.

Table W 6: Total population of vulnerable people and potential demand for each depot catchment area

	Depot	Total vulnerable population count	Potential demand (10% of total)	Rank
10min	Cootamundra	6,009	257	3
	Junee	4,049	185	5
	Temora	4,083	187	4
	Tumut	6,988	342	2
	Wagga Wagga	52,455	2,680	1
20 min	Cootamundra	4,964	233	5
	Junee	5,135	239	4
	Temora	8,157	395	2
	Tumut	6,779	292	3
	Wagga Wagga	56,424	2,919	1

The distribution of population, according to these variables, in the 10 minute and 20 minute catchment areas is shown by Figure W 10 to Figure W 12.

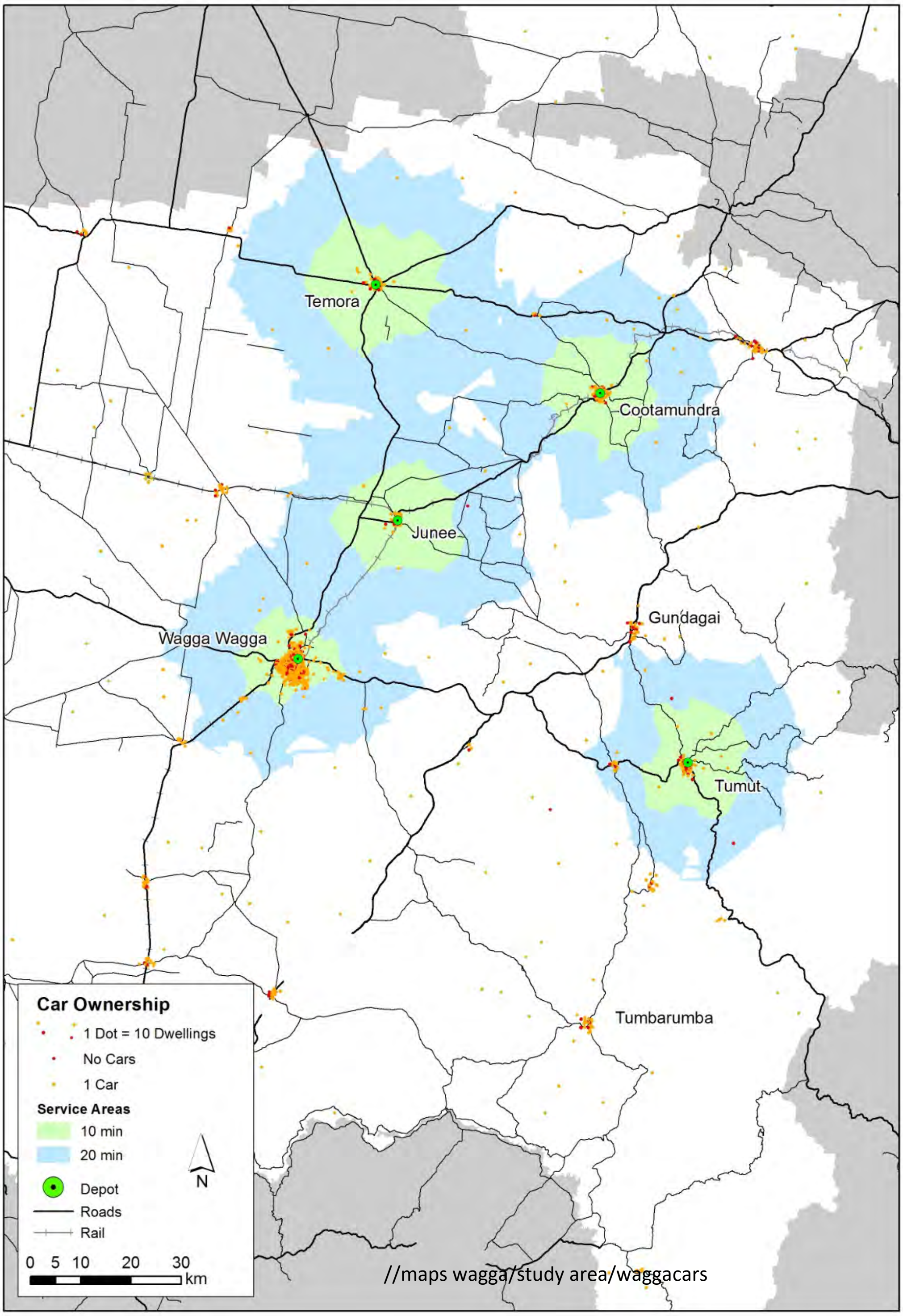

Figure W 10: Distribution of dwellings with none or one car in the Wagga Wagga study area

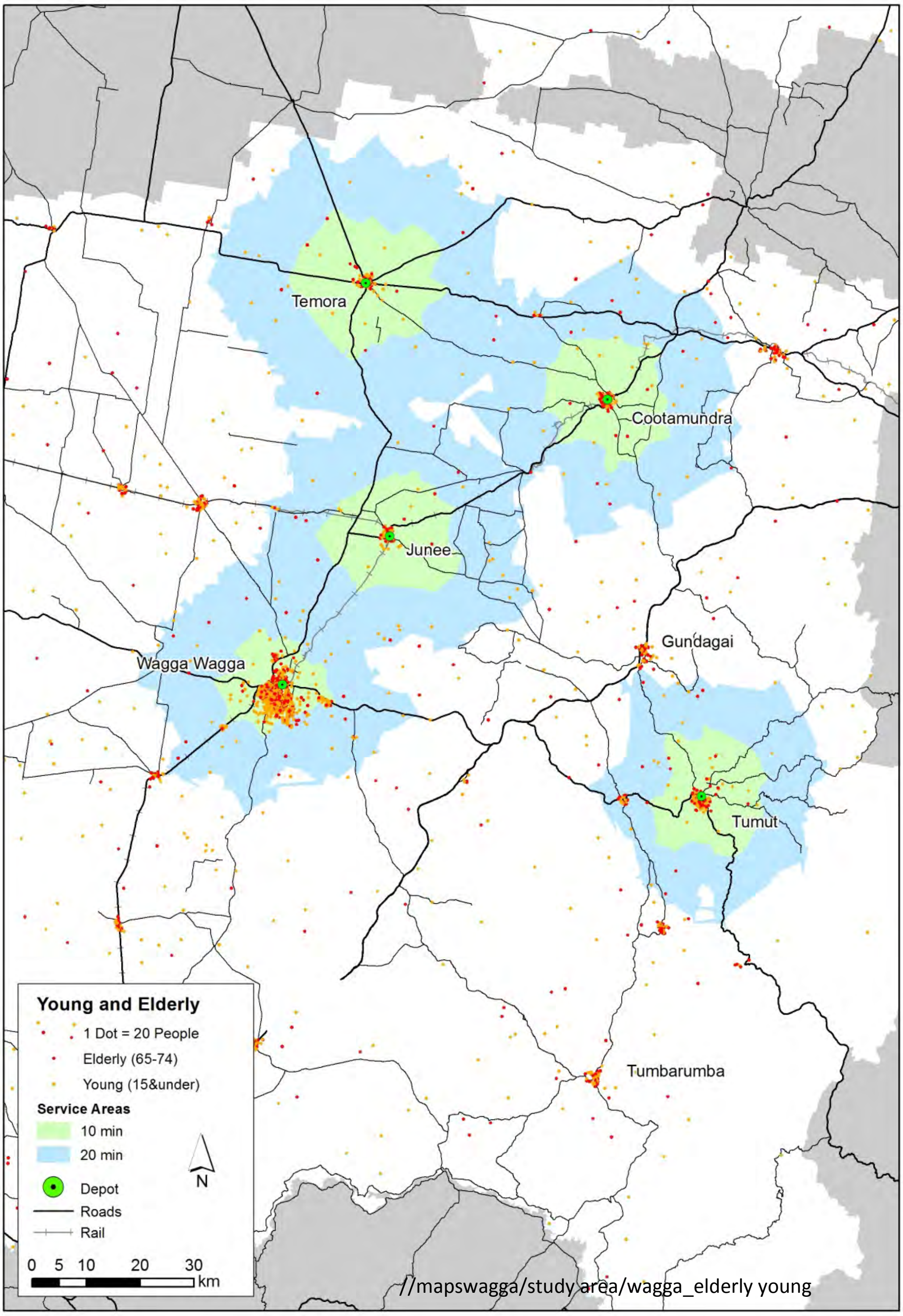

Figure W 11: Distribution of the older and young population in the Wagga Wagga study area

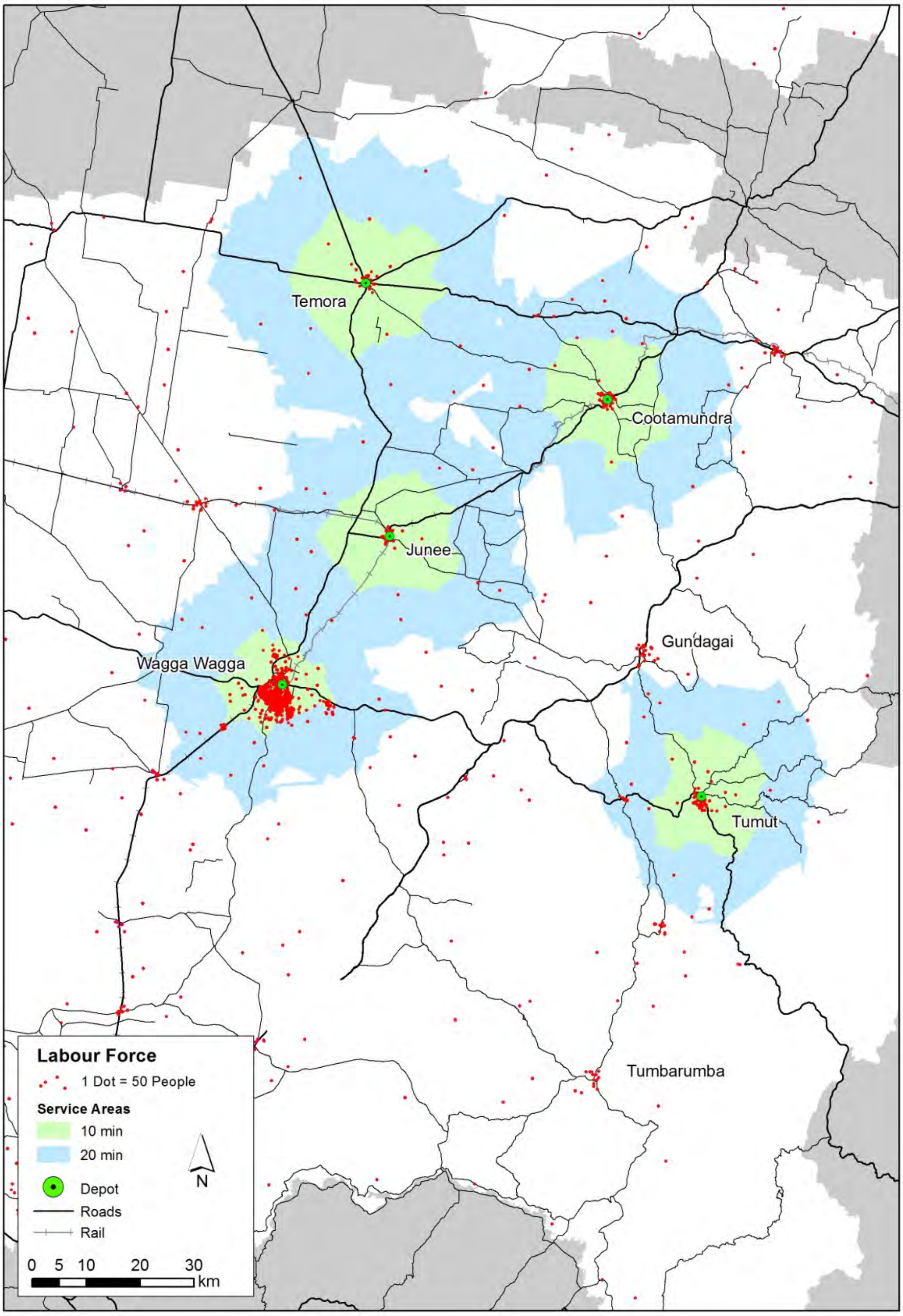

Figure W 12: Distribution of the employed population in the Wagga Wagga study area

Costs of Meeting Demand

As discussed in the Methodology, different groups within the community are likely to make a different number of trips per week for which transport is needed. For the purposes of this study, it is assumed households with one or no car will take 10 trips (one-way) per week, older people will take 6 trips, young people aged 15 or below will take 2 trips per week (outside their school trips) and those utilising FTS to access jobs will take 10 trips per week.

Table W 7 presents the number of trips per week from converting the potential demand of 10 per cent of the vulnerable population (Table W 6) by reference to the assumptions of the number of trips by different groups.

Table W 7: The number of trips per week by different groups in the community

	Depot	0 or 1 car in the household	Older people	Young people	Employed	Total
10min	Cootamundra	1,317	233	346	2,571	4,468
	Junee	700	115	261	1,854	2,930
	Temora	850	143	226	1,867	3,085
	Tumut	1,197	188	412	3,416	5,214
	Wagga Wagga	8,558	964	3,099	26,795	39,416
20min	Cootamundra	1,415	269	398	2,923	5,006
	Junee	778	132	326	2,334	3,570
	Temora	936	165	306	2,392	3,799
	Tumut	1,374	225	492	3,950	6,041
	Wagga Wagga	8,826	1,035	3,336	29,191	42,388

Table W 8 converts these trips to a minimum number of car and minibus trips using the information presented in the Methodology, Table 5 and the number of vehicle trips assuming 7 and 6 day operation with an even profile of demand (giving rise to more vehicles on a 6 day operation as the given demand is spread over a smaller number of hours). It must be acknowledged that an even profile of demand is unlikely but this approach gives a baseline range to the number of vehicles to meeting demand.

This table identifies where minibus or car operation may be more suitable. For example, for the 10 minute catchment area cars would be more suitable for Junee than a single minibus whereas in Wagga Wagga a minibus operation would be more suitable. This table also identifies that the 20 minute catchment area in Wagga Wagga would not be sensible, given the number of vehicles required.

Table W 8: The number of car and minibus trips per week and the number of vehicles required

	Depot	Number of car trips	Number of minibus trips	Number of cars (7 day operation)	Number of minibuses (7 day operation)	Number of cars (6 day operation)	Number of minibuses (6 day operation)
10min	Cootamundra	496	124	5	2	6	2
	Junee	326	81	3	1	4	1
	Temora	343	86	4	1	4	1
	Tumut	579	145	6	2	7	2
	Wagga Wagga	4,380	1,095	40	10	46	12
20min	Cootamundra	1,112	278	10	3	12	3
	Junee	793	198	8	2	9	3
	Temora	844	211	8	2	9	3
	Tumut	1,342	336	12	3	14	4
	Wagga Wagga	9,420	2,355	85	22	99	25

The costs of providing the number of vehicles identified in Table W 8 is calculated and presented in Table W 9 and Table W 10 for weekly costs and annual costs respectively. Weekly costs are calculated by reference to the km and hourly costs provided by TfNSW and annual costs are based on 52 week operation. In the calculations, the number of vehicles required is always rounded up so that if the number of trips requires 2.1 cars per day, for example, this is rounded up to a daily requirement of 3 cars per day for costing purposes. This drives some of the differences between the weekly and annual costs for six and seven day operation. It should be noted that because costs are built on the daily cost of providing a vehicle, these are the same for 6 or 7 day operation. In practical terms, 7 day operation is likely to be greater cost per vehicle supplied than seven times a weekday cost because of weekend loadings for staff.

Table W 9: Weekly cost of meeting demand by car and minibus (in $)

	Depot	car (7 day operation)	minibus (7 day operation)	car (6 day operation)	minibus (6 day operation)
10min	Cootamundra	$16,757	$8,723	$17,236	$7,477
	Junee	$10,054	$4,362	$11,491	$3,739
	Temora	$13,406	$4,362	$11,491	$3,739
	Tumut	$20,109	$8,723	$20,109	$7,477
	Wagga Wagga	$134,058	$43,617	$132,143	$44,863
20min	Cootamundra	$33,515	$13,085	$34,472	$11,216
	Junee	$26,812	$8,723	$25,854	$11,216
	Temora	$26,812	$8,723	$25,854	$11,216
	Tumut	$40,217	$13,085	$40,217	$14,954
	Wagga Wagga	$284,873	$95,958	$284,394	$93,465

Table W 10: Annual cost of meeting demand by car and minibus (in $)

		car	minibus	car	minibus
	Depot	**7 day operation**		**6 day operation**	
10min	Cootamundra	$871,377	$453,619	$896,274	$388,816
	Junee	$522,826	$226,810	$597,516	$194,408
	Temora	$697,102	$226,810	$597,516	$194,408
	Tumut	$1,045,652	$453,619	$1,045,652	$388,816
	Wagga Wagga	$6,971,016	$2,268,096	$6,871,430	$2,332,898
20 min	Cootamundra	$1,742,754	$680,429	$1,792,547	$583,225
	Junee	$1,394,203	$453,619	$1,344,410	$583,225
	Temora	$1,394,203	$453,619	$1,344,410	$583,225
	Tumut	$2,091,305	$680,429	$2,091,305	$777,633
	Wagga Wagga	$14,813,409	$4,989,810	$14,788,513	$4,860,205

Investigation of the potential to develop flexible or on-demand transport solutions for regional NSW

Professor Corinne Mulley

Deliverable 4: The evaluation framework for FTS implementation

Introduction: the purpose of the Evaluation Framework

This framework sets out a plan for measuring the effectiveness of the FTS pilots. These pilots will be identified, planned and implemented according to the needs assessment, identification of FTS costs, and business case framework (project tasks 4, 5 and 6 respectively).

The intention to carry out pilots for the FTS study enables the researchers and practitioners to combine the FTS theory with experience in the field to generate learning about how effectively the services can be implemented and operated in NSW. The framework below has a structure that is intended to maximise these learning opportunities.

Factors to be assessed by the evaluations

The aims of the pilots will be to:

- (i) Assess the feasibility of FTS in NSW
- (ii) Enable estimation of the practical outcomes of FTS implementation in the form of benefits with respect to different stakeholder groups;
- (iii) Test the accuracy of the needs assessment (demand forecasts) and the identification of FTS costs;
- (iv) Identify service quality issues to be addressed in future pilots or full FTS implementations in NSW.

The pilot evaluations will examine progress on each of these aims. Thus the pilot evaluations will provide learning material for the furtherance of the FTS project.

Clearly not all of these aims can be measured directly using quantitative methods therefore this framework includes a mix of quantitative and qualitative methods.

This evaluation plan proposes measures that will test the effectiveness of each pilot against its aims. The pilots will be projects with aims that are unlikely to be the same as those for an ongoing FTS operation. Therefore it is to be expected that an ongoing FTS operation would use a different performance framework – with different performance indicators – to the one specified here.

Measurement methods

This section specifies the approaches to measurement for each of the aims set out in the previous section.

(i) Assess the feasibility of FTS in NSW

The feasibility of FTS in NSW would be under question if the pilot study were to identify an implementation issue that proved to be insoluble in the NSW context. Therefore the evaluation should include an examination of all implementation issues identified during the pilot and their solutions. The evaluation report will include an assessment of whether the solutions to the issues are likely to replicable in future FTS pilots or full FTs implementations. A prerequisite for this is that a full issues register be maintained for the pilot. This issues register would be used to inform a project review of each pilot project. This review should include sections summarising the key learning points from the management of the pilot and proposed ways of dealing with these issues in future pilots. The requirement for a project review would be built into the funding and contracting arrangements for each pilot.

(ii) Enable estimation of the practical outcomes of FTS implementation in the form of benefits with respect to different stakeholder groups

The benefits of FTS will be different for each stakeholder group consequently different measurement methods will be required for each group. This section looks at each stakeholder group separately. Note that not all benefits will be positive.

Stakeholder group	Potential benefits	Measurement
Society/Government	Δ overall public transport accessibility	Quantitative measure of accessibility (e.g. % of households within 400m of a functional bus service point*) measured across the pilot area before and during the pilot. The analysis should pay attention to the 'vulnerable groups' (older people, households with no access to a car, young people, people requiring access to employment and people with disabilities) identified in the needs assessment.
Funders (TfNSW and others)	Δ revenue	Total revenue received before and during the pilot
	Δ costs	Total and unit costs per passenger km or passenger trip (if passenger km not measureable) of bus services in the study area

Stakeholder group	Potential benefits	Measurement
	Δ achievement of organisational objectives (LTTMP)	Qualitative policy analysis with respect to public transport patronage and transport accessibility.
	Δ achievement of organisational objectives with respect to FTS	Qualitative policy analysis with respect to specific FTS policies.
	Achievement of funders' objectives with respect to this particular pilot	Each pilot will have specific objectives related to its expected outcomes. For example, an FTS may be designed to improve spatial access (network coverage) or temporal access (network coverage at particular times of day). All of these pilot-specific objectives must be made clear in the pilot plan.
Bus operators	Δ revenue	Fare box and contract revenue before and during the pilot;
Other operators (taxis, community transport, school buses)	Δ revenue	Collection of data on transport usage in the area before and during the pilot.
FTS operator (this may be an existing transport operator)	Service costs	Quantitative analysis of operational costs across the pilot
	Scheduling effort	Qualitative assessment of effort required to co-ordinate FTS, supported if applicable by data on additional systems expenditure and if possible by quantitative workload data.

Stakeholder group	Potential benefits	Measurement
Service users	Δ accessibility of transport services	Existing and new service users should be assessed separately. The same measure as used for assessing overall transport accessibility (see above) applied to a sample of service users. These data would enable an analysis of changes to the *distribution* of accessibility for the two groups. In addition, times taken to reach local services by public transport should be compared.
	Purpose of FTS trips	A quantitative survey of the reasons for using the FTS services. In particular, benefits will depend on whether the passenger is using FTS to access services directly or as a link into the wider public transport network.

* Note: The measure '% of households within 400m of a functional bus service point' requires a definition of a 'functional bus service point'. In conventional (fixed timetabled route) bus operations it is normally defined as a bus stop served by a certain minimum frequency of bus services. FTS services do not necessarily stop at bus stops. Therefore 100% of households *in the FTS time-based catchment area* will have accessibility, and in most cases the FTS across a given measurement area will give a higher score than the conventional service. What is important for the evaluation of a pilot is the change in score brought about by the introduction of FTS. The comparative size of change in scores in successive pilots will be valuable information for determining the types of area where FTS has the highest economic/societal benefits.

(iii) Test the accuracy of the needs assessment (demand forecasts) and the identification of FTS costs

Forecasts of demand are often critical to the success of transport projects. Therefore a full review of the accuracy of patronage forecasts will be undertaken on completion of the pilot. This review will require transparency and clarity around the forecasting methods and on the collection of robust patronage data during the pilot.

The evaluation will also test any assumptions made in the needs assessment and the business case. The specification for project deliverable 3 should include a requirement that each assumption is set out clearly with an indication of how it will be tested using empirical data from the pilots.

In addition the pilot evaluation presents an opportunity to assess the completeness and accuracy of the identification of FTS costs (project task 5). In order to enable this analysis cost data will be collected in a form consistent with the output of project task 5.

(iv) Identify service quality issues to be addressed in future pilots or full FTS implementations in NSW

The longer term sustainability of FTS in NSW will to some extent depend on the quality of services provided. Therefore service quality will be measured for the pilots. This measurement will help to ensure that existing public transport quality standards are not being compromised by FTS, and that any quality standards applicable only to FTS are benchmarked.

Existing standards include passenger safety, comfort and overall service satisfaction. Any change in levels achieved in these standards in the pilot area will be documented.

New standards relate to the nature of FTS. Of particular importance are passenger perceptions of the new services in relation to:

(a) Time between booking and pick-up;

(b) Ease of booking a service;

(c) Access to information about the services

In fact standards for these factors may already exist in sectors which already provide FTS-type services such as taxis and community transport. In any case the experiences of users of transport in these sectors can be used for benchmarking the FTS pilots.

Reporting of the evaluation

Each pilot will be reported using the structure and contents of this plan. The funding for the pilot will need to include sufficient resource to enable the preparation and dissemination of the reports.

The principle purpose of the pilot evaluations is to facilitate learning across all stakeholders. Consequently the evaluation reports, set out using the structure of this framework, will be disseminated to all stakeholder groups. This will of course necessitate some additional work to make the documents accessible to each of the target groups.