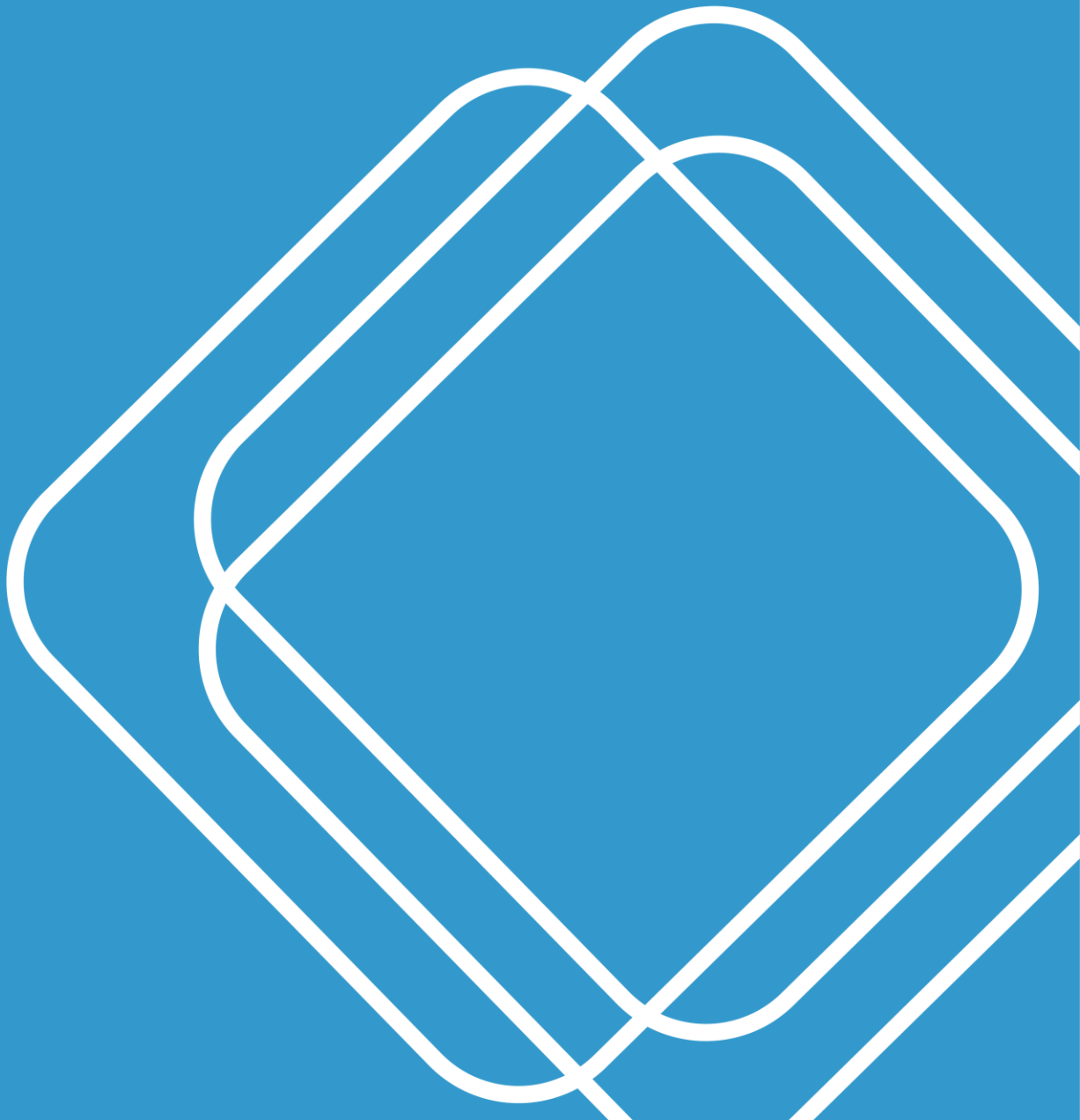


RAIL ACCESS & CAR OWNERSHIP IN OUTER URBAN AREAS

Final Study

12 DECEMBER 2018





Quality Assurance

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|------------------------|--|-------------|----------------|
| Project: | Rail Access & Car Ownership in Outer Urban Areas | | |
| Project Number: | SCT_00049 | | |
| Client: | Landcom | ABN: | 79 268 260 688 |
| Prepared by: | SCT Consulting PTY. LTD. (SCT Consulting) | ABN: | 53 612 624 058 |

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| Document name: | Rail Access & Car Ownership in Outer Urban Areas |
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| 1.0 | 4 December 2018 | Draft Report |
| 2.0 | 12 December 2018 | Final Report |
| | | |

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Executive Summary

SCT Consulting was engaged by Landcom to undertake a traffic impact assessment for Tallawong Station Precinct South (TSPS). As part of planning for the site, stakeholders raised concern over lower parking rates proposed adjacent to rail stations and sought more evidence for the acceptability of lower parking provision in areas well serviced by public transport.

The purpose of this study is to investigate the relationship between car ownership, development density and distance to transit. This report is based on Australian Bureau of Statistics (ABS) data provided by Sydney Metro, which was used to consider the broad trends across Sydney as well as some case studies in outer urban areas.

The study reviewed ABS meshblock data across Sydney as well as a reviewing case studies of apartment blocks close to rail stations.

The analysis indicates that shorter distances to stations and density contribute to lower levels of car ownership, but these factors don't fully account for the variability of customer choices. There are a number of different car ownership trends at different stations, with some regions having lower car ownership almost exclusively around stations and others where rail access has not changed levels of car ownership.

The case study provides numerous examples of low car ownership, despite significant walk times of up to 13 and even 25 minutes. The example of Jamison Road, South Penrith is even that despite a long trip to the local train station, car ownership levels can be quite low – 61% of households with one or zero cars.

There are several implications of this analysis:

- Households are willing to accept low levels of car ownership around train stations. The majority of train stations are already characterised by low levels of car ownership, except in stations characterised by poor frequency and potentially older housing stock;
- There remains a level of uncertainty regarding all of the variables that contribute to household car ownership decisions. There are significant levels of variance in different parts of Sydney that aren't fully accounted for in the density and distance to train station variables;
- Various levels of Government can influence car ownership. Academic research indicates that decisions about the public transport service offering, car parking controls, and urban design all influence the car driving and ownership (Cervero, 2002) (McKibbin, 2011) (Shoup, 2018).

Further work would be required to fully quantify the factors that influence car ownership choices.

1.0 Introduction

1.1 Background

SCT Consulting was engaged by Landcom to undertake a traffic impact assessment for Tallawong Station Precinct South (TSPS). As part of planning for the site, stakeholders raised concern over lower parking rates proposed adjacent to rail stations and sought more evidence for the acceptability of lower parking provision in areas well serviced by public transport.

1.2 Purpose of report

The purpose of this study is to investigate the relationship between car ownership, development density and distance to transit. This report is based on Australian Bureau of Statistics (ABS) data provided by Sydney Metro, which was used to consider the broad trends across Sydney as well as some case studies in outer urban areas.

2.0 Methodology

2.1 Data

Data was provided by Sydney Metro for the purposes of this analysis, which is shown in **Table 2-1**.

Table 2-1 Data used in preparation of this analysis

| Data source | Provider | Use |
|----------------------------|---|--|
| Meshblock shapefiles | Sydney Metro (also available on the ABS website) | Geography of meshblocks and concordance to other ABS geographies |
| Car ownership by meshblock | Sydney Metro, who originally received the data from ABS | Number of households with 0 cars, 1 cars... 30 cars per dwelling |
| Meshblock counts | Sydney Metro, who originally received the data from ABS | Number people and dwellings in each meshblock, as well as meshblock area and predominate use |
| OpenStreetMaps | OpenStreetMap contributors | Sydney geography |

Source: SCT Consulting, 2018

It is noted that for privacy reasons, the ABS anonymise data by applying random factors on top of many numbers. As a result, the case studies should be read with awareness that the result has a small degree of statistical uncertainty applied.

2.2 Analysis

2.2.1 Maps

For consideration of trends across Sydney, maps were prepared in a 'bivariate' style, showing the relationship of two variables on the same map – car ownership and development density. Given the proposal of TSPS to have units with reduced parking spaces, the number of households with zero or one cars is of most interest.

To simplify the readability of maps, the two variables were grouped into three bands, making a 3x3 grid of results. The development density bands were based on typical typologies:

- 0-22 dwellings / Ha is typical of detached dwelling urban form;
- 22-65 dwellings / Ha is typical of semi-detached to townhouse style urban form; and
- 65 dwellings / Ha is typical of apartment style urban form.

The bands are summarised in **Table 2-2**.

Table 2-2 Explanation of colouring bands for maps

| | 0 – 50% of households have 0-1 cars | 50 – 80% of households have 0-1 cars | More than 80% of households have 0-1 cars |
|-------------------------------|-------------------------------------|--------------------------------------|---|
| Density of 0-22 dw/Ha | | | |
| Density of 22-65 dw/Ha | | | |
| Density of more than 65 dw/Ha | | | |

Source: Colour scheme from Joshua Stevens, SCT Consulting, 2018

2.2.2 Case studies

For the case studies, meshblock data was aggregated up to small precincts of interest, located within proximity of train stations. Travel time information was taken using Google.

3.0 Regional Maps

The analysis maps were prepared for the following corridors / areas:

- Penrith to Doonside;
- Campbelltown to Liverpool;
- Panania to Narwee; and
- Sutherland.

These regions were selected as they can be generally characterised as a mix of different densities, with new and old apartment stock, as well as being outside of the inner suburbs of Sydney. A general map has been also prepared that covers Inner Sydney.

Maps are provided for the bivariate distribution (car ownership and density) as well as for car ownership only and development density only. These maps are provided as **attachments** to this technical note due to size.

The maps describing development density tend to be more ordered, with density typically located adjacent to train stations, although this is not universal. There are occasionally road corridors with higher levels of density, such as Port Hacking Road, Sutherland. It is interesting to note that lower levels of car ownership tend to be 'clustered' in regions, indicating that there are some underlying factors that influence behaviour that are evident in some areas and not in others.

Level of car ownership varies significantly in different geographies. In some areas, there is a clear trend of train stations tending to have pockets of lower car ownership and higher densities, with many locations experiencing very high levels (80%+) of households with one or zero cars. In many cases, households have lower car ownership despite being lower density – implying that households are opting out of car ownership regardless of car parking supply constraints. This can be observed in stations such as Chatswood, Macarthur, Campbelltown, Ingleburn, Croydon, Ashfield, and Wentworthville Stations.

However, there are examples where car ownership is high around stations – such as at Leppington and Holsworthy (both in Campbelltown to Liverpool) Stations. These stations are also characterised by low density urban form. A similar trend exists at:

- Como Station;
- Beecroft Station;
- Rydalmere Station;
- Cheltenham Station; and
- Warrawee Station.

These stations tend to have poorer train frequency than other stops on their lines, which could partially explain the need for higher car ownership.

On balance, shorter distances to stations and density influence lower levels of car ownership, but don't fully account for the variability of customer choices.

4.0 Case Studies

4.1 Blacktown Road, Blacktown

Figure 4-1 Blacktown Road case study area



Source: TfNSW, 2018

Table 4-1 Car ownership

| | |
|--------------------------------|------|
| No. of Dwellings | 371 |
| Average Cars per Dwelling | 0.88 |
| % Dwellings with 1 Car or less | 70% |

Source: SCT Consulting, and ABS, 2018

Table 4-2 Travel time to station and city

| | |
|----------------------------|------------|
| Walk to Station | 15 minutes |
| Cycle to Station | 7 minutes |
| Bus to Station | 13 minutes |
| Nearest City by Train | Parramatta |
| Train Time to Nearest City | 10 minutes |

Source: SCT Consulting, and ABS, 2018

4.2 Devitt Street, Blacktown

Figure 4-2 Devitt Street case study area



Source: TfNSW, 2018

Table 4-3 Car ownership

| | |
|--------------------------------|------|
| No. of Dwellings | 331 |
| Average Cars per Dwelling | 0.79 |
| % Dwellings with 1 Car or less | 69% |

Source: SCT Consulting, and ABS, 2018

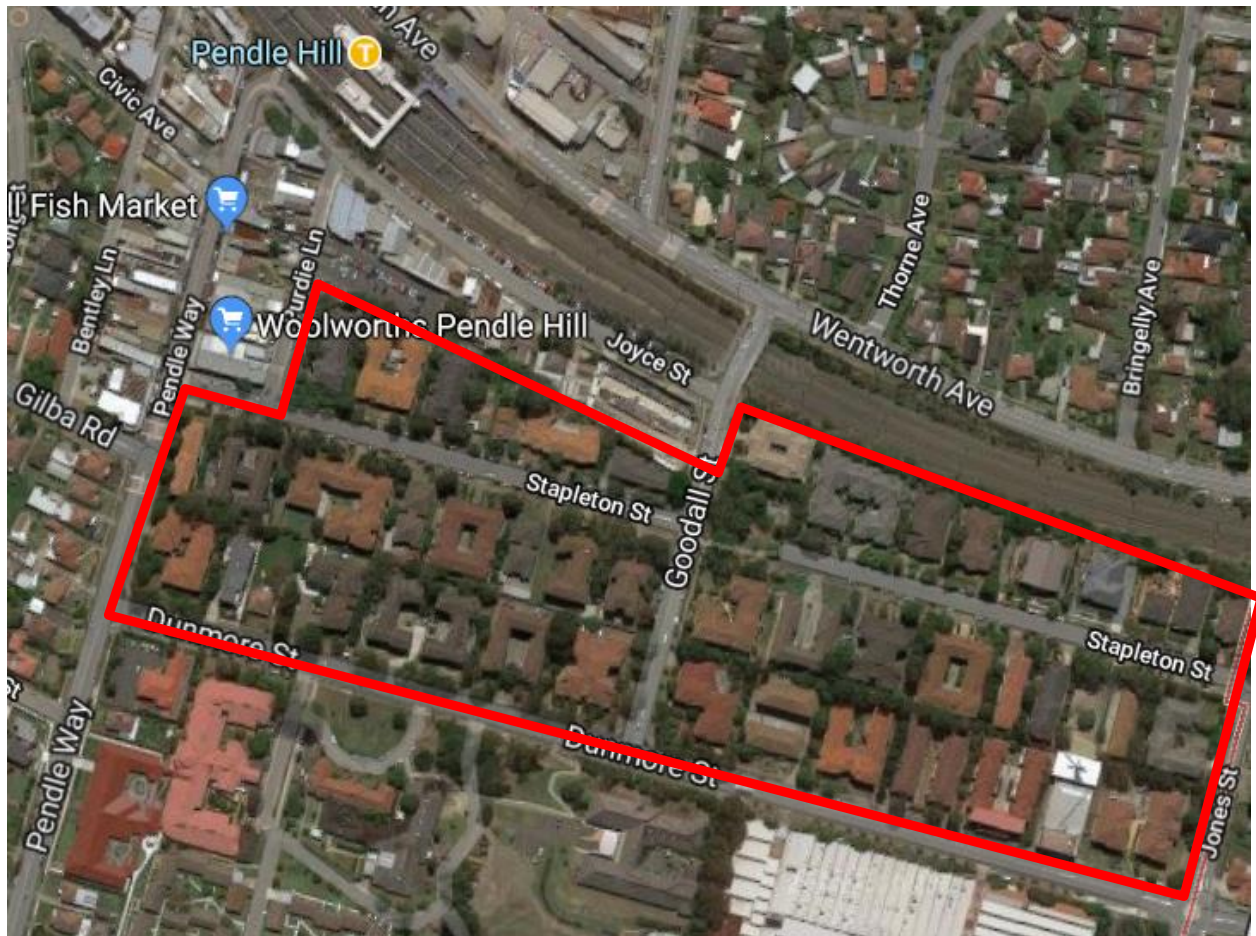
Table 4-4 Travel time to station and city

| | |
|----------------------------|------------|
| Walk to Station | 13 minutes |
| Cycle to Station | 10 minutes |
| Bus to Station | N/A |
| Nearest City by Train | Parramatta |
| Train Time to Nearest City | 10 minutes |

Source: SCT Consulting, and ABS, 2018

4.3 Pendle Hill

Figure 4-3 Pendle Hill case study area



Source: TfNSW, 2018

Table 4-5 Car ownership

| | |
|--------------------------------|------|
| No. of Dwellings | 692 |
| Average Cars per Dwelling | 0.83 |
| % Dwellings with 1 Car or less | 63% |

Source: SCT Consulting, and ABS, 2018

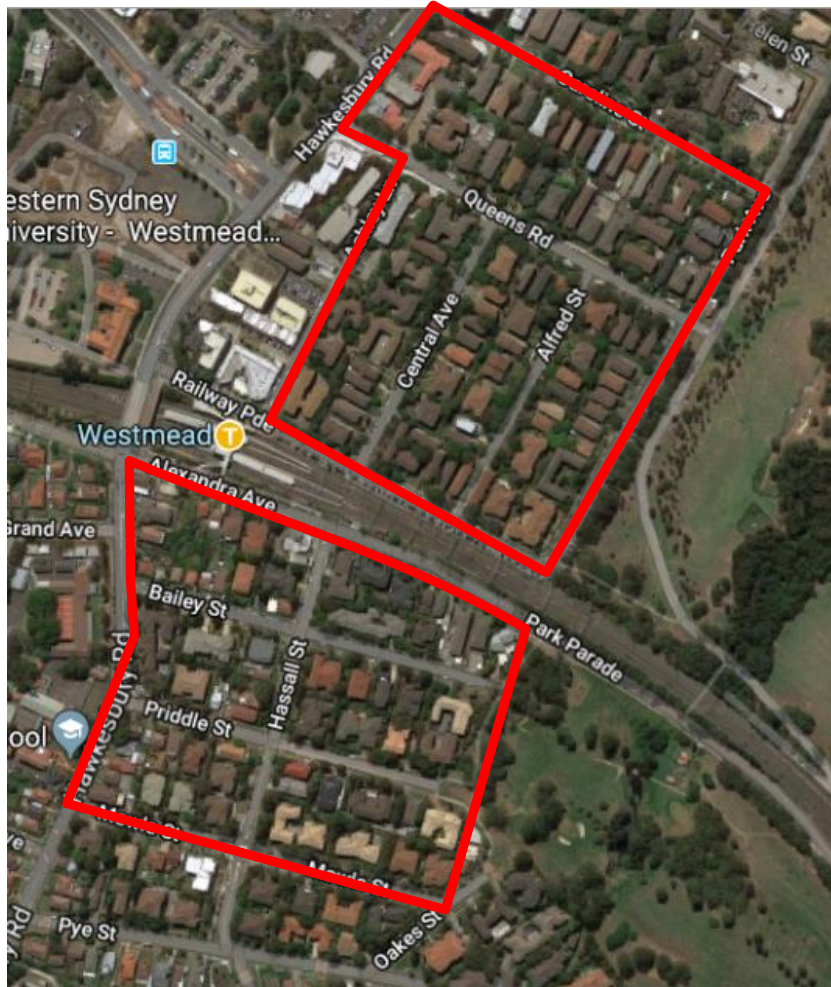
Table 4-6 Travel time to station and city

| | |
|----------------------------|------------|
| Walk to Station | 4 minutes |
| Cycle to Station | 5 minutes |
| Bus to Station | N/A |
| Nearest City by Train | Parramatta |
| Train Time to Nearest City | 7 minutes |

Source: SCT Consulting, and ABS

4.4 Westmead North and South

Figure 4-4 Westmead north and south case study area



Source: TfNSW, 2018

Table 4-7 Car ownership

| | |
|--------------------------------|-------|
| No. of Dwellings | 1,023 |
| Average Cars per Dwelling | 0.82 |
| % Dwellings with 1 Car or less | 78% |

Source: SCT Consulting, and ABS, 2018

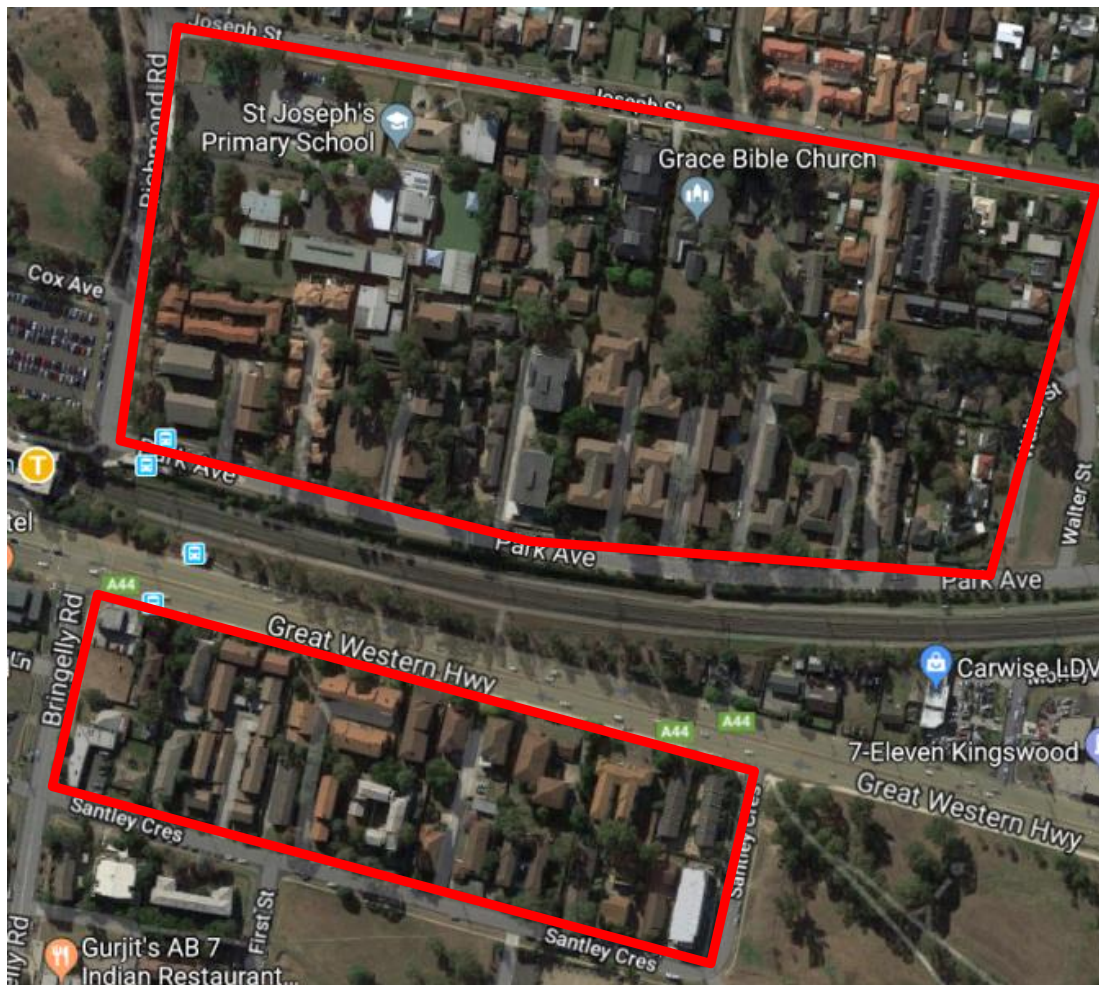
Table 4-8 Travel time to station and city

| | |
|----------------------------|------------|
| Walk to Station | 4 minutes |
| Cycle to Station | 4 minutes |
| Bus to Station | N/A |
| Nearest City by Train | Parramatta |
| Train Time to Nearest City | 2 minutes |

Source: SCT Consulting, and ABS, 2018

4.5 Kingswood North and South

Figure 4-5 Kingswood north and south case study area



Source: TfNSW, 2018

Table 4-9 Car ownership

| | |
|--------------------------------|------|
| No. of Dwellings | 666 |
| Average Cars per Dwelling | 0.59 |
| % Dwellings with 1 Car or less | 62% |

Source: SCT Consulting, and ABS, 2018

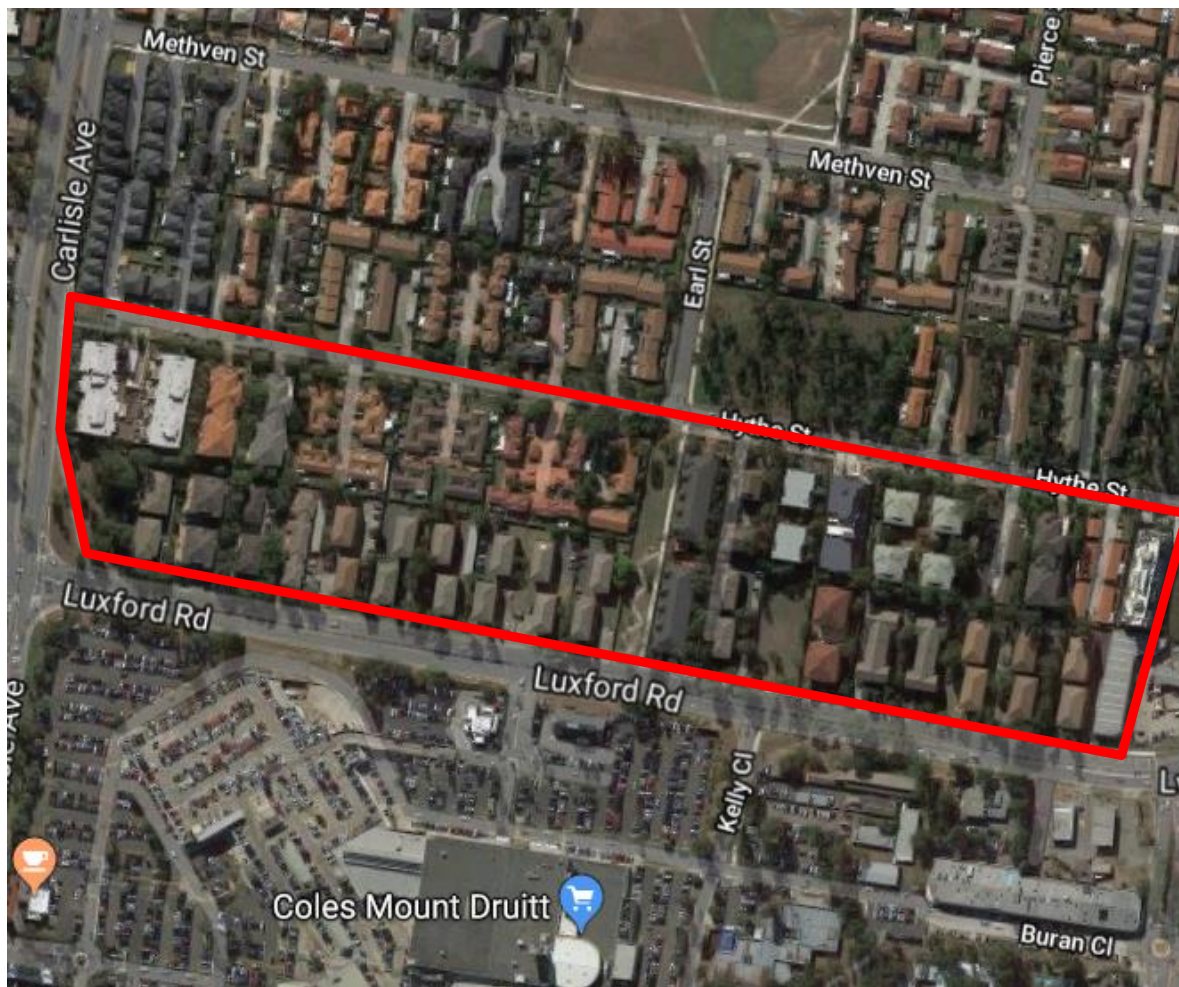
Table 4-10 Travel time to station and city

| | |
|----------------------------|------------|
| Walk to Station | 6 minutes |
| Cycle to Station | 6 minutes |
| Bus to Station | N/A |
| Nearest City by Train | Parramatta |
| Train Time to Nearest City | 34 minutes |

Source: SCT Consulting, and ABS, 2018

4.6 Luxford Road, Mt Druitt

Figure 4-6 Luxford Road case study area



Source: TfNSW, 2018

Table 4-11 Car ownership

| | |
|--------------------------------|------|
| No. of Dwellings | 771 |
| Average Cars per Dwelling | 0.78 |
| % Dwellings with 1 Car or less | 69% |

Source: SCT Consulting, and ABS, 2018

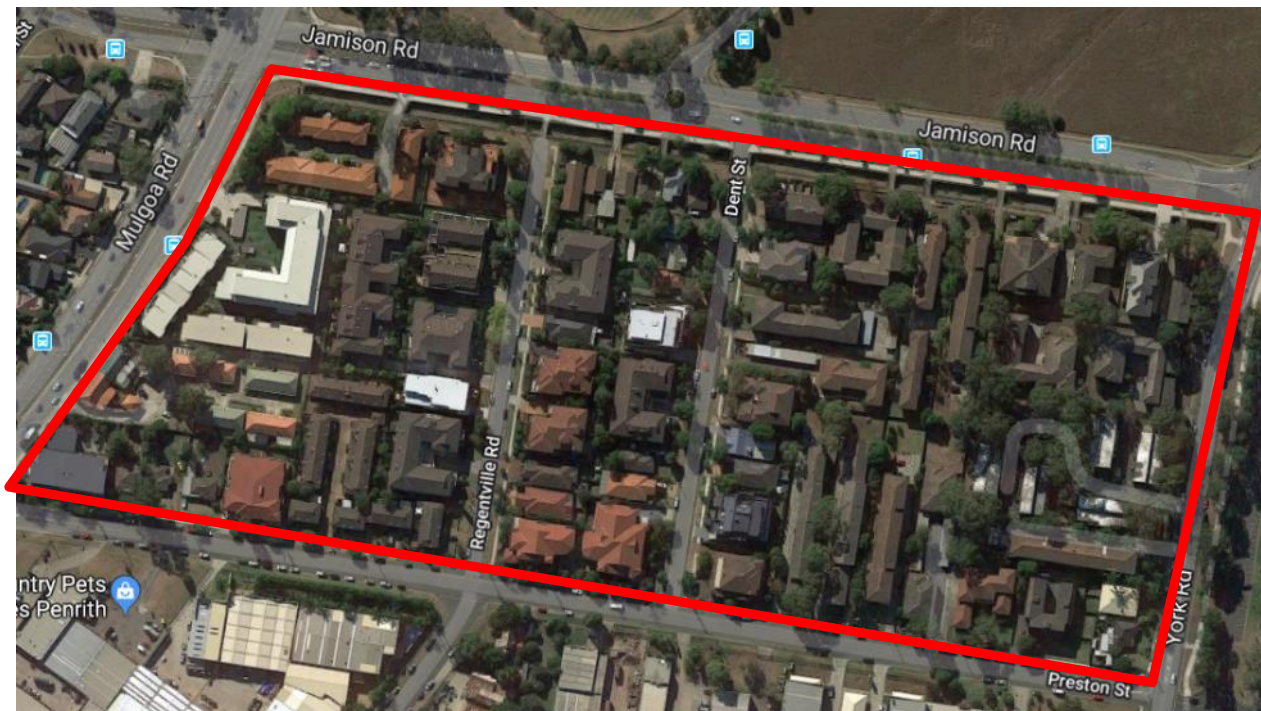
Table 4-12 Travel time to station and city

| | |
|----------------------------|------------|
| Walk to Station | 13 minutes |
| Cycle to Station | 11 minutes |
| Bus to Station | N/A |
| Nearest City by Train | Parramatta |
| Train Time to Nearest City | 20 minutes |

Source: SCT Consulting, and ABS, 2018

4.7 Jamison Road, South Penrith

Figure 4-7 Jamison Road case study area



Source: TfNSW, 2018

Table 4-13 Car ownership

| | |
|--------------------------------|------|
| No. of Dwellings | 782 |
| Average Cars per Dwelling | 0.89 |
| % Dwellings with 1 Car or less | 61% |

Source: SCT Consulting, and ABS, 2018

Table 4-14 Travel time to station and city

| | |
|----------------------------|------------|
| Walk to Station | 25 minutes |
| Cycle to Station | 10 minutes |
| Bus to Station | 20 minutes |
| Nearest City by Train | Parramatta |
| Train Time to Nearest City | 24 minutes |

Source: SCT Consulting, and ABS, 2018

4.8 Case study summary and implications

A summary of the findings of the case studies is provided below in **Table 4-15**.

Table 4-15 Summary of case studies

| | Blacktown Road, Blacktown | Devitt Street, Blacktown | Pendle Hill | Westmead North & South | Kingswood North & South | Luxford Road, Mt Druiett | Jamison Road, South Penrith |
|--|---------------------------|--------------------------|-------------|------------------------|-------------------------|--------------------------|-----------------------------|
| Car ownership | | | | | | | |
| No. of dwellings | 371 | 331 | 692 | 1,023 | 666 | 771 | 782 |
| Avg. cars per dwelling | 0.88 | 0.79 | 0.83 | 0.82 | 0.59 | 0.78 | 0.89 |
| % Dwellings with 1 Car or less | 70% | 69% | 63% | 78% | 62% | 69% | 61% |
| Travel time to station and city | | | | | | | |
| Walk to Station (min) | 15 | 13 | 4 | 4 | 6 | 13 | 25 |
| Cycle to Station (min) | 7 | 10 | 5 | 4 | 6 | 11 | 10 |
| Bus to Station (min) | 13 | N/A | N/A | N/A | N/A | N/A | 20 |
| Nearest City by Train | Parramatta | Parramatta | Parramatta | Parramatta | Parramatta | Parramatta | Parramatta |
| Train Time to Nearest City (min) | 10 | 10 | 7 | 2 | 34 | 20 | 24 |

Source: SCT Consulting, and ABS, 2018

There has been research to suggest car ownership is affected by factors such as distance to public transport, development density, household income, occupation industry, and parking policies. The above case studies indicate that there is a strong relationship between car ownership and distance to public transport.

The case studies show an average number of cars per dwelling of less than one, significantly lower than that of Greater Sydney with an average number of cars per dwelling of 1.6. Similarly, the proportion of dwellings with in above case studies owning one or less cars lies around 60% to 70%, significantly greater than the average for Greater Sydney at 51%. The proximity to train stations favours walking and cycling over driving to workplaces, reducing the importance of car ownership despite availability of private parking at home. Other factors influencing users' decision to walk or cycle to station include household income, cost of travel, congestion, and parking policies around train stations.

An interesting case to note is Jamison Road in South Penrith. With a walking time to station of 25 minutes, relatively long in comparison to other case studies, the car ownership remains comparable. This is significant as it indicates commuters are still opting for non-car options despite the increased distance. In this case, parking policies and the density of the residential area have a stronger influence over low car ownership than distance to transit

5.0 Conclusion

The analysis indicates that shorter distances to stations and density contribute to lower levels of car ownership, but these factors don't fully account for the variability of customer choices. There are a number of different car ownership trends at different stations, with some regions having lower car ownership almost exclusively around stations and others where rail access has not changed levels of car ownership.

The case study provides numerous examples of low car ownership, despite significant walk times of up to 13 and even 25 minutes. The example of Jamison Road, South Penrith is even that despite a long trip to the local train station, car ownership levels can be quite low – 61% of households with one or zero cars.

There are several implications of this analysis:

- Households are willing to accept low levels of car ownership around train stations. The majority of train stations are already characterised by low levels of car ownership, except in stations characterised by poor frequency and potentially older housing stock;
- There remains a level of uncertainty regarding all of the variables that contribute to household car ownership decisions. There are significant levels of variance in different parts of Sydney that aren't fully accounted for in the density and distance to train station variables;
- Various levels of Government can influence car ownership. Academic research indicates that decisions about the public transport service offering, car parking controls, and urban design all influence the car driving and ownership (Cervero, 2002) (McKibbin, 2011) (Shoup, 2018).

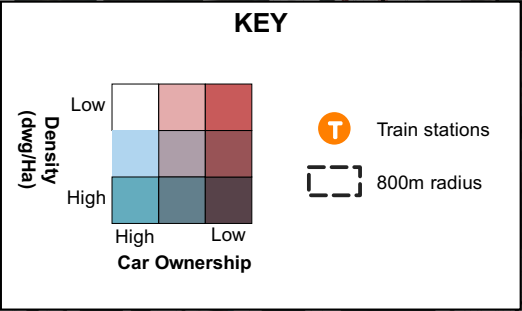
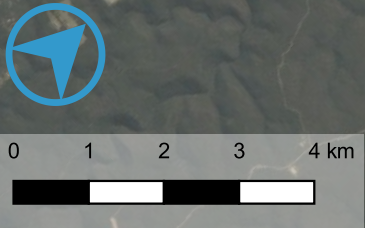
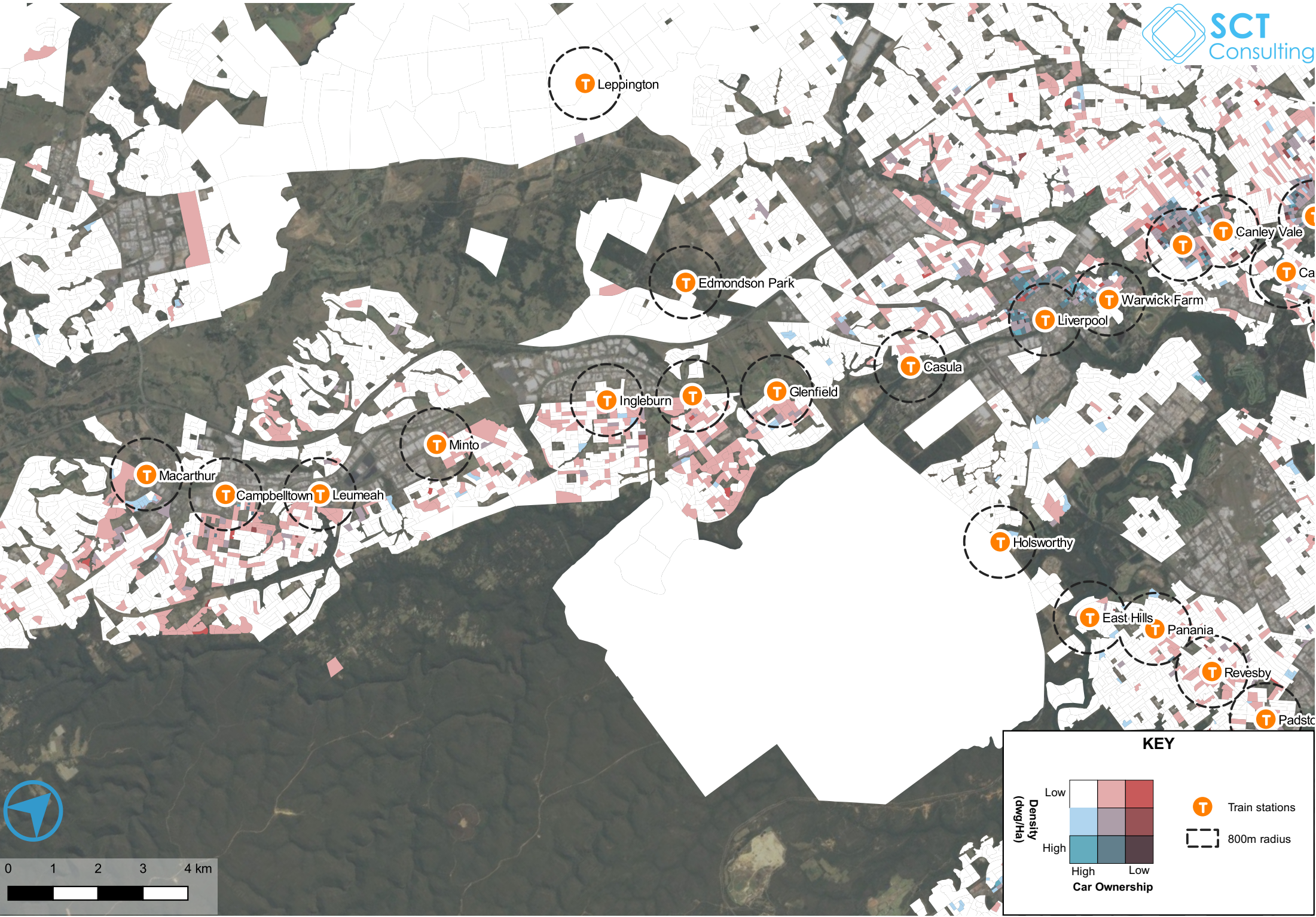
Further work would be required to fully quantify the factors that influence car ownership choices.

6.0 Bibliography

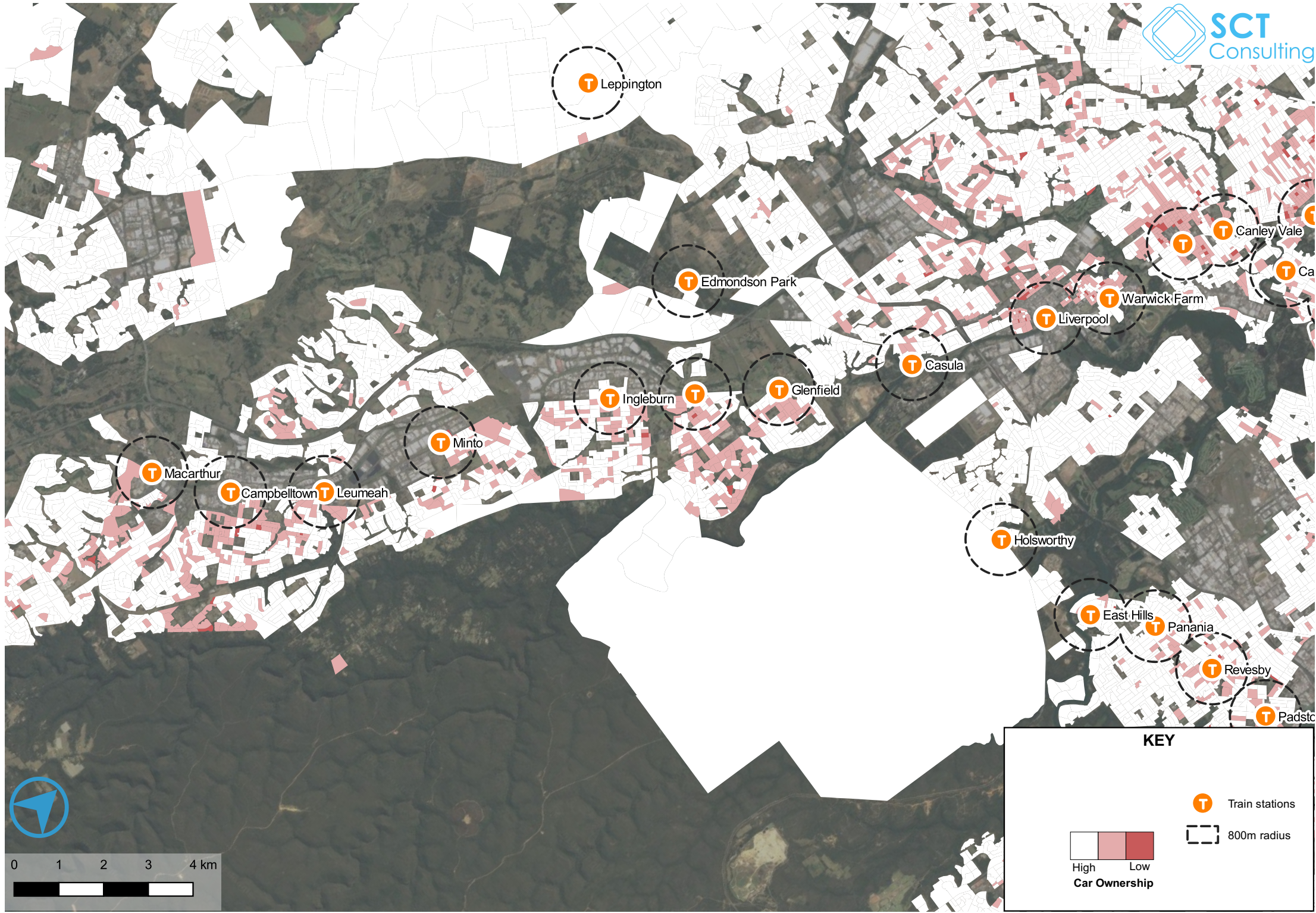
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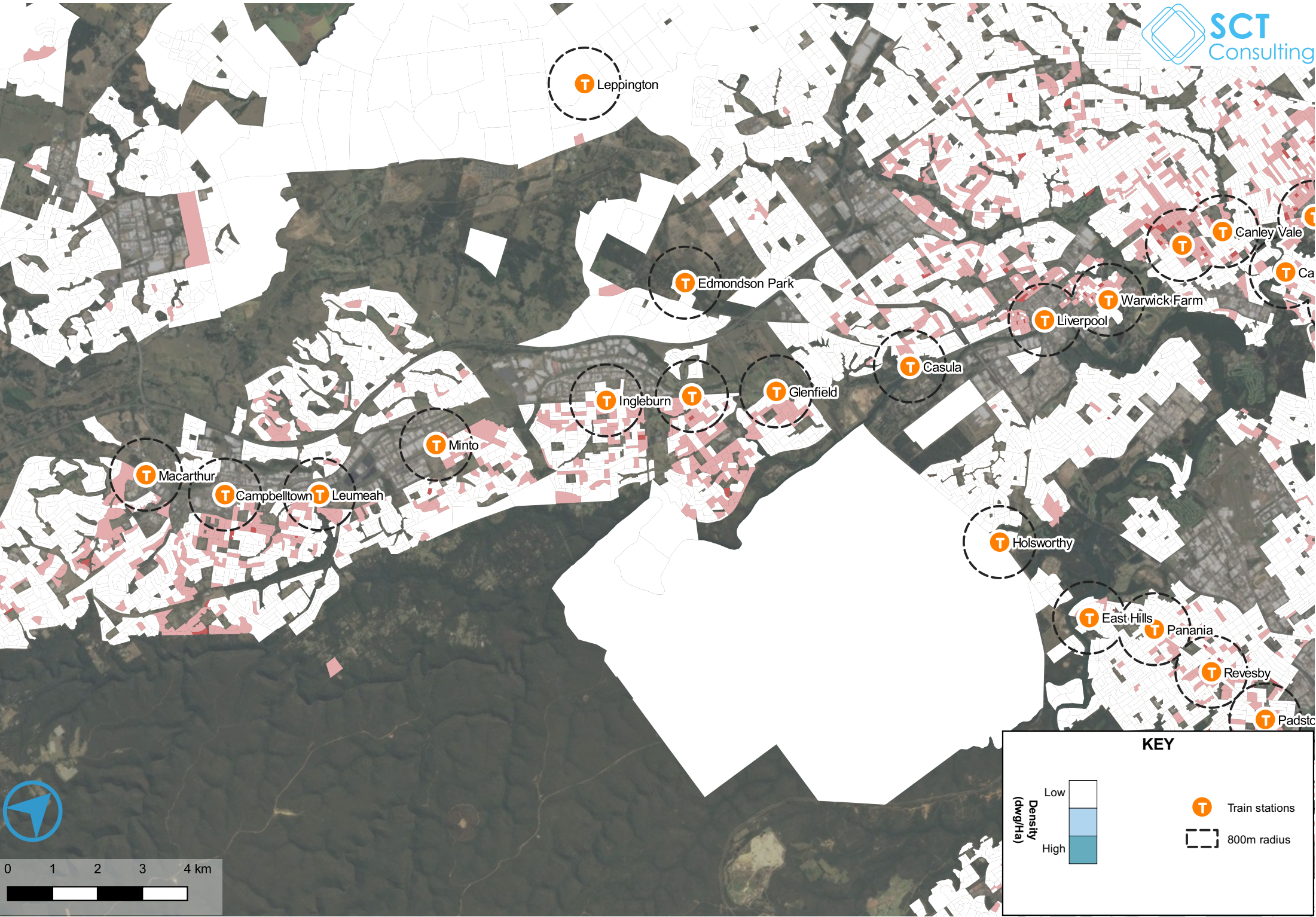
Attachments

Campbelltown to Liverpool - Density vs Car Ownership



Campbelltown to Liverpool - Car Ownership Only





KEY

Density (dwg/ha)

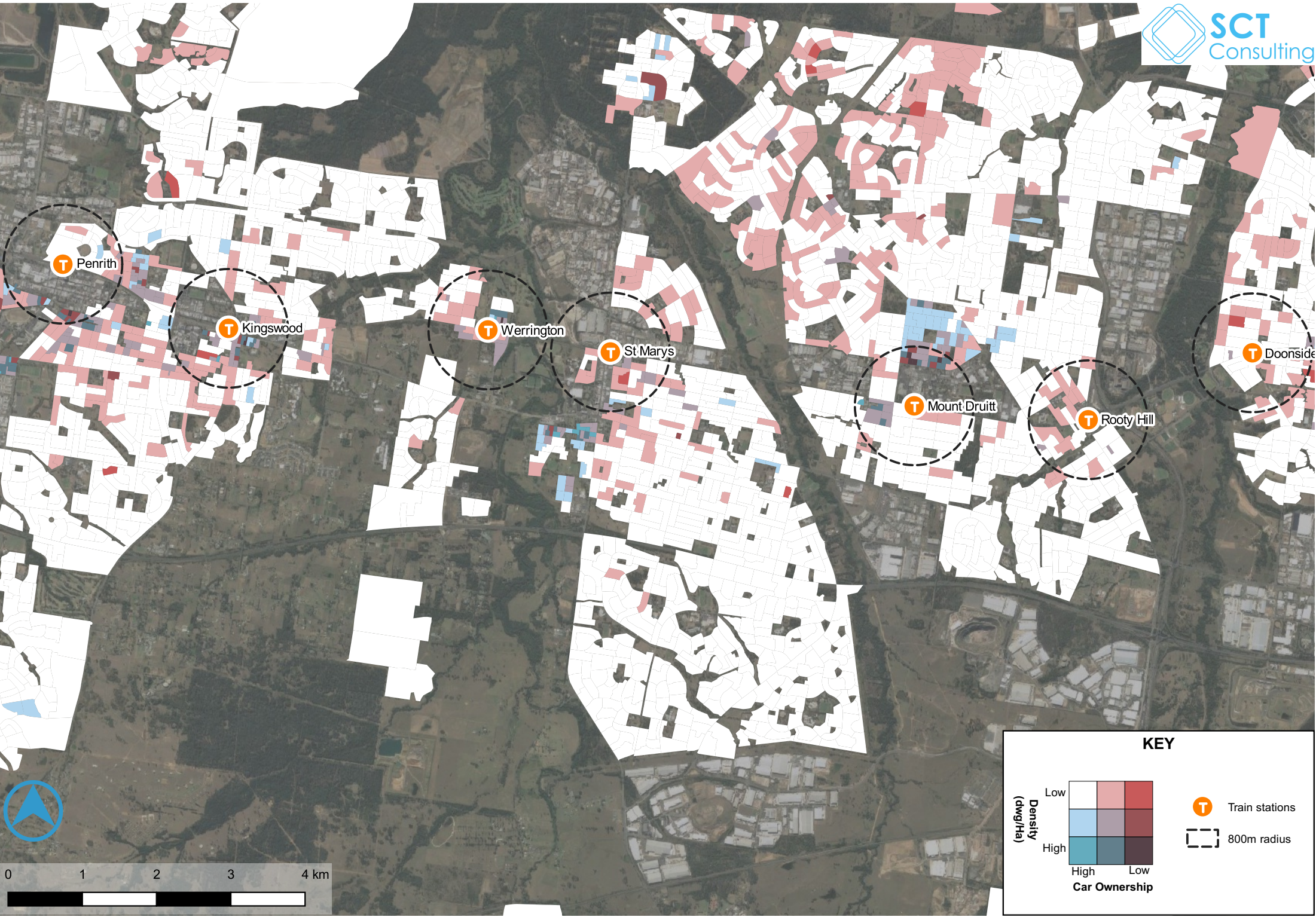
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High

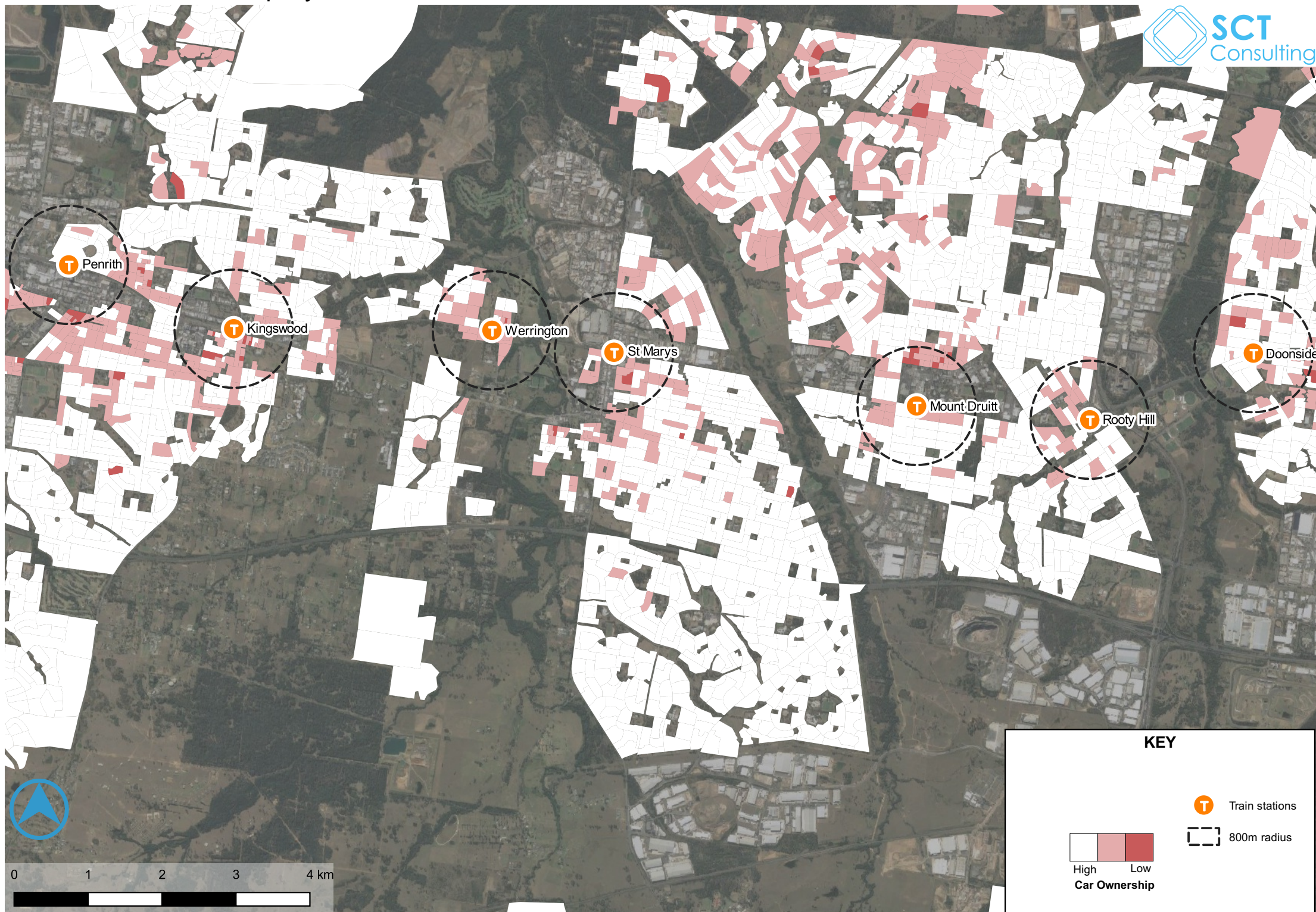
T Train stations

800m radius

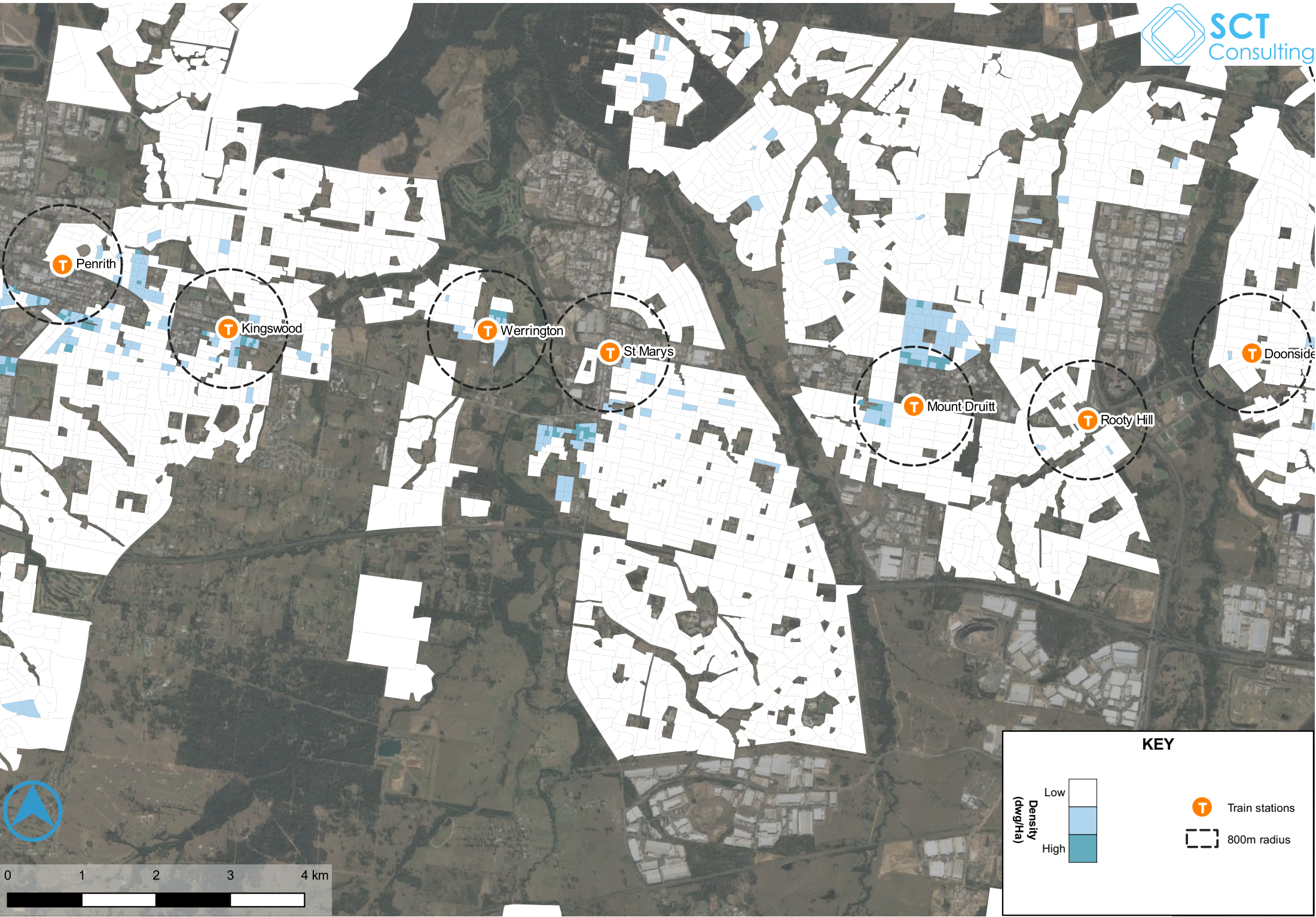
Penrith to Doonside - Density vs Car Ownership



Penrith to Doonside - Car Ownership Only



Penrith to Doonside - Density only



KEY

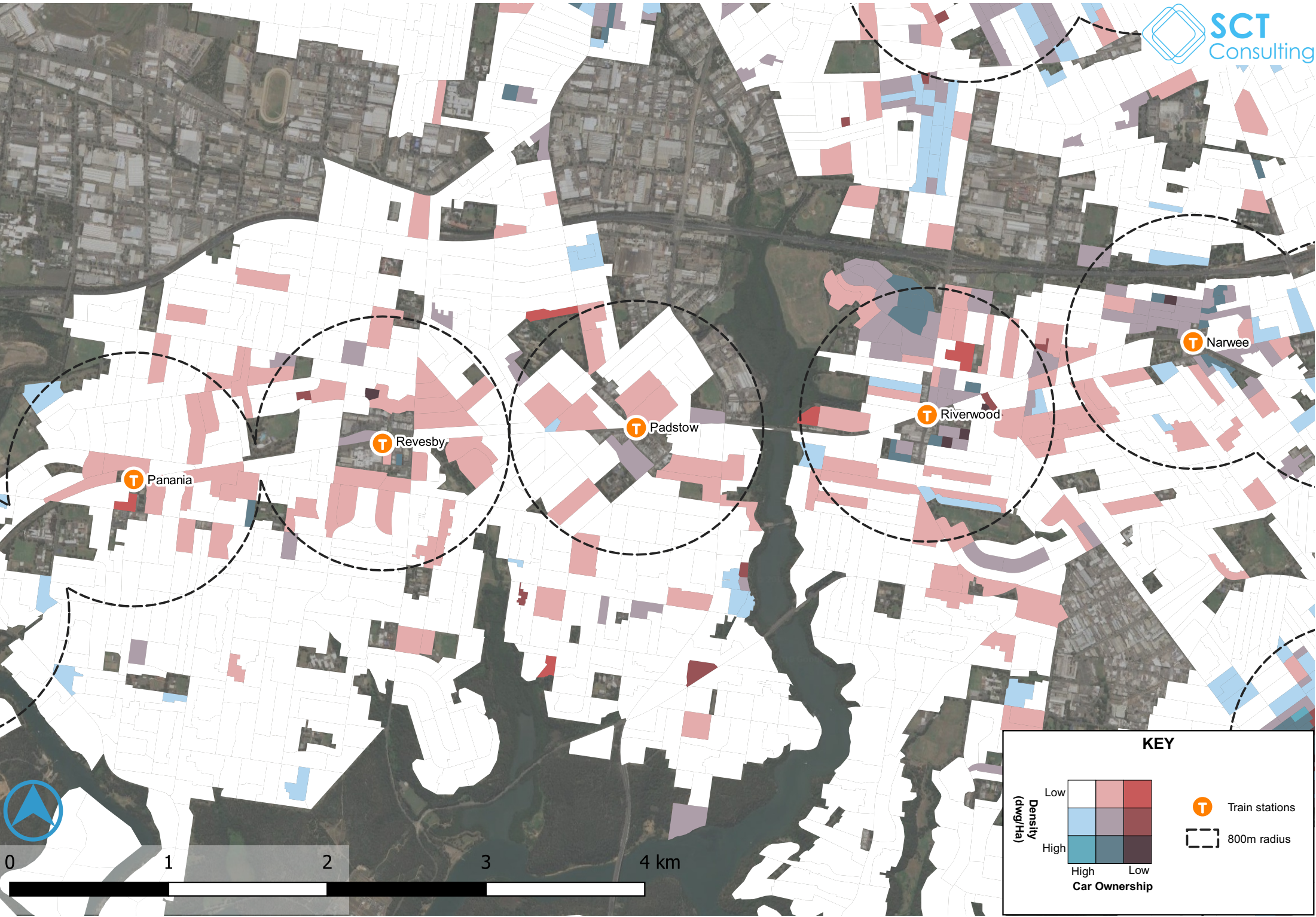
- Density
(dwg/ha)

Low

High
-  Train stations

 800m radius

Panania to Narwee - Density vs Car Ownership



KEY

Density (dwg/Ha)

| | | | |
|------|------|--|-----|
| Low | | | |
| High | | | |
| | High | | Low |

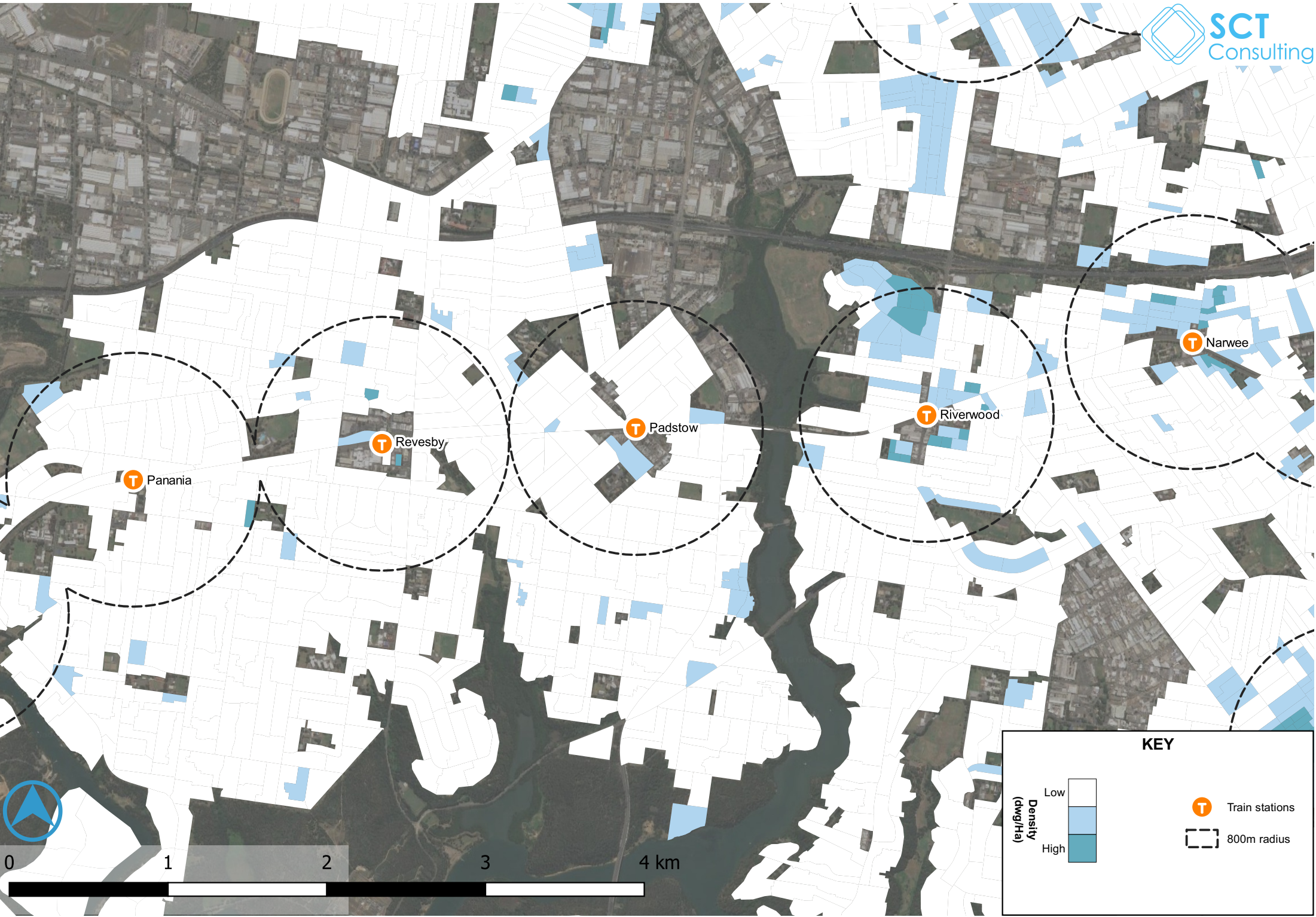
Car Ownership

Train stations

800m radius



Panania to Narwee - Density only



KEY

Density
(dwg/ha)

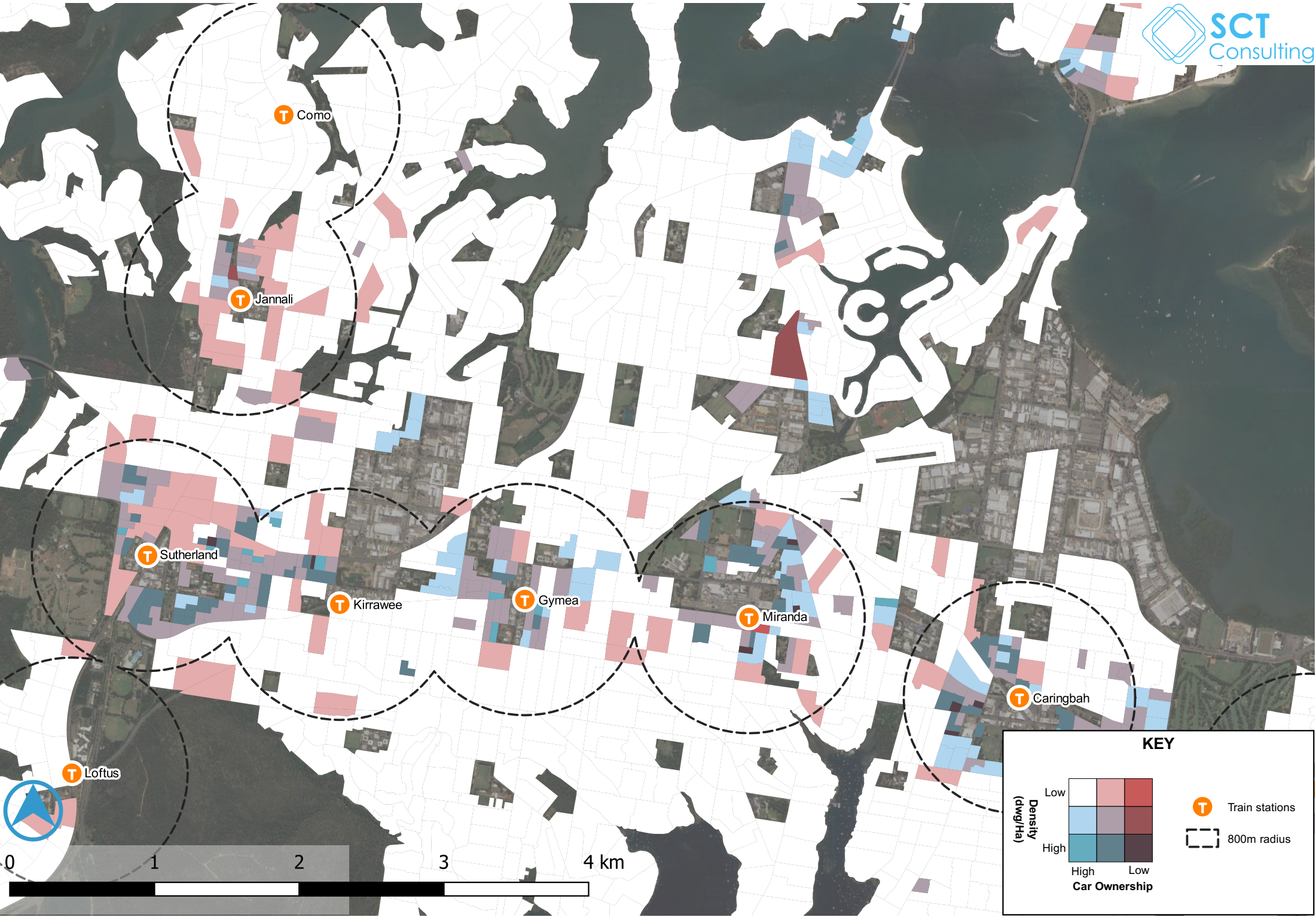
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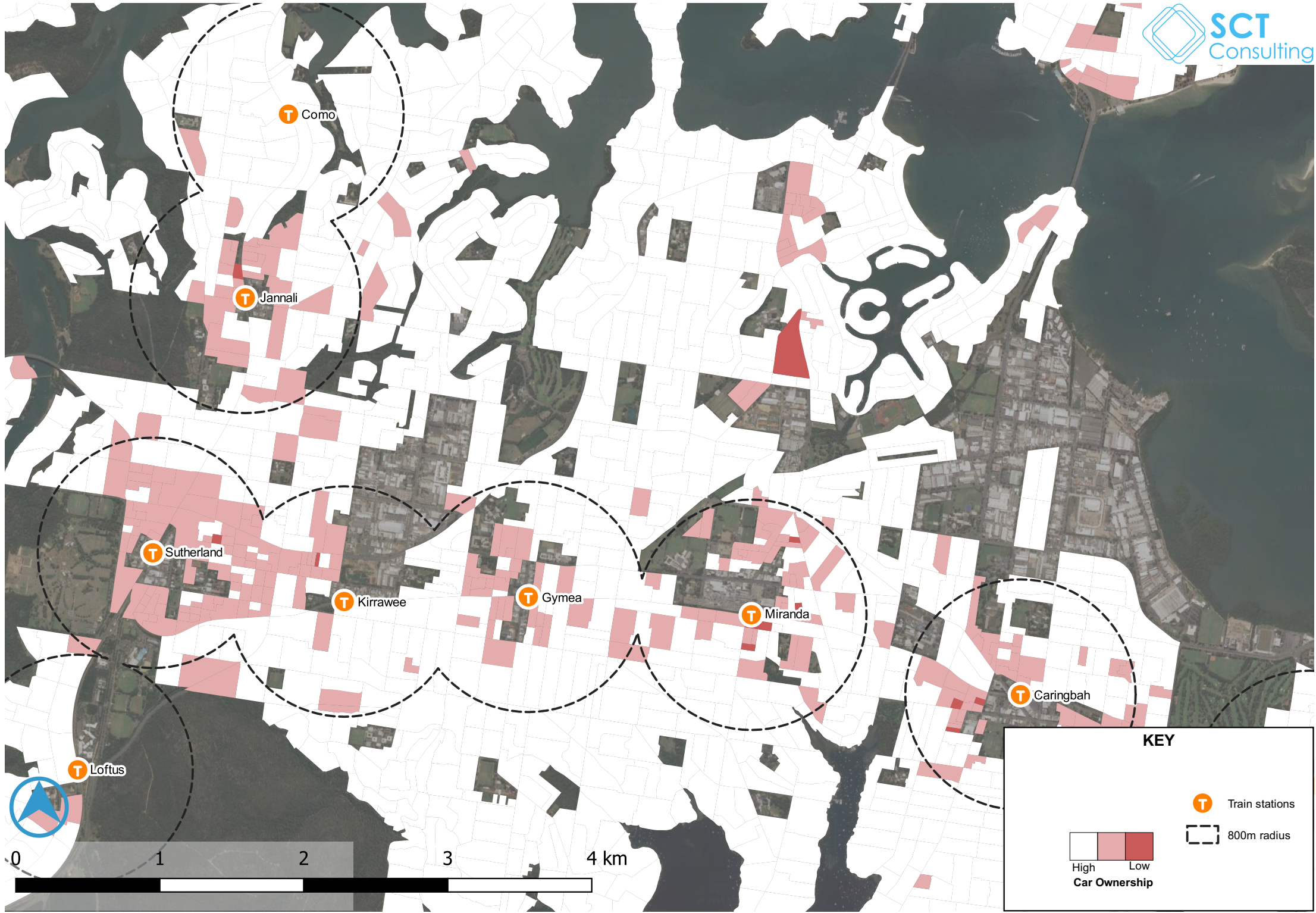
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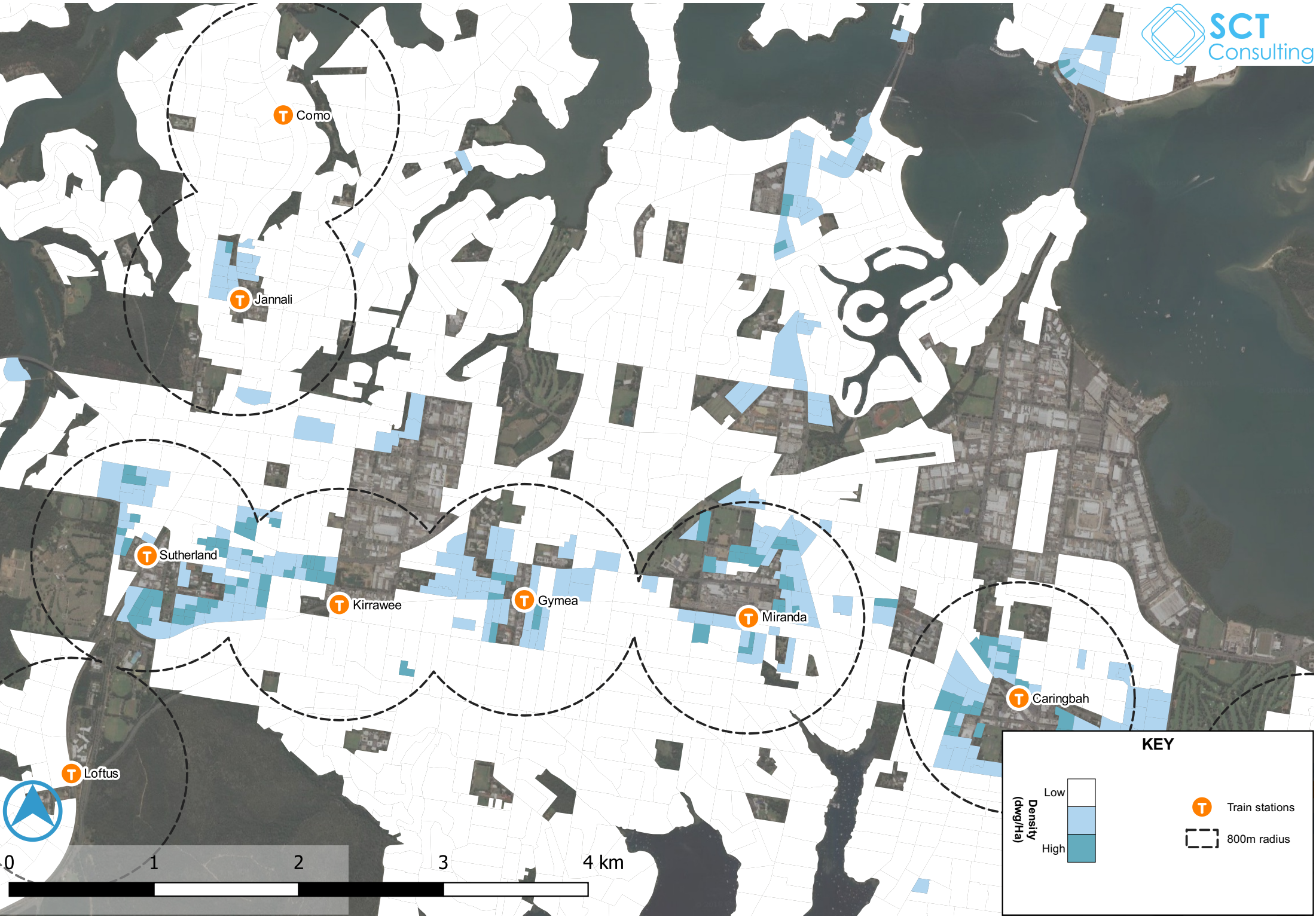
T Train stations

800m radius

Sutherland - Density vs Car Ownership

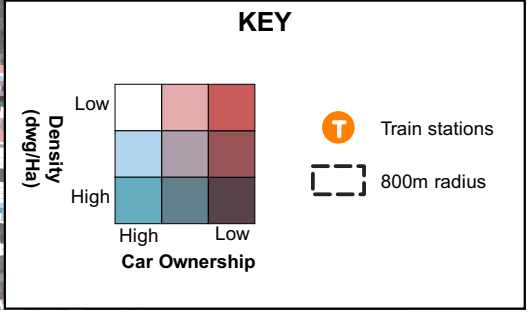
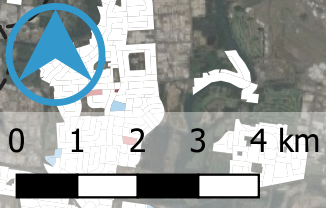
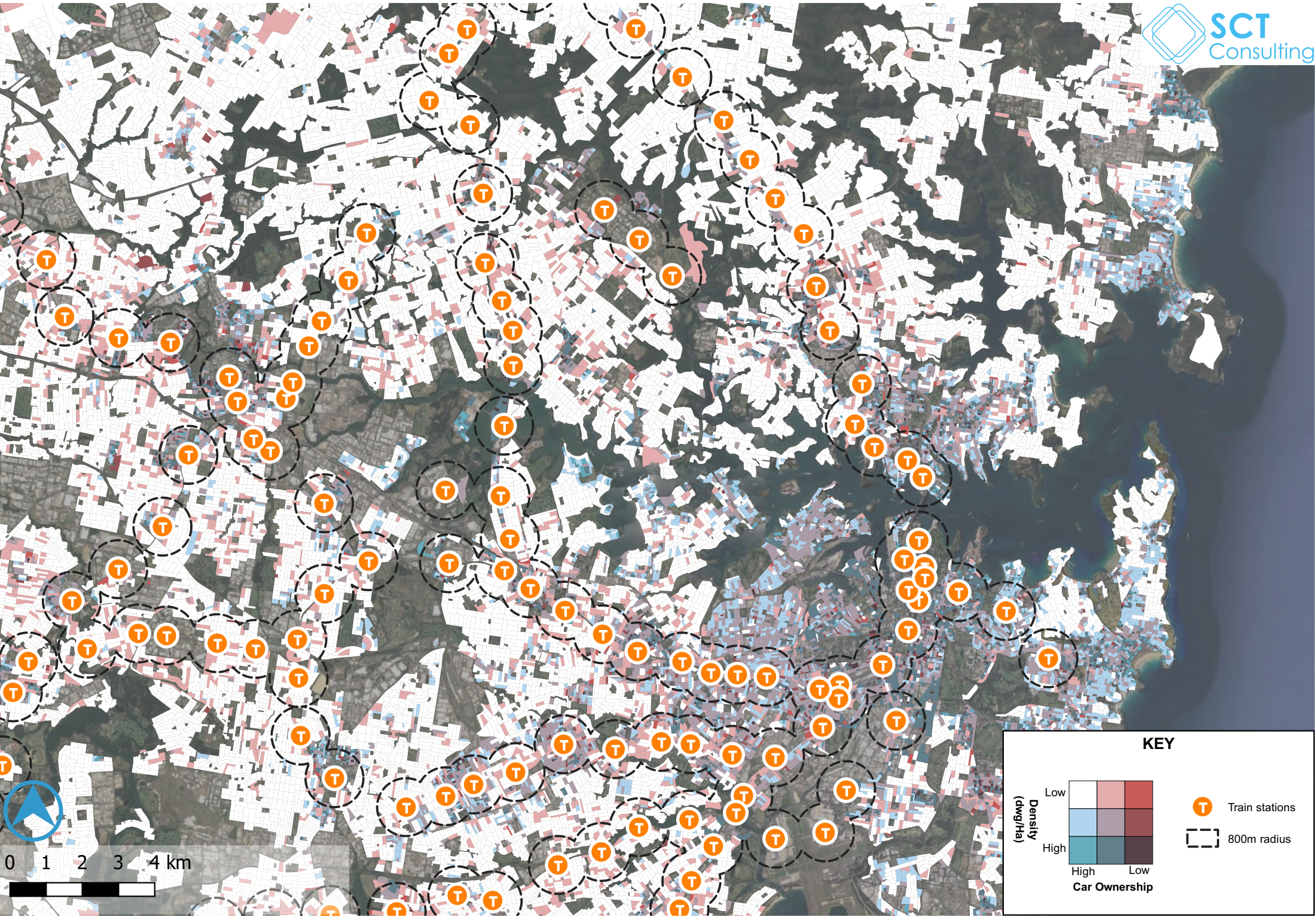


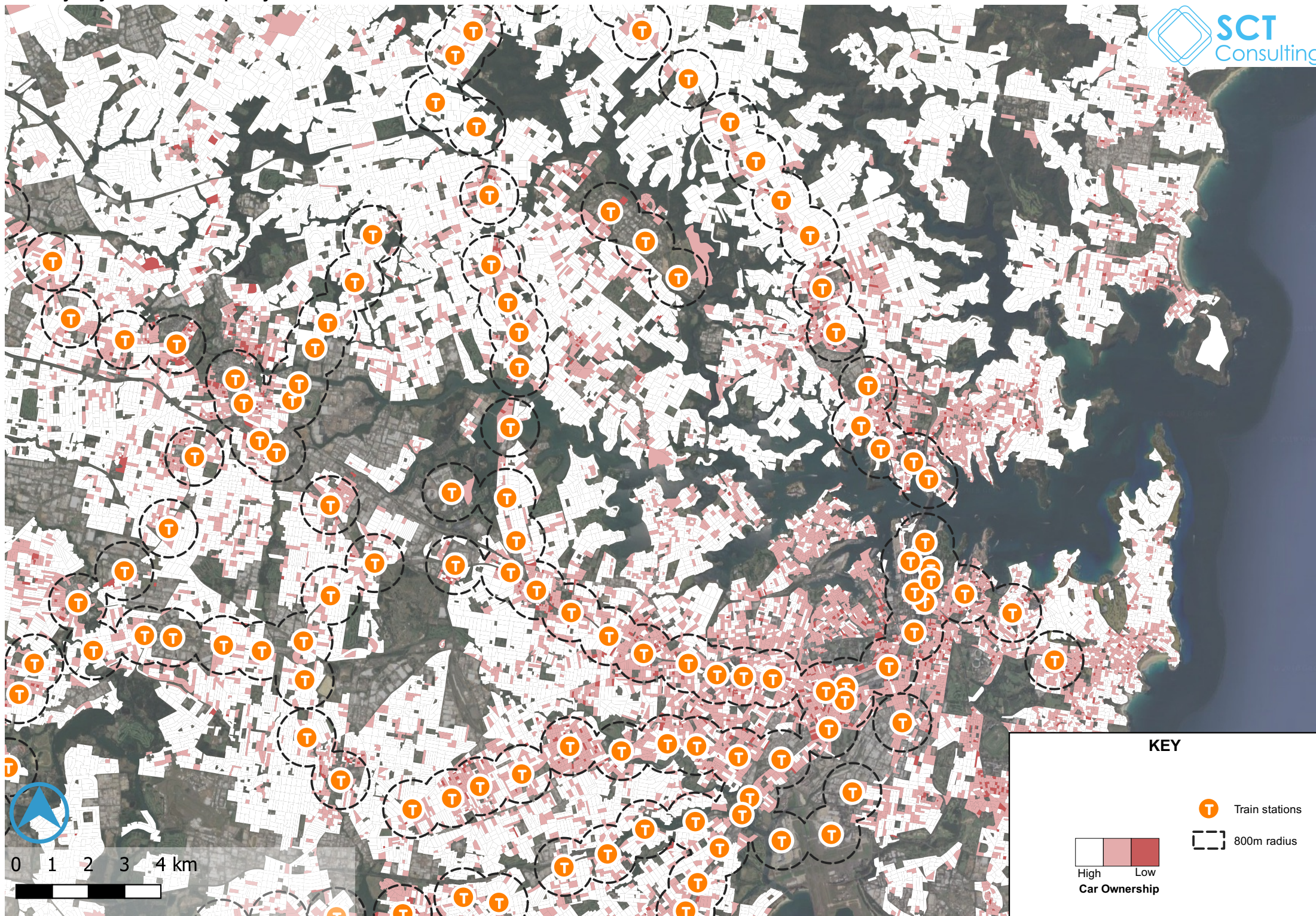


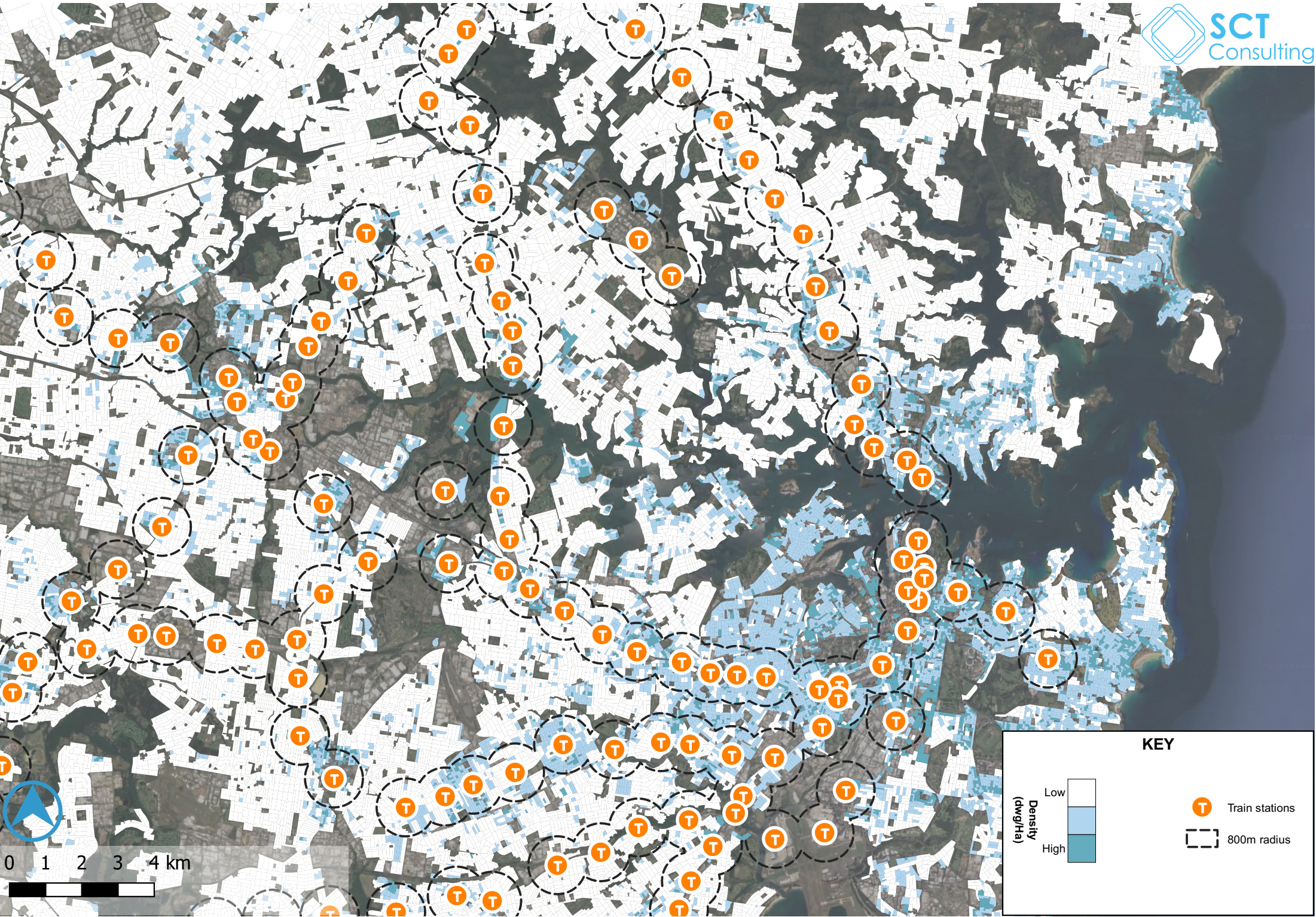


KEY





- Low
- Density (dwg/ha)
- High
- T Train stations
- 800m radius







KEY

| | |
|--|--|
|  Low |  Train stations |
|  High |  800m radius |

