Mapping cities by transit riders' trajectories: The case of Brisbane, Australia

It is well documented how mega-scale transport infrastructure can shape and reshape the built form and even drive economic development at a national level (Banister, 1995; Rodrigue et al., 2013). In the United States (US), the transcontinental railroads and the interstate highways, for instance, have profoundly transformed many cities and regions (White, 2012; Murphy, 2009). Anecdotally, one of the few man-made features that astronauts in outer space can clearly distinguish is the US interstate highway system. Compared to private transport modes, public transit often does not have much in the way of exclusive infrastructure like highways and thus its identity is arguably less salient. Perhaps to many residents living in car-dependent cities and regions, public transit is even regarded as something 'irrelevant' or even considered 'unpleasant' in their daily lives (Hess, 2012).

Emerging non-traditional data (NTD) such as transit agencies' smartcard data and Google's General Transit Feed Specifications (GTFS) have made it easier to unveil the way in which public transit remains relevant, reveal how it facilitates daily mobility, and highlight the way in which different locales across a metropolitan area are connected by public transit. Based on a 24-hour period of smartcard data for Brisbane (04 March, 2014) allied with GTFS data, we retrieved 205,560 distinct transit riders' trip trajectories by direction (AM/inbound vs. PM/outbound). These riders account for 98% of all distinct riders that tapped their respective smartcards at least twice in that day. The trajectories allow us to see how local public transit infrastructure, which consists of heavy railroads, ferries, buses, and bus rapid transit (locally referred to as busways), were used and how this usage has linked various locales around the city, that is, forms a spatial structure that is facilitated and even enabled by public transit.

Figure 1 visualises the trajectories using a waterpark metaphor, in that, like water, people flow downhill. To this end we show people flowing in towards the CBD during the morning peak and outbound from the CBD during the afternoon peak. The figure indicates that public transit infrastructure to and from the CBD was most heavily utilised with the effect of connecting inner-city locales with outlying suburbs. What is a little surprising is that some of the public transport infrastructure has served different numbers of riders when we examine differences between AM/inbound and PM/outbound trajectories, wherein subtle variations exist. More specifically, transit corridors between the northern exurbs and the inner city, most notably, tend to serve fewer inbound riders than outbound ones pointing to the northern suburbs. This could imply that residents' demand for transit services is more concentrated in the morning than in the evening. In summary this visualisation permits us to examine the use of public transit infrastructure through a new lens whereby we can see the way in which public transit remains relevant to many travellers across the Brisbane metropolis, a developed city where most trips are completed by automobile. In addition, we highlight the capacity for an emerging NTD source to enhance our understanding of diurnal mobility across a metropolis with the potential to

contribute to how we manage public transit systems in our quest to progress towards more sustainable transport.

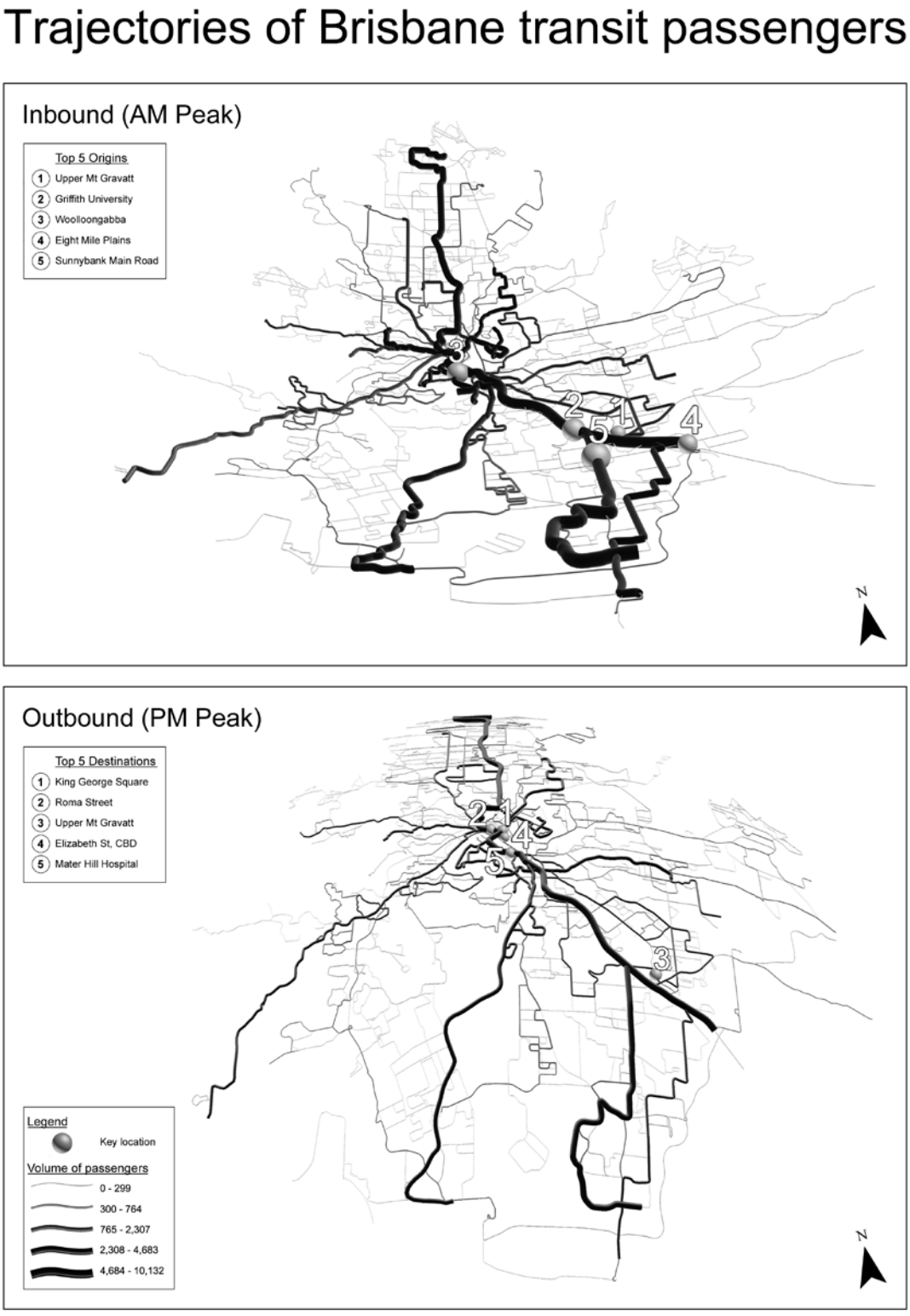

Figure 1: Trajectories of Brisbane Transit passengers (B&W)

Trajectories of Brisbane transit passengers

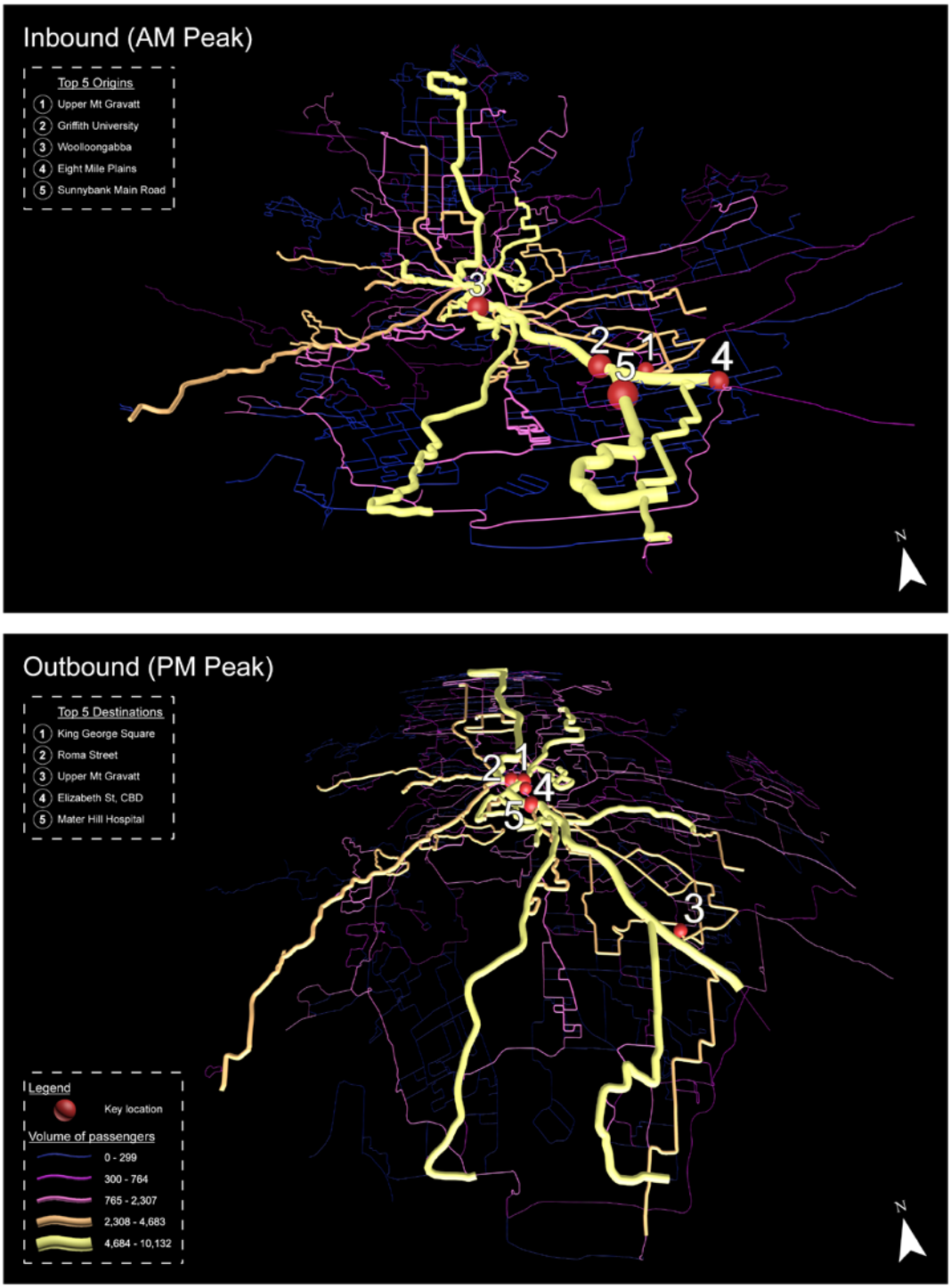

Figure 1: Trajectories of Brisbane Transit passengers (Colour 1)

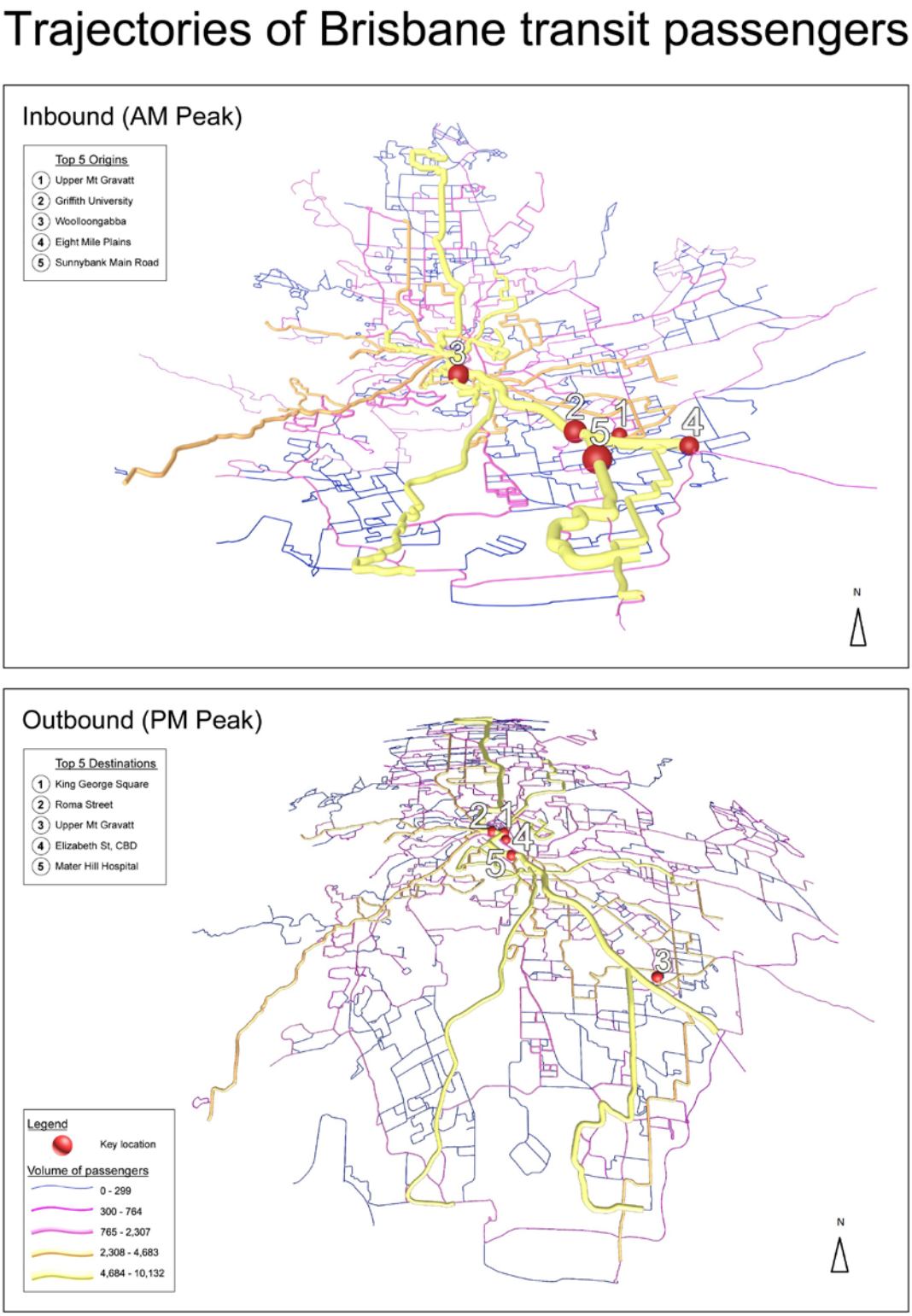

Figure 1: Trajectories of Brisbane Transit passengers (Colour 2)

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Software: API, TransCAD, 3ds Max and QGIS