12

Background Report

Outputs of Transport/ Land Use Modelling

Renfrewshire Local Development Plan
Main Issues Report December 2011

Renfrewshire Council

Renfrewshire Local Development Plan: Outputs of Transport/Land Use Modelling 2014-19

Analysis of Modelling Outputs

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Project Director, Project Manager and Project Team.

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Glossary of Terms

The following table explains some of the terminology used throughout this document.

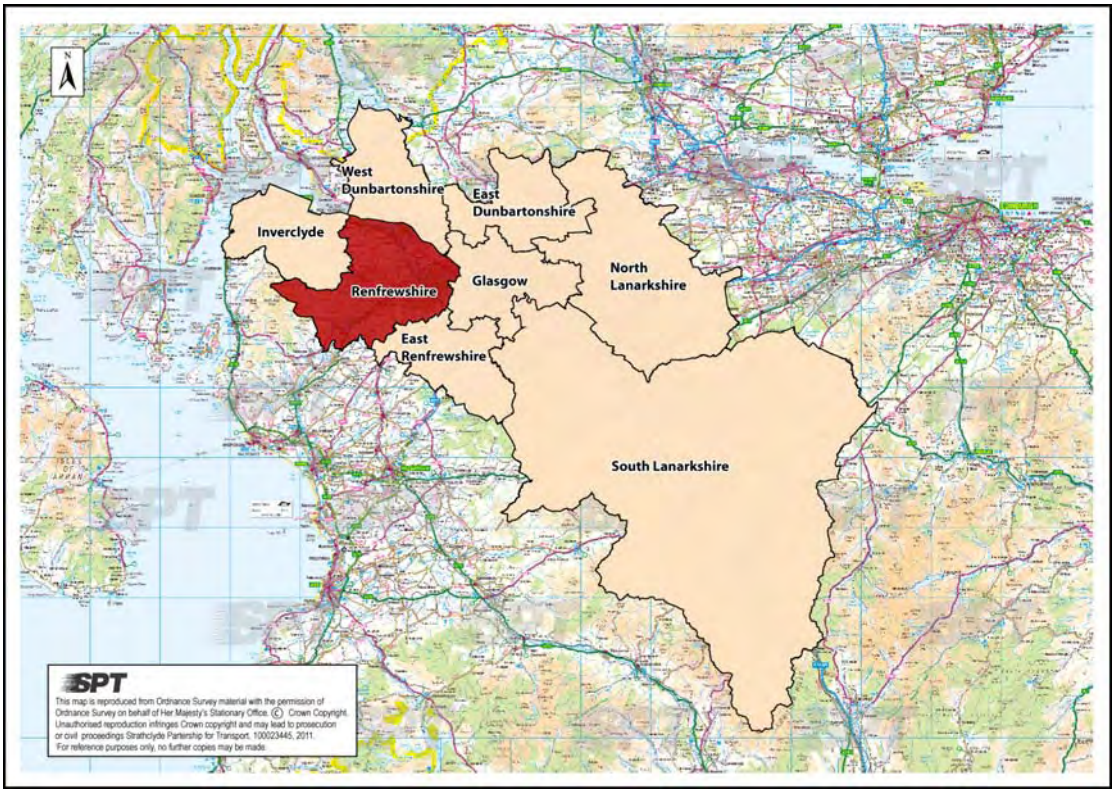
Term	Meaning
AM Peak Hour	Represents a typical morning rush hour (0800-0900hrs)
Bandwidths	Methods used to illustrate relative increases and decreases eg the thicker the bandwidth, the greater the increase, with associated coloured bands to indicate increases and decreases.
CO_2	Carbon Dioxide (emissions)
NO_X	Nitrogen Oxide (emissions)
PM Peak Hour	Represents a typical evening rush hour (1700-1800hrs)
PM10	Particulate Matter (emissions)
SITLUM	Strathclyde Integrated Transport and Land Use Model (Version 4A)
SITM4A	Strathclyde Integrated Transport Model
Trip Ends	Refers to the model zone where a trip ends
Trip Starts	Refers to the model zone from which a trip originates
Trips - Car Person	A trip made by a person using a car vehicle
Trips - Car Vehicles	Car vehicles (excluding goods vehicles)
Trips - PT Person or Passenger Transport trips	A trip made by a person using public transport
Volume over Capacity or V/C	Used to illustrate congestion eg a V/C of 85% on a road means that the road is being used at 85% of its capacity (at this point significant delays begin to occur).
Zones	Sub-divided geographical areas within the transport models representing the start and finish locations for journeys.

Table 1 – Renfrewshire Council: Model Summary Statistics

Renfrewshire	2014	2019	Percentage Change
Land Use / Economics			
Population (000s)	167	164	-1.8%
Households	82,006	89,383	+8.9%
Jobs	56,553	57,032	+0.8%
0 Car Households	28,452	31,405	+10.4%
1 Car Households	35,611	42,035	+18%
2+ Car Households	17,942	15,944	-8.8%%
Housing Floorspace m^2	7,424,589	7,475,589	+0.7%
Retail Floorspace m^2	161,761	156,194	-3.4%
Office Floorspace m^2	821,570	798,999	-2.7%
Industrial Floorspace m^2	868,787	835,445	-3.8%
Transport			
Trip Starts PT Person am	6,383	6,706	+5.1%
Trip Starts PT Person pm	2,966	3,083	+3.9%
Trip Starts Car Person am	15,632	16,460	+5.3%
Trip Starts Car Person pm	13,713	14,135	+3.1%
Trip Ends PT Person am	3,983	4,236	+6.4%
Trip Ends PT Person pm	5,189	5,371	+3.5%
Trip Ends Car Person am	16,262	16,990	+4.5%
Trip Ends Car Person pm	17,596	18,094	+2.8%

* Oxford Economic Forecast

Location Plan



Renfrewshire and the Clyde Valley Strategic Development Planning Authority and Constituent Councils' Areas

1. INTRODUCTION

1.1 Staff from SPT and Renfrewshire Council agreed the modelled data to be supplied from SPT's modelling suite to provide the forecast transport network interaction with land-use and demographics in Renfrewshire. This paper presents the transport and land-use forecasts for Renfrewshire Council's area for the period from 2014 to 2019; the period of the Renfrewshire Local Development Plan.

1.2 SPT undertook the assessment using the Strathclyde Integrated Transport and Land Use Model (SITLUM) and the Strathclyde Integrated Transport Model (SITM4).

1.3 The analyses was based on the land-use forecasts prepared by Councils (for Transport Scotland's LATIS facility) combined with Oxford Economics (OE) land-use and economic forecasts produced for the Glasgow and the Clyde Valley Strategic Development Plan Authority. These were allied to a transport reference case which includes the current day network and services together with committed transport schemes.

2. POPULATION PROJECTIONS

2.1 Population data

2.1.1 This section sets out the population forecasts for Renfrewshire and the Clyde Valley which fed the modelling analysis described in section 3.

2.1.2 The population data presented in Table 2 are those prepared by Oxford Economics on behalf of the Glasgow and the Clyde Valley Strategic Development Authority.

	Oxford Economic Local Authority Forecasts (000s)					
	2008	2011	2014	2019	2021	2031
East Dunbartonshire	105	103	102	101	100	97
East Renfrewshire	89	89	89	89	89	89
Glasgow City	584	585	586	588	589	592
Inverclyde	81	79	78	76	76	72
North Lanarkshire	325	325	326	326	327	329
Renfrewshire	170	168	167	164	164	159
South Lanarkshire	310	311	313	315	317	321
West Dunbartonshire	91	90	89	87	87	84
Glasgow Clyde Valley	**1,755**	**1,752**	**1,749**	**1,747**	**1,747**	**1,743**

Table 2 - Populations by Council Area
(Councils in the Glasgow and Clyde Valley area)

3. MODELLING

3.1 Model Preparation

3.1.1 The following section describes the modelling process undertaken to provide baseline information to support the Renfrewshire Local Development Plan process.

3.2 Planning, Economic and Demographic data

3.2.1 2014 was established as the base year for model analysis and 2019 was selected as the forecast year reflecting the period of the Local Development Plan. The transport models were then developed to reflect these scenarios. The models reflect the Land-Use / Economics and Transport as the two key elements for planning containing:

- current and forecast planning data supplied from Transport Scotland's LATIS[1] service (Land-Use and Transport Integration in Scotland)
- transport network and public transport services data, reflecting the current and committed scenarios

3.2.2 The base planning data for the models therefore reflects the current land-use throughout Scotland and forecast years are incorporated that provide the year on year variation in land-use predicted by Councils, City Regions Development Planning Authorities and the General Records Office for Scotland (GROS).

3.2.3 In addition to Land-use, SPT's SITLUM model incorporates demographic, including migration, and current and forecast economic data.

3.2.4 In 2010 the Glasgow and the Clyde Valley Strategic Development Planning Authority (GCVSDPA) commissioned Oxford Economics to analyse and report on the economic forecast for the Strathclyde area. This included the effects on demographics. This data was incorporated in the SITLUM model and this in turn feeds the travel matrices in the SITM4A model and the approach is recognised by other partners, including Transport Scotland

3.3 Transport Network Bases

3.3.1 The transport networks in the model reflect a 2014 reference base and 2019 forecast year, the latter containing all development committed to be constructed or implemented by that time.

3.3.2 The 2014 base year reflects the transport network, services and travel patterns in that year.

3.3.3 The 2019 Reference Case was constituted from:

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[1] *The LATIS service collates all current and forecast planning data provided by the Councils and Development Plan Authorities in Scotland. This is then rationalised with General Records Office for Scotland (GROS) data. The relevant data is then passed to SPT for inclusion in the transport models*

Current day network and land-use planning scenario
(The underlying planning forecasts are those supplied by councils to LATIS and shared with SPT and others)

Economic and demographic forecasts from Oxford Economics (as supplied to the GCVSDPA)

Committed transport schemes including:

- Airdrie-Bathgate rail line and services
- M74 Completion
- M80 Stepps to Haggs
- East End Regeneration Route
- Kirkintilloch Link Road
- Bishopbriggs Relief Road
- M8 Baillieston to Newhouse
- Edinburgh Glasgow Improvements Programme

3.4 Zoning Detail

3.4.1 The geographically referenced data in the transport model, including planning data and demographics, is related to zones within the model. The SITLUM model is a spatially based model and uses the relationships between zones in terms of transport and land-use to model forecast changes at a more aggregate than SPT's strategic network model. The level of zoning in SITLUM is illustrated in Figure 1.

Figure 1 - SITLUM Zones

3.5 Model Outputs – Overview

3.5.1 Strathclyde Integrated Transport and Land-Use Model (SITLUM)

This model integrates transport and travel with land-use, demographic and economic factors and provides outputs that reflect the interaction of these varying influences on long and short term behaviour.

The model outputs a range of data, mainly by zone

- Population
- No of Households
- No of jobs
- Floorspace by category
- Levels and nature of trip making
- Trip starts
- Trip ends
- Volume of car trips
- Volume of passenger transport trips
- Emissions – NO_X, CO_2, PM10

4 EXAMINATION OF MODEL OUTPUTS

The outputs in this section indicate the information for Renfrewshire Local Development Plan. These data are presented in tabular and diagrammatic format in section 5.

Examination of these outputs reveals the following:

4.1 Demographics and Planning

4.1.1 Table 1 and Figures 2 – 4 show a small decrease in population of just under 2% between 2014 and 2019 for the whole of Renfrewshire, allied to an increase in the number of households by about 9%. The reduction in population is spread across Renfrewshire with the areas around the Gryffe valley showing the largest drops of up to 7%. The only location showing a small increase in population is the residential development area around Braehead. The band from Paisley through to Lochwinnoch shows changes of 3-4% reduction, with a slightly lower reduction on the west side of Paisley of around 1-2%.

4.1.2 In contrast to the population the number of households grows across the council area. The combination of reducing population and rising households, reflects the current trend of reducing household size. This is again reflected in the figures in Table 1, showing the overall number of households increasing, but overall household floor space only marginally increasing, indicating smaller units. Figure 5 illustrates that the number of households grows most in the urban areas.

4.1.4 Figures 5 & 6 indicate very little change forecast in the total number of jobs across Renfrewshire - a small increase of just under 1%. It can be seen from the map that there is some variation in the changes with zones in the rural areas in the north of Renfrewshire from Langbank through Bishopton towards Paisley showing a small decrease and the remainder of the Council area showing small increases with the highest 2-3% in the residential areas in the north of Paisley.

4.1.5 In Renfrewshire around 35% of households do not own a car and this percentage is forecast to remain steady over the period to 2019. In effect, however, this raises the number of zero car owning households to over 31,000. There is a growth of 18% in the number of households with one car and a decrease of around 11% of households with two or more cars. (Figure 7)

4.1.6 Within Renfrewshire, the total housing floorspace remains broadly static, whereas retail, office and industrial floorspace all reduce over the period to 2019 by around 3 – 4%. (Figure 8).

NOTE: Land-use changes in development areas are spread over time and phases may require demolition before reconstruction can begin – this will be reflected in reductions in activity in some of these areas over the period 2014 - 2019

4.2 Travel

4.2.1 Figures 9 – 26 show changes in the level of trip making through the period from 2014 to 2019

4.2.2 An increase in public transport trips starts within Renfrewshire between 2014 and 2019 is forecast for both the am and pm peak periods of 5% and 4% respectively (Figure 9). Similarly there are increases in the trip ends within Renfrewshire in both peaks with the am peak increasing by 6% and the pm peak by 3.5% (Figure 12). The figures show the balance of trips leaving Renfrewshire in the morning being greater than the inbound trips, with the reverse being the case in the evening.

4.2.3 For car based trips the trend is similar to public transport travel with am peak person trip starts growing by 5% and pm by 3% (Figure 10). Car based person trip ends within Renfrewshire increase by 4.5 % in the am peak and 3% in the pm peak (Figure 13). The changes by actual vehicles trips (Figures 11 & 14) are unsurprisingly very similar to the person trips by car. Western areas of Renfrewshire show little increase in trip making throughout the time periods by all modes of travel.

4.2.4 The rates of growth are not uniform throughout the Council area with the higher levels of increased trip making concentrated mainly around the Paisley area. This applies to both public transport and car use. Increased car trips are also predicted around the northern parts of the Council area through Langbank, Bishopton and Erskine areas and higher increases in public transport use more prevalent in Erskine.

4.2.5 Trip ends within Renfrewshire therefore show a broadly similar increase across the modes, with those for public transport growing by 6% in the am peak and by 3.5% in the pm peak. Trip end growth for person trips by car and by number of vehicles are just over 4% in the am peak and just under 3% in the pm peak.

4.2.6 Figures 15 – 26 show the distribution of increases in trip starts and trip ends for both car and public transport modes throughout Renfrewshire and illustrate that they are similar. Trip starts and trip ends increase across Renfrewshire, but the highest increases are in the most populated areas of Paisley and its immediate surroundings and in the areas around Erskine and Renfrew.

4.3 Emissions

4.3.1 Figures 27 – 32 give an indication of changes in emissions over the period 2014 – 2019. Inbuilt to the model is the influence on vehicle emissions of improving vehicle engine technology that results in both improved efficiency and reduced emissions over time. This factor, allied to the relatively small changes in vehicle trip volumes results in a general reduction in NOx, CO_2 and PM10 emissions with variations across the Council area related to the volumes and changes in vehicle trips. The higher reductions in emissions relate to the more densely populated locations and those with higher levels of car use.

4.4 Future development of the transport network

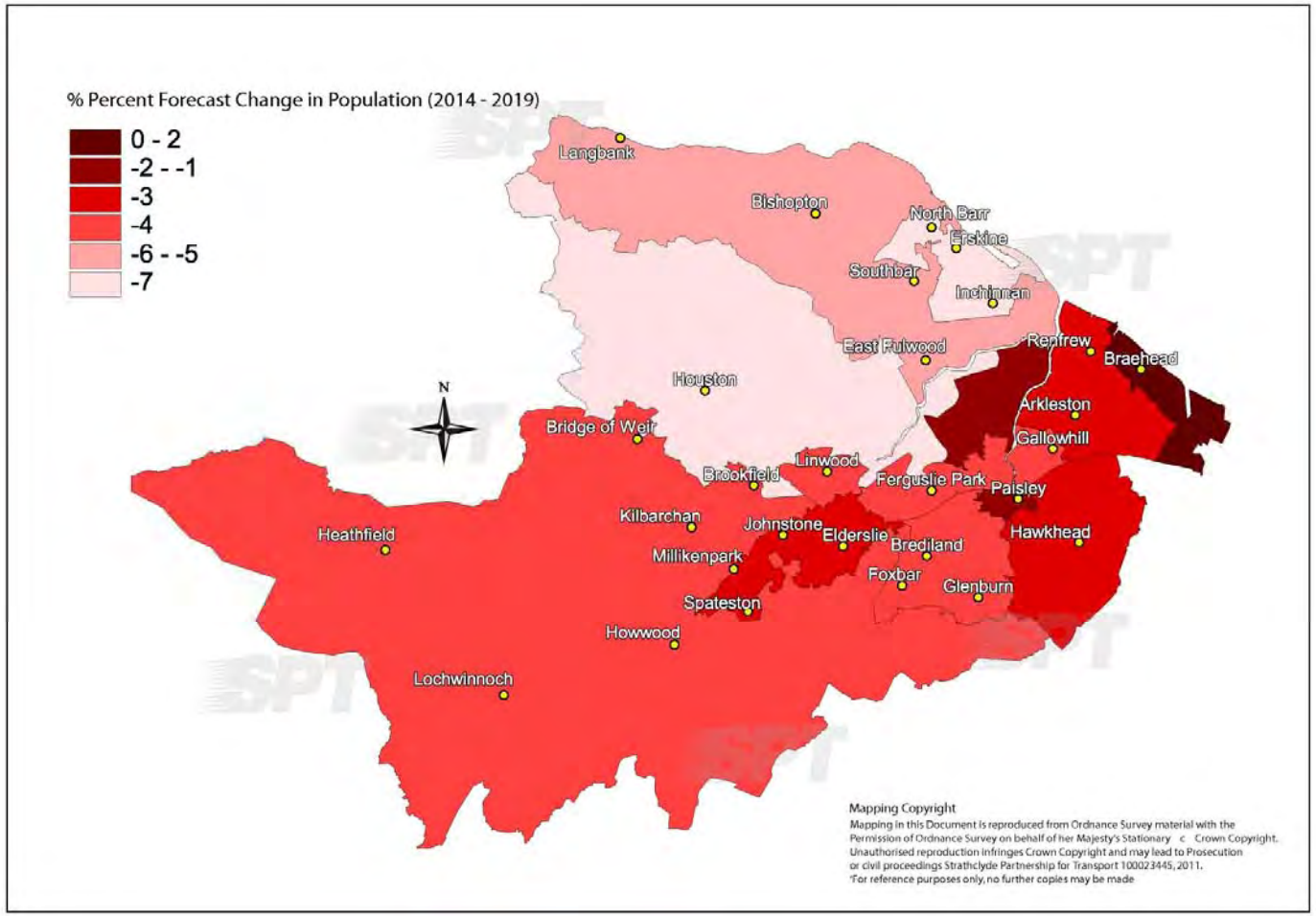
4.4.1 In line with their various transport strategies, it is anticipated that Renfrewshire Council, SPT and Transport Scotland together with their other transport partners will continue to develop public transport proposals, encourage sustainable travel and reduce dependency on car.

5 PLANNING, ECONOMIC & DEMOGRAPHIC MODELLING OUTPUTS

5.1 OUPUT: POPULATION

FIGURE 2 - PERCENTAGE CHANGE IN POPULATION BY ZONE

6



5.2 OUTPUT: HOUSEHOLDS

FIGURE 3 - CHANGE IN NUMBER OF HOUSEHOLDS

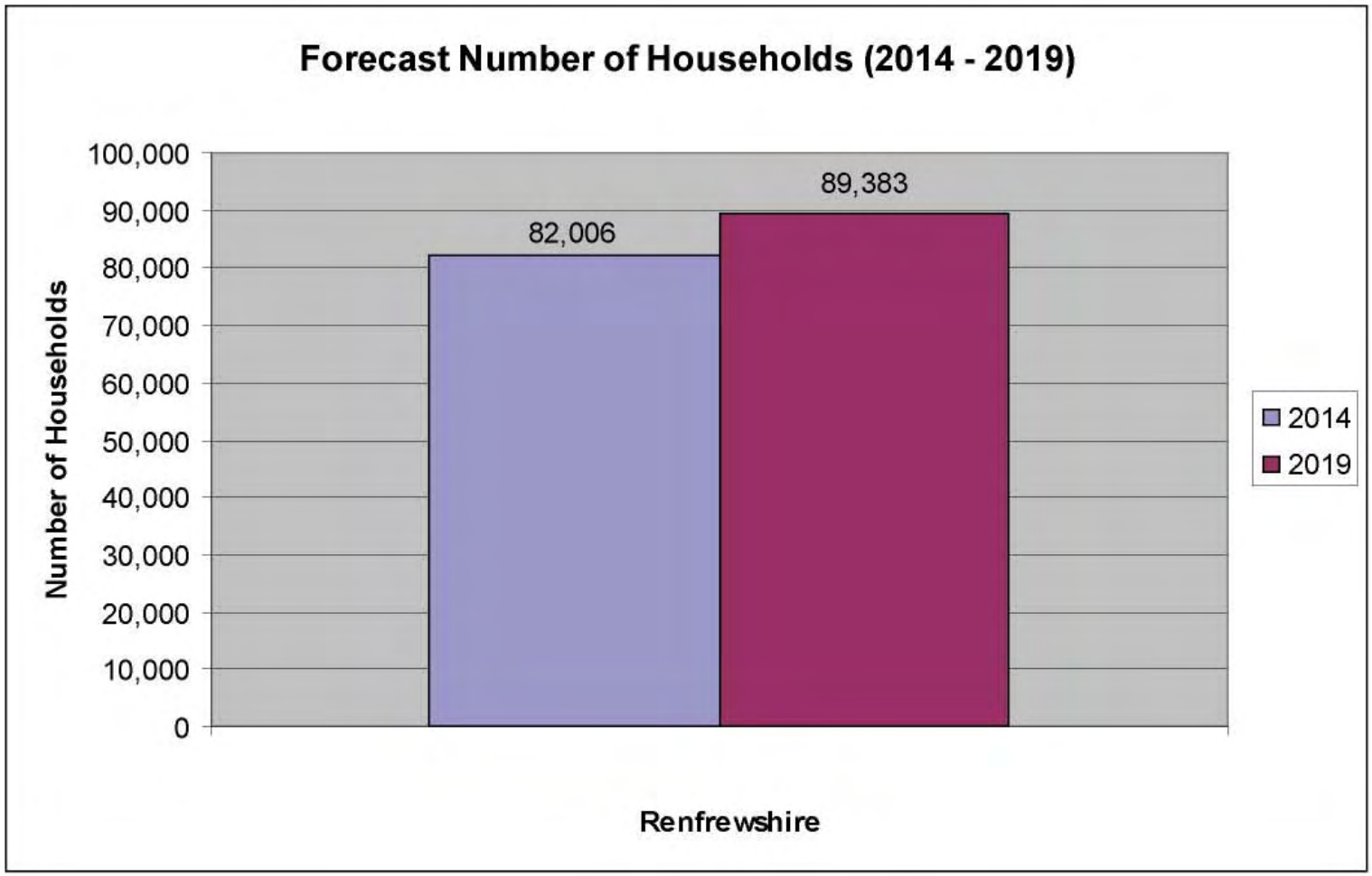
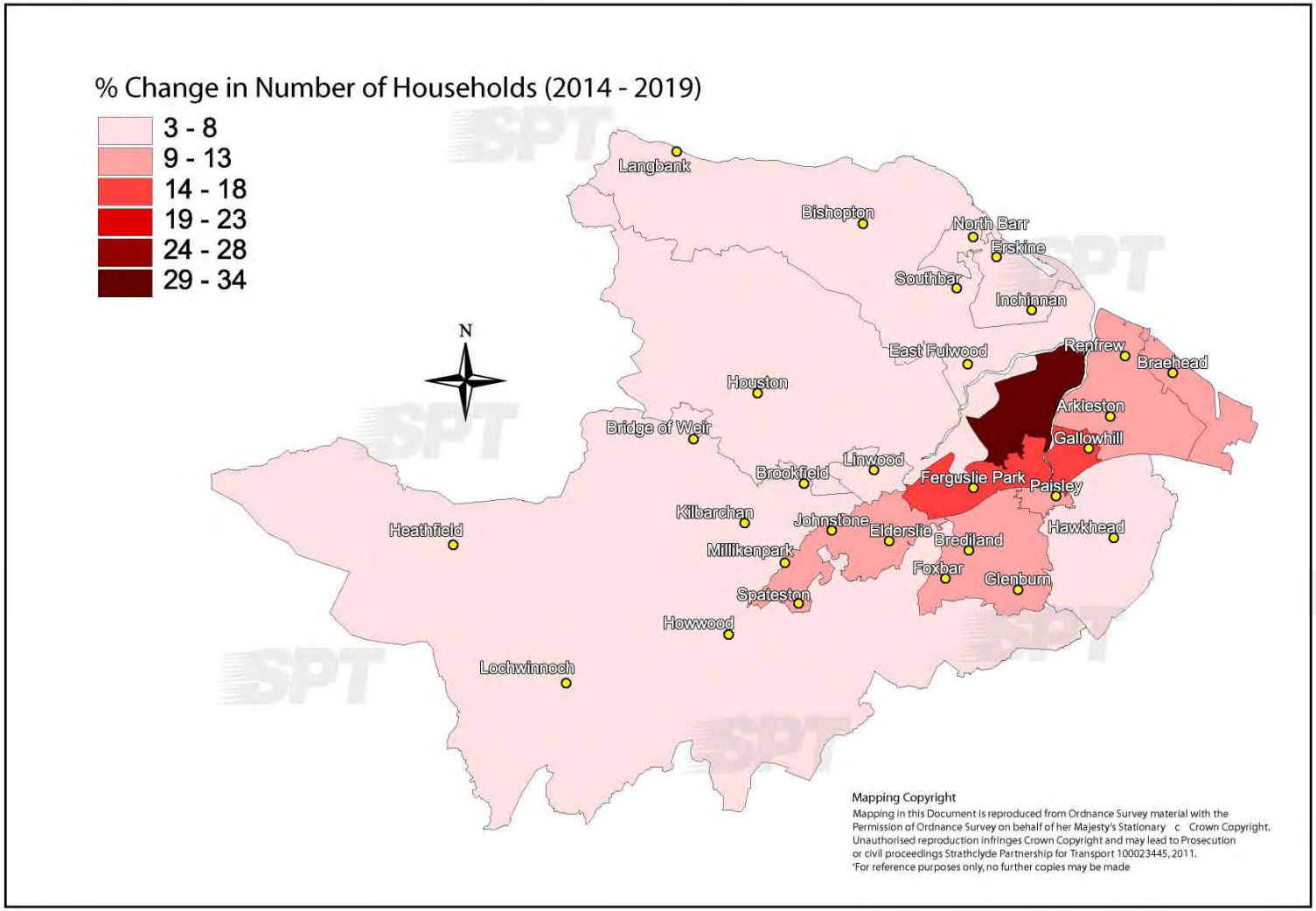


FIGURE 4 - PERCENTAGE CHANGE IN NUMBER OF HOUSEHOLDS



5.3 OUTPUT: EMPLOYMENT

FIGURE 5 – CHANGE IN NUMBER OF JOBS (FULL TIME EQUIVALENTS)

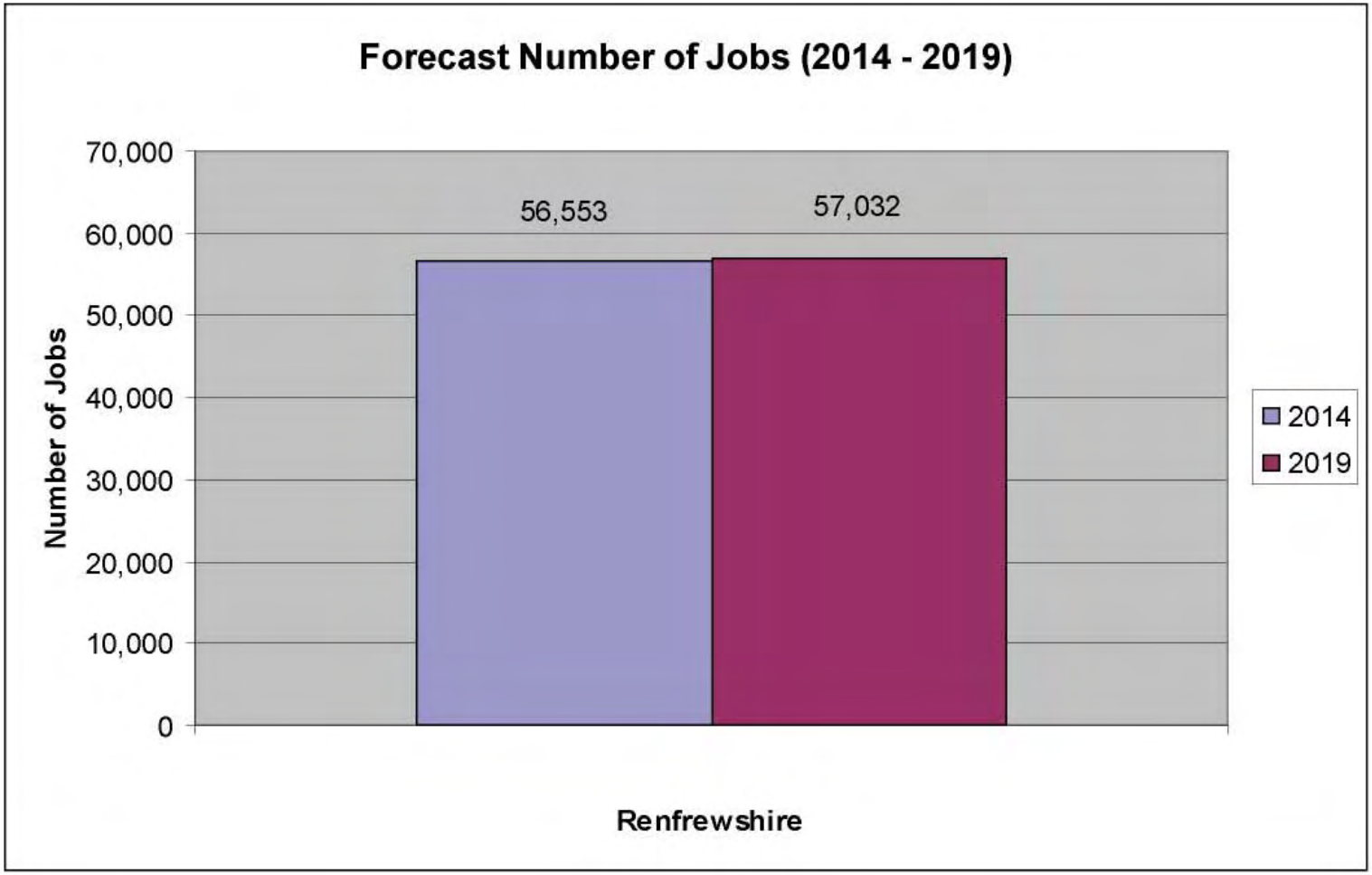
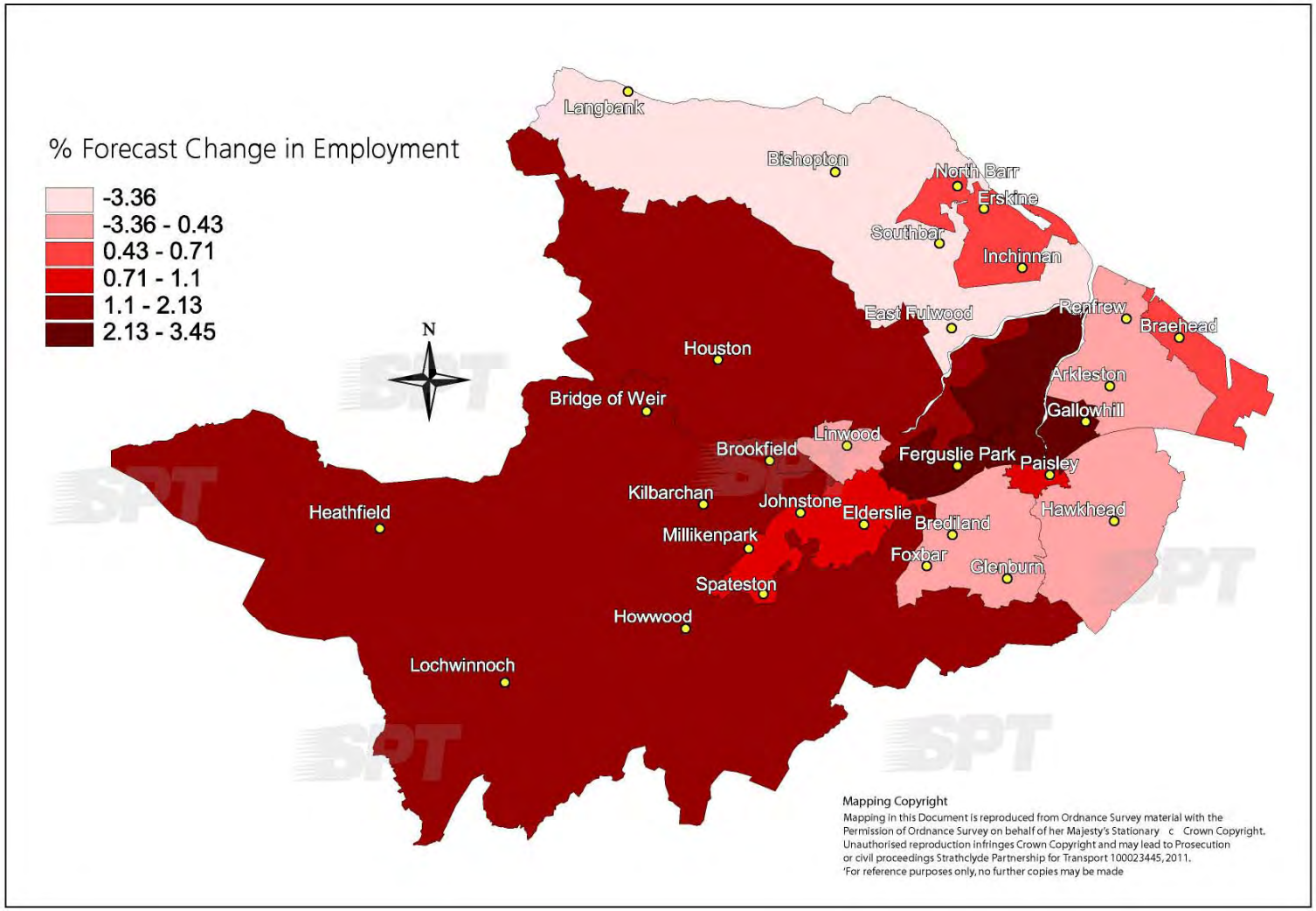
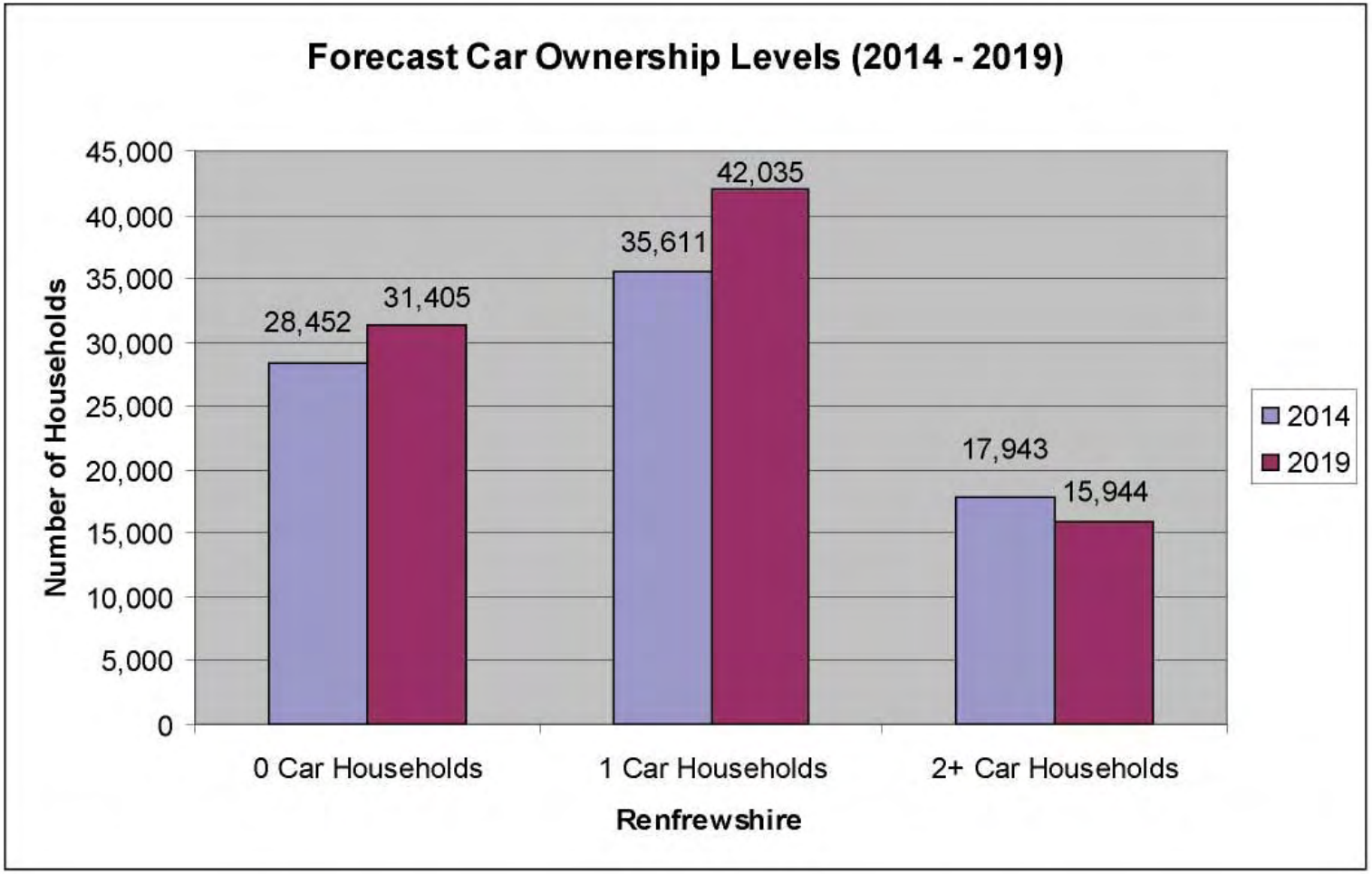


FIGURE 6 – PERCENTAGE CHANGE IN NUMBER OF JOBS



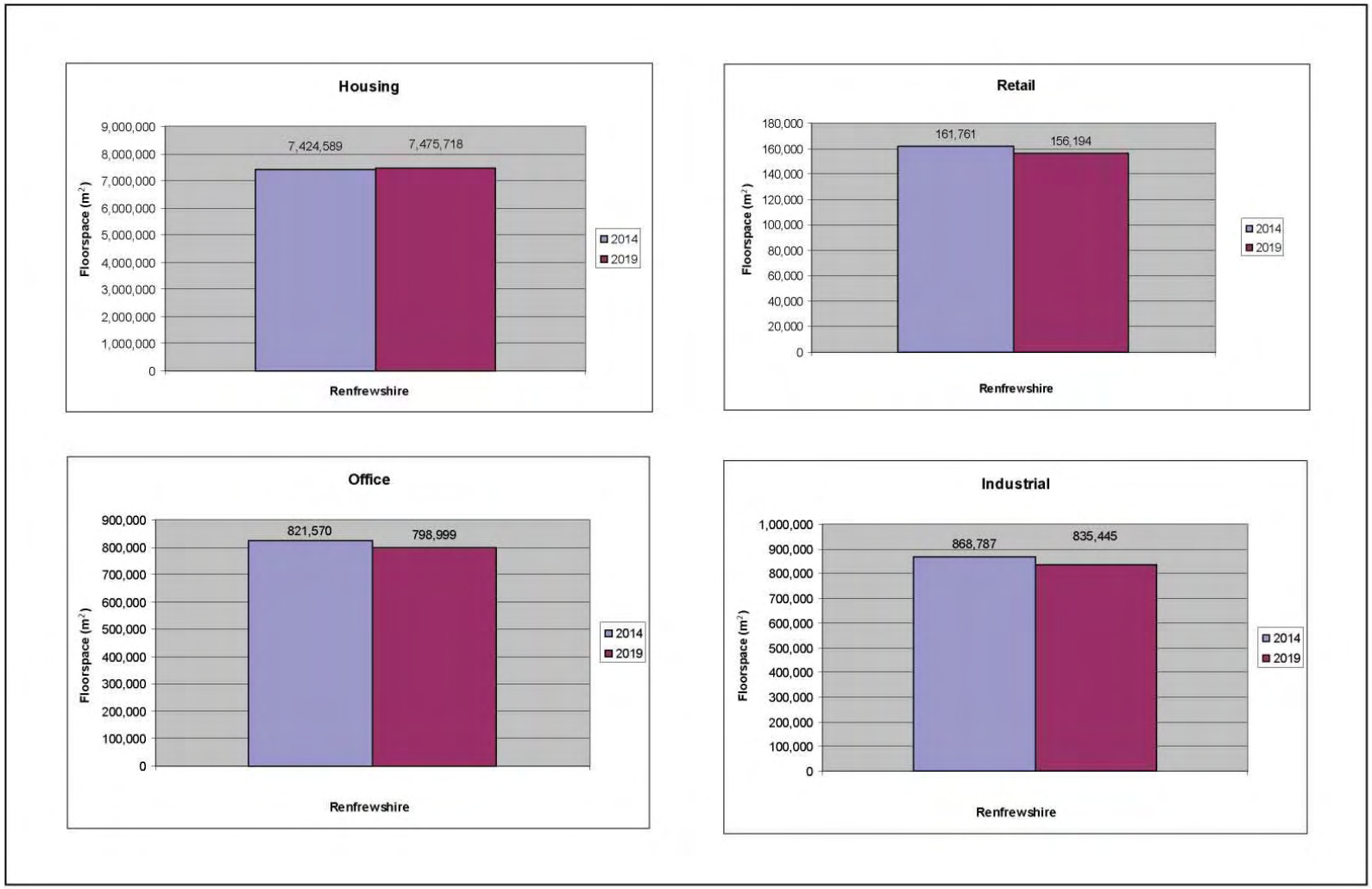
5.4 OUTPUT: CAR OWNERSHIP

FIGURE 7 – CHANGES IN CAR OWNERSHIP



5.4 OUTPUT: FLOORSPACE ALLOCATION

FIGURE 8 - CHANGES IN FLOORSPACE (HOUSING, RETAIL, OFFICE, INDUSTRIAL)



6 TRANSPORT MODELLING OUTPUT

6.1 OUTPUT: TRIP START & END DATA

Figures 10 to 25 on the following pages illustrate the modelled forecast change in the number of trips either starting from zones within Renfrewshire or ending in Renfrewshire zones. For the purposes of this report three trip types have been illustrated. These are:

- PT Person Trips

  These diagrams illustrate the modelled forecast change between 2014 and 2019 in the actual number of people that either start or end their trip in Renfrewshire zones using public transport.

- Car Person Trips

  These diagrams illustrate the modelled forecast change between 2014 and 2019 in the actual number of people that either start or end their trip in Renfrewshire zones using a car vehicle.

- Car Vehicle Trips

  These diagrams illustrate the modelled forecast change between 2014 and 2019 in the number of actual car vehicles (excluding goods vehicles) either originating or ending trips in Renfrewshire zones.

FIGURE 9 – CHANGES IN PUBLIC TRANSPORT PASSENGER TRIP STARTS

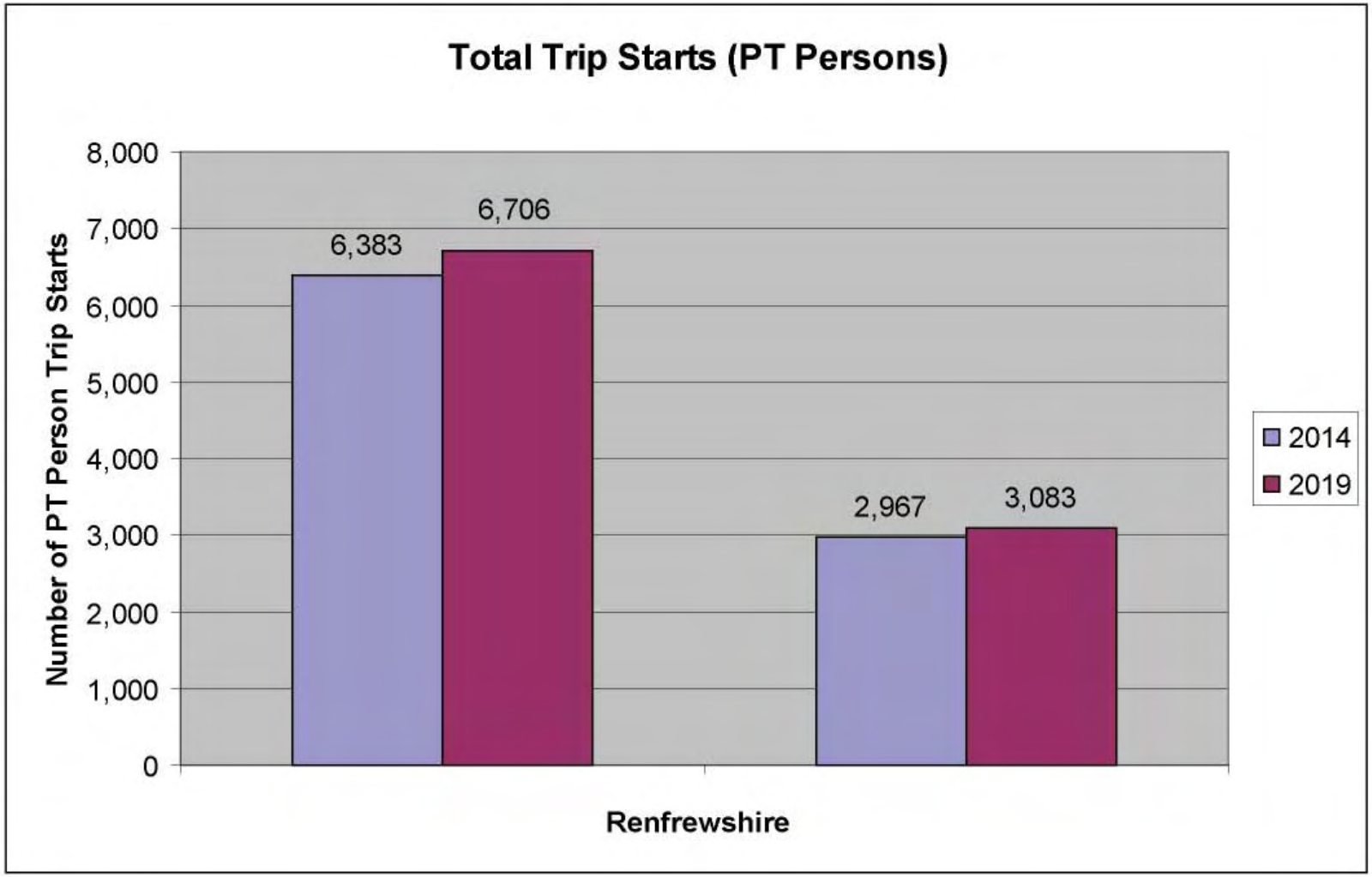


FIGURE 10 – CHANGES IN CAR USER TRIP STARTS

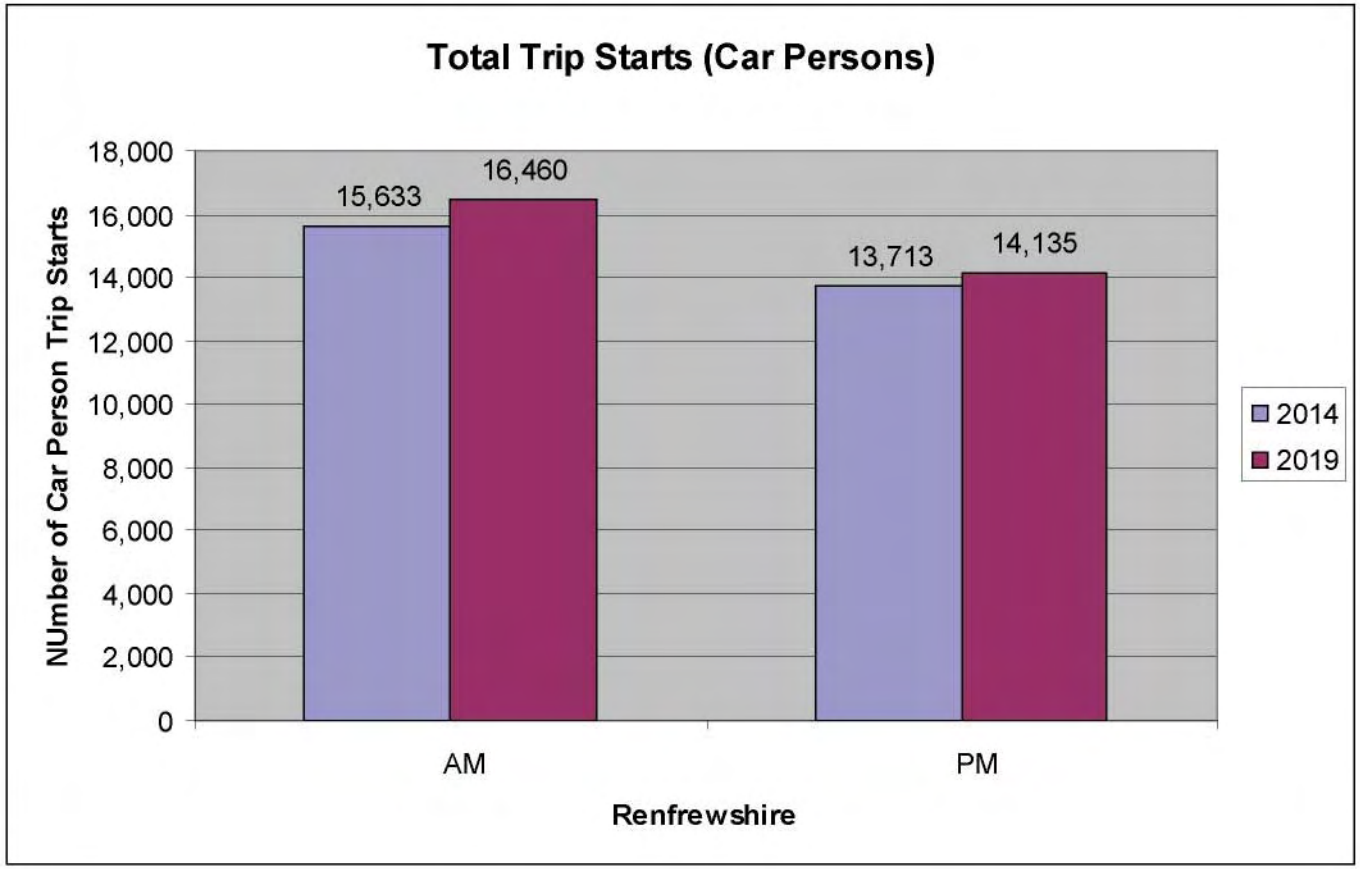


FIGURE 11 – CHANGES IN CAR VEHICLE TRIP STARTS

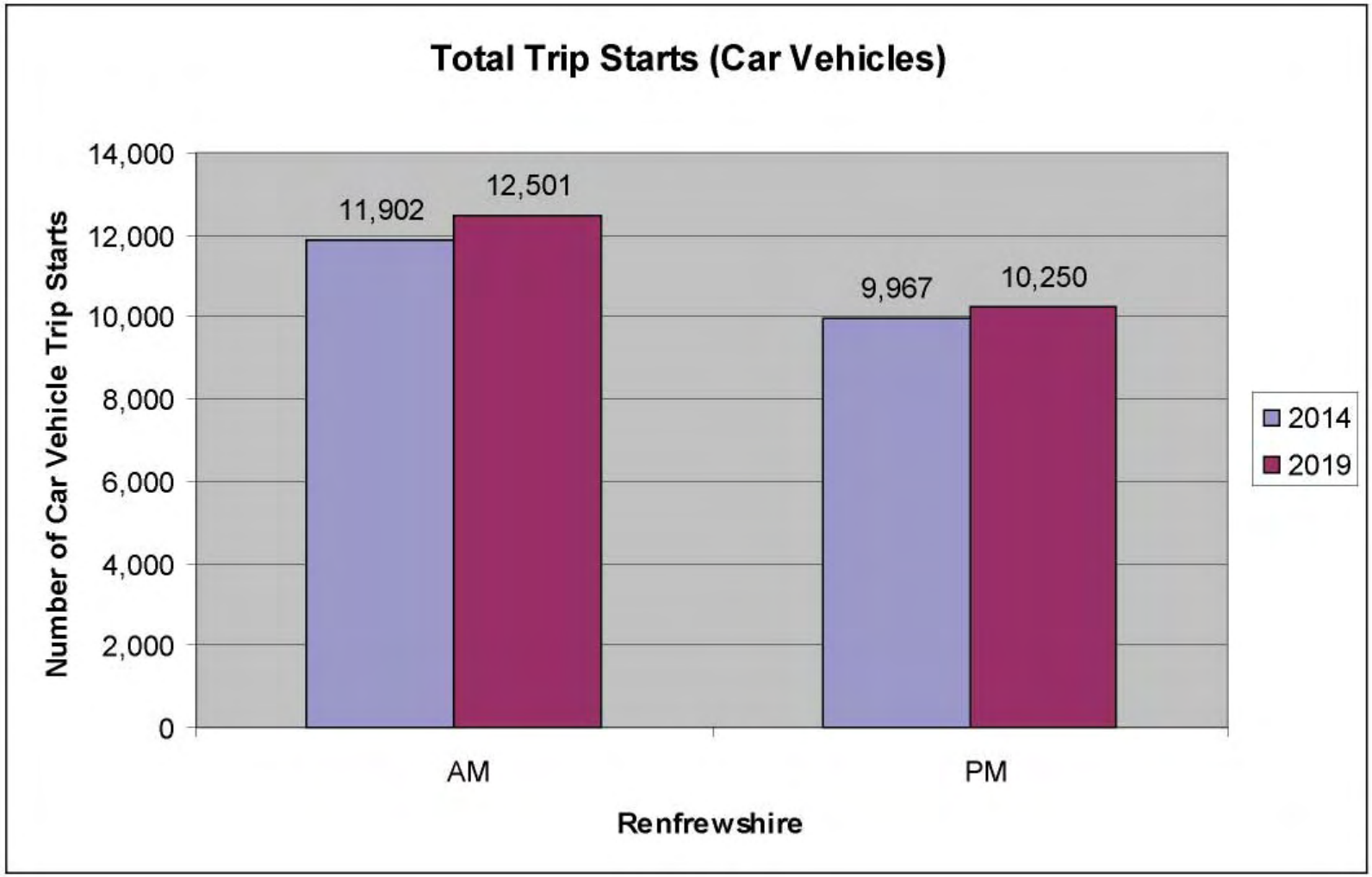


FIGURE 12 – CHANGE IN PUBLIC TRANSPORT PASSENGER TRIP ENDS

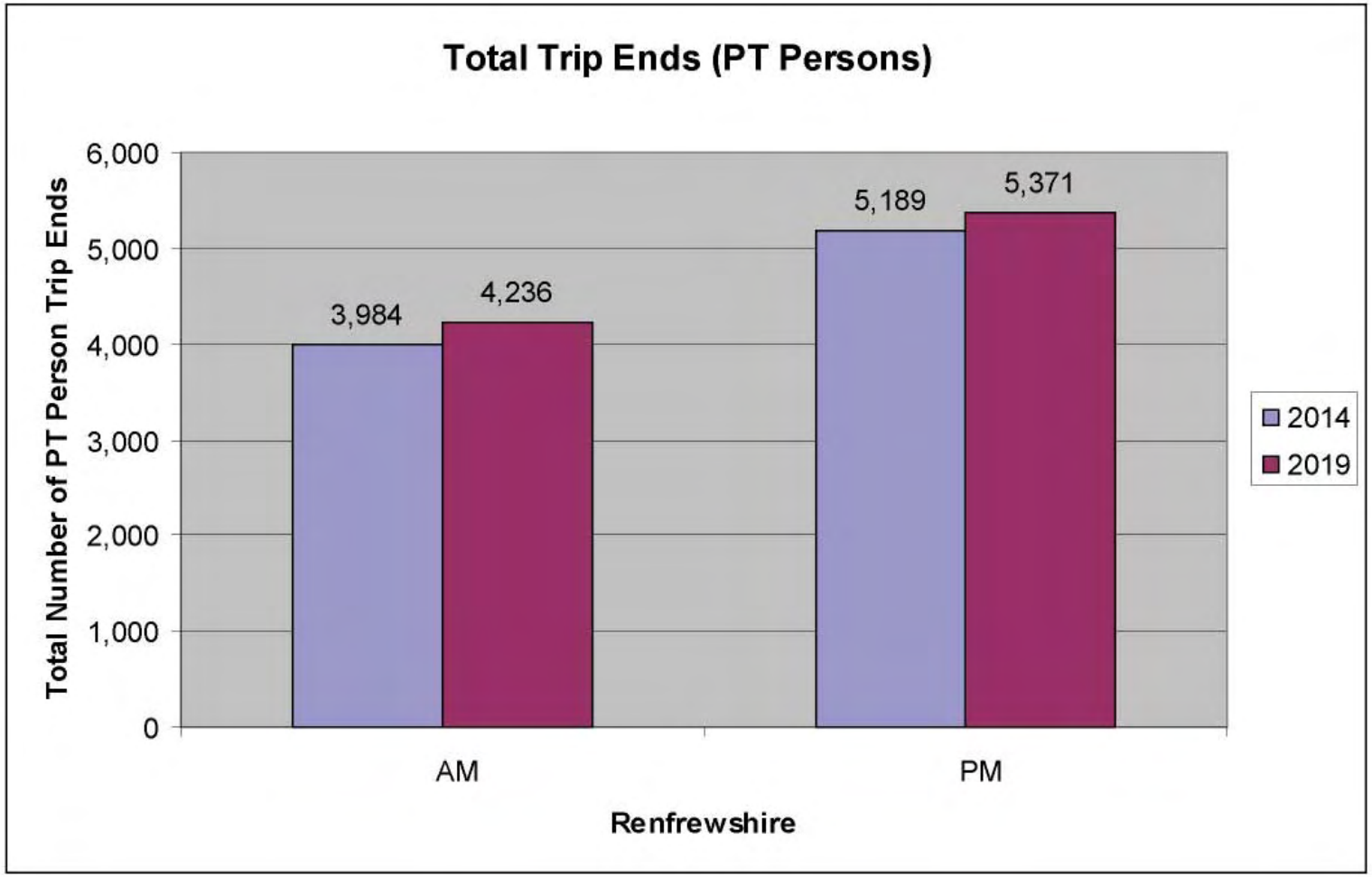


FIGURE 13 – CHANGE IN CAR USER TRIP ENDS

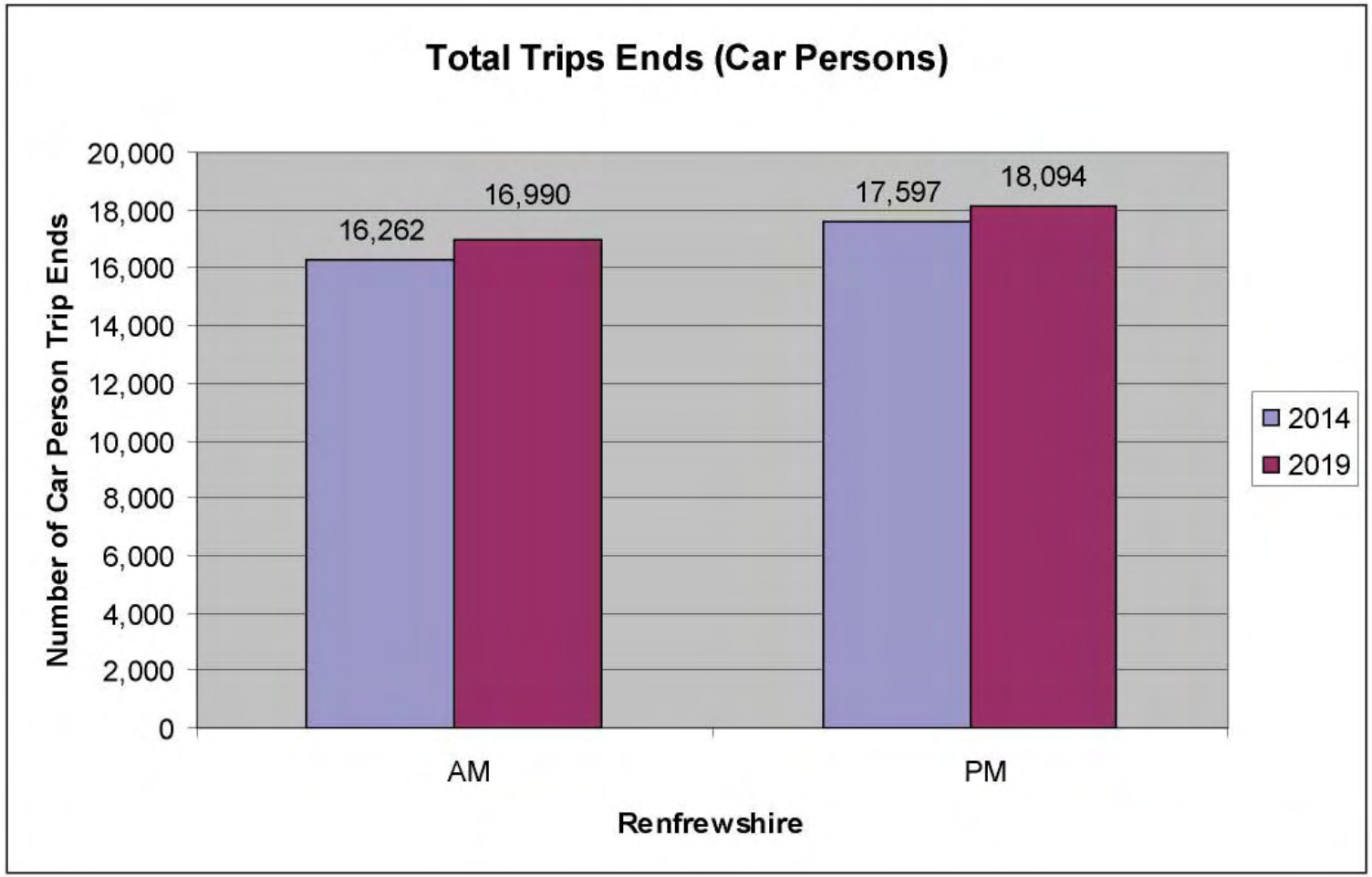


FIGURE 14 – CHANGE IN CAR VEHICLE TRIP ENDS

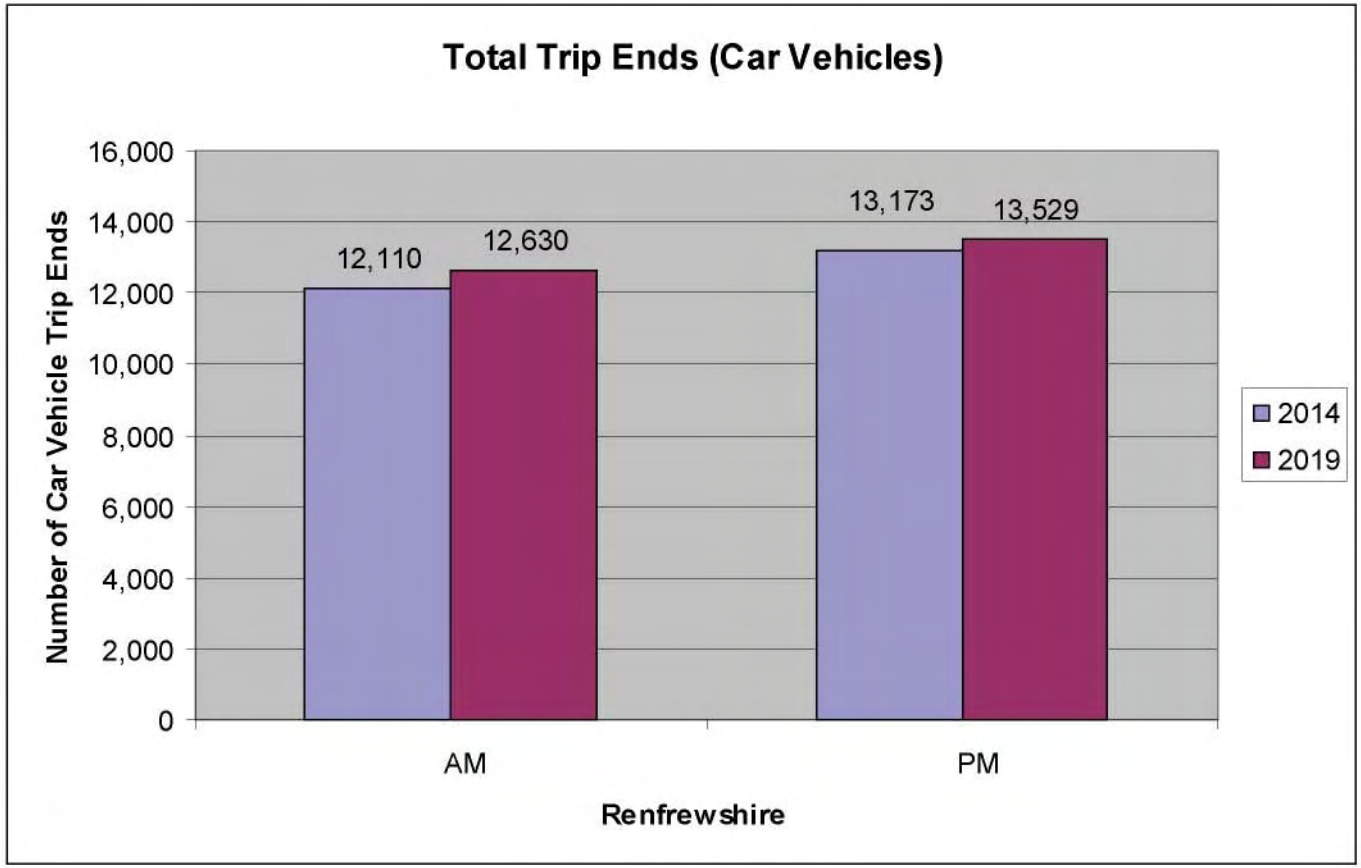


FIGURE 15 – CHANGE IN AM PUBLIC TRANSPORT PASSENGER TRIP STARTS

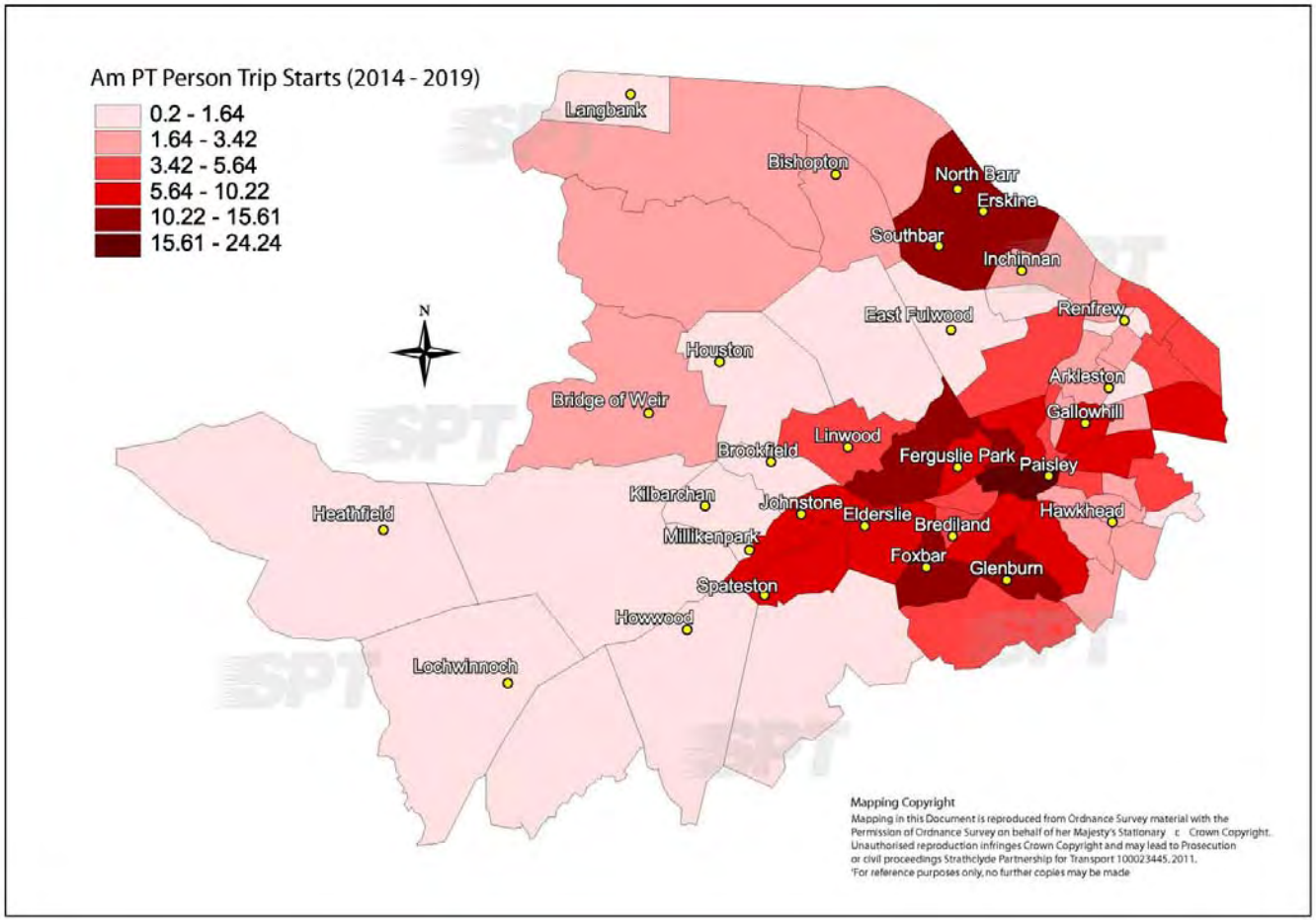


FIGURE 16 – CHANGE IN PM PUBLIC TRANSPORT PASSENGER TRIP STARTS

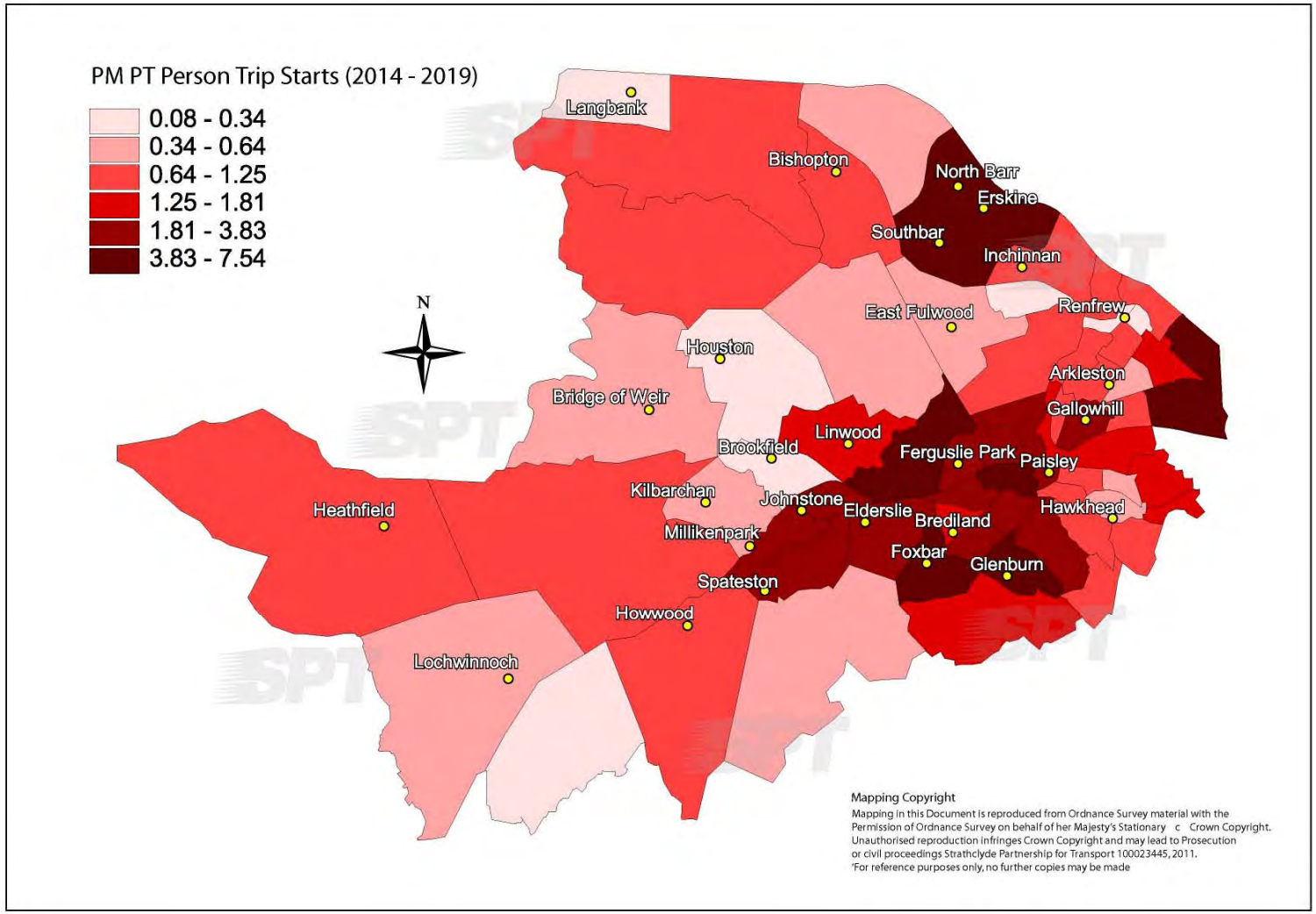


FIGURE 17 – CHANGE IN AM CAR PERSON TRIP STARTS

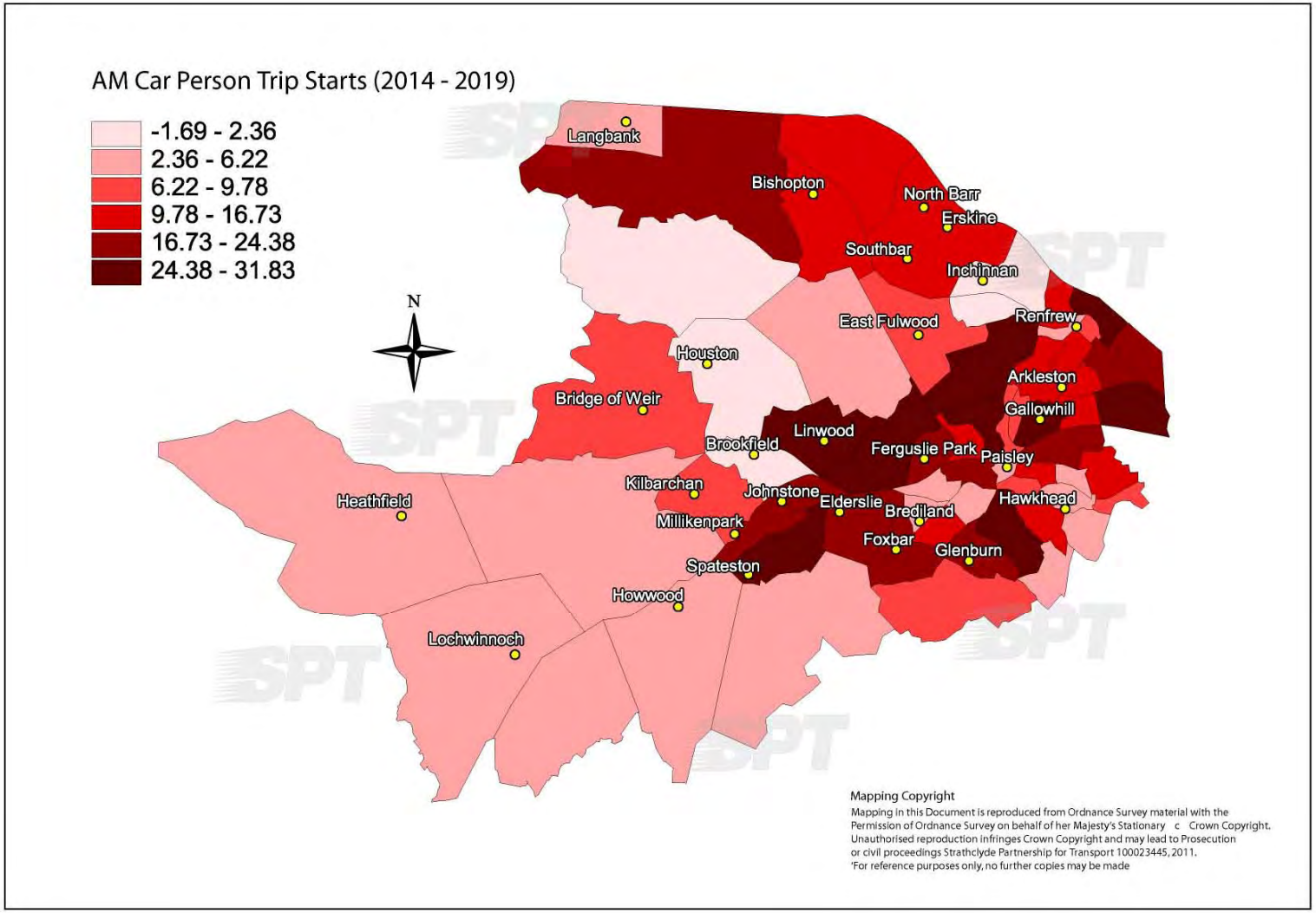


FIGURE 18 – CHANGE IN PM CAR PERSON TRIP STARTS

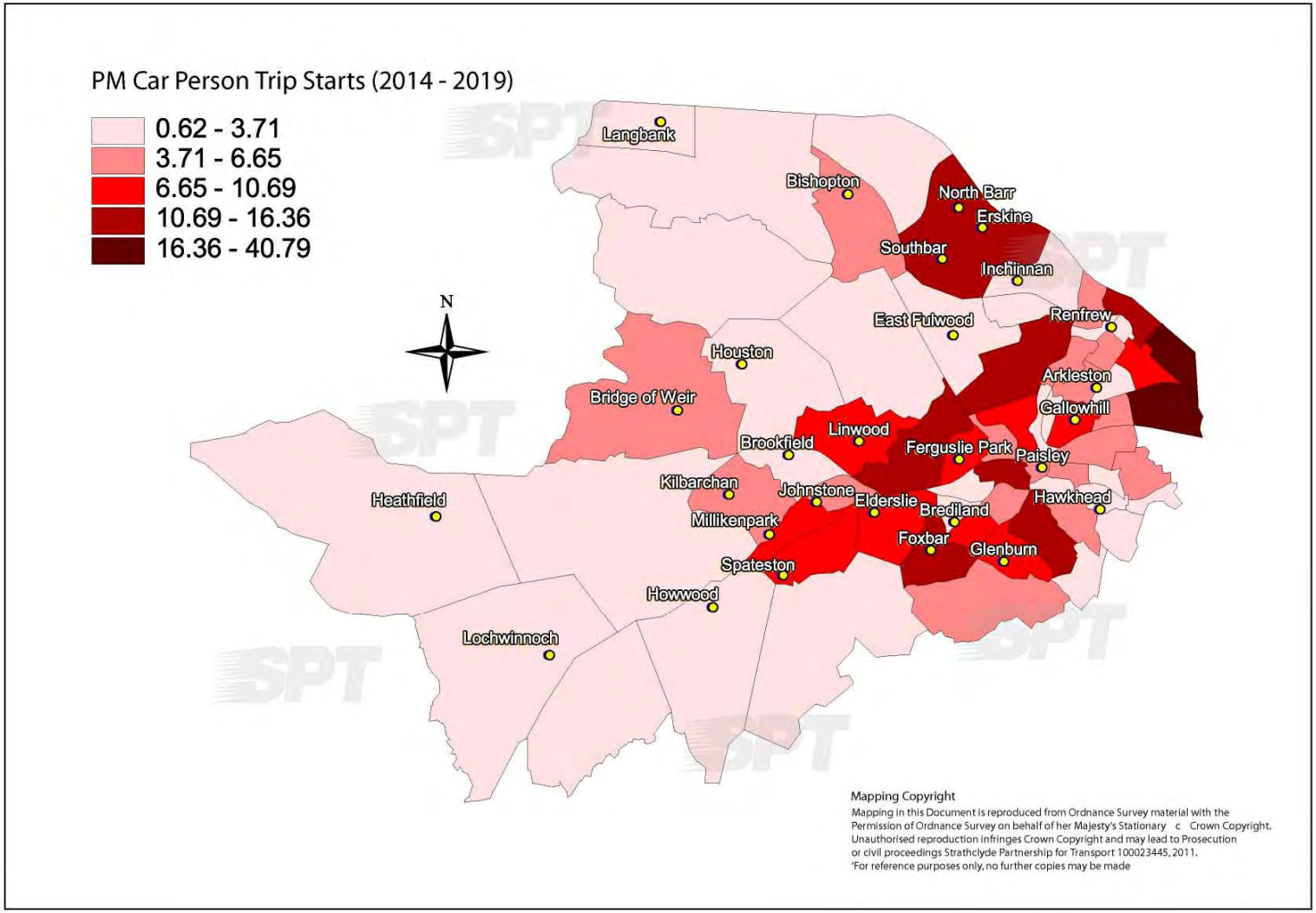


FIGURE 19 – CHANGE IN AM CAR VEHICLE TRIP STARTS

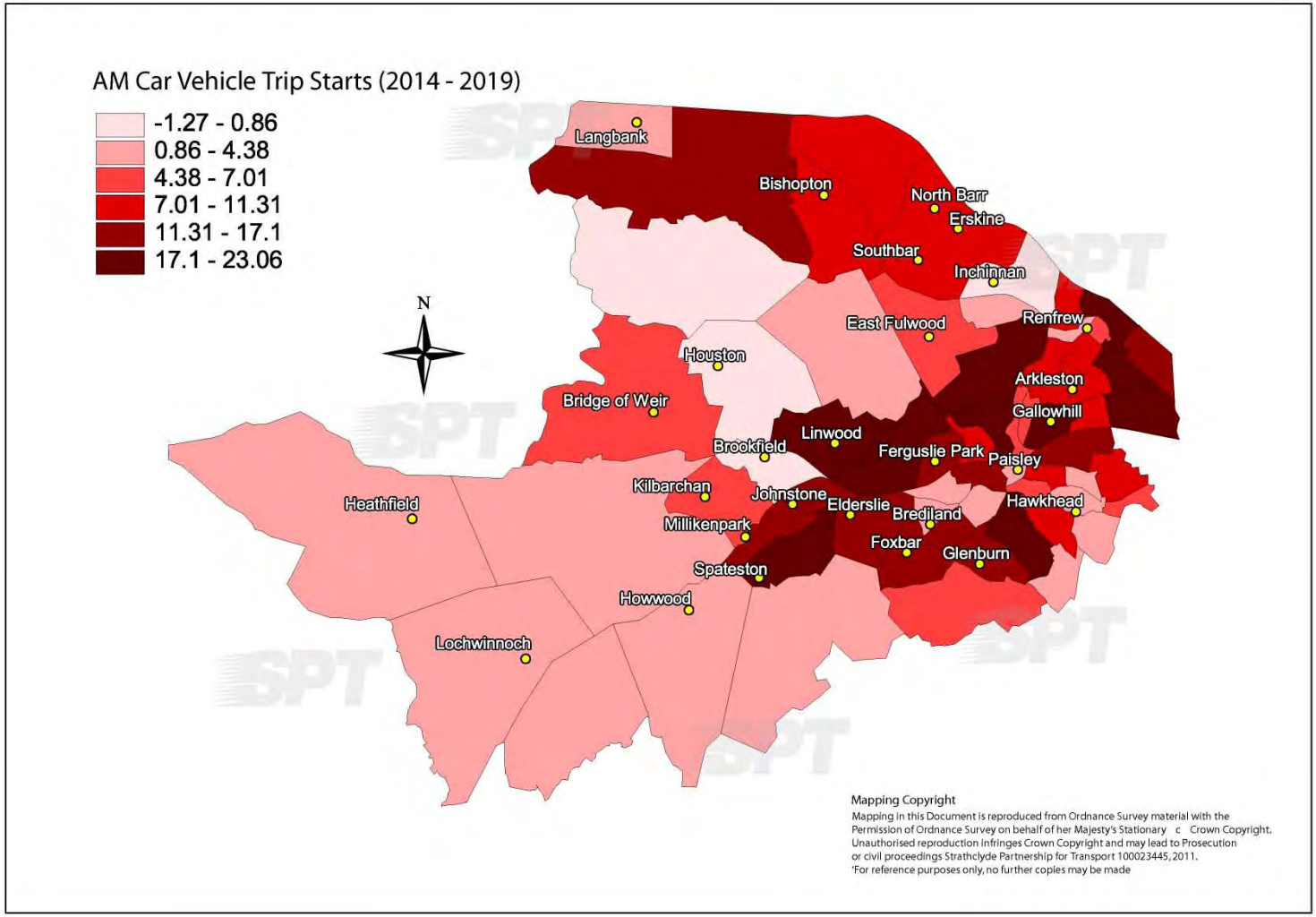


FIGURE 20 – CHANGE IN PM CAR VEHICLE TRIP STARTS

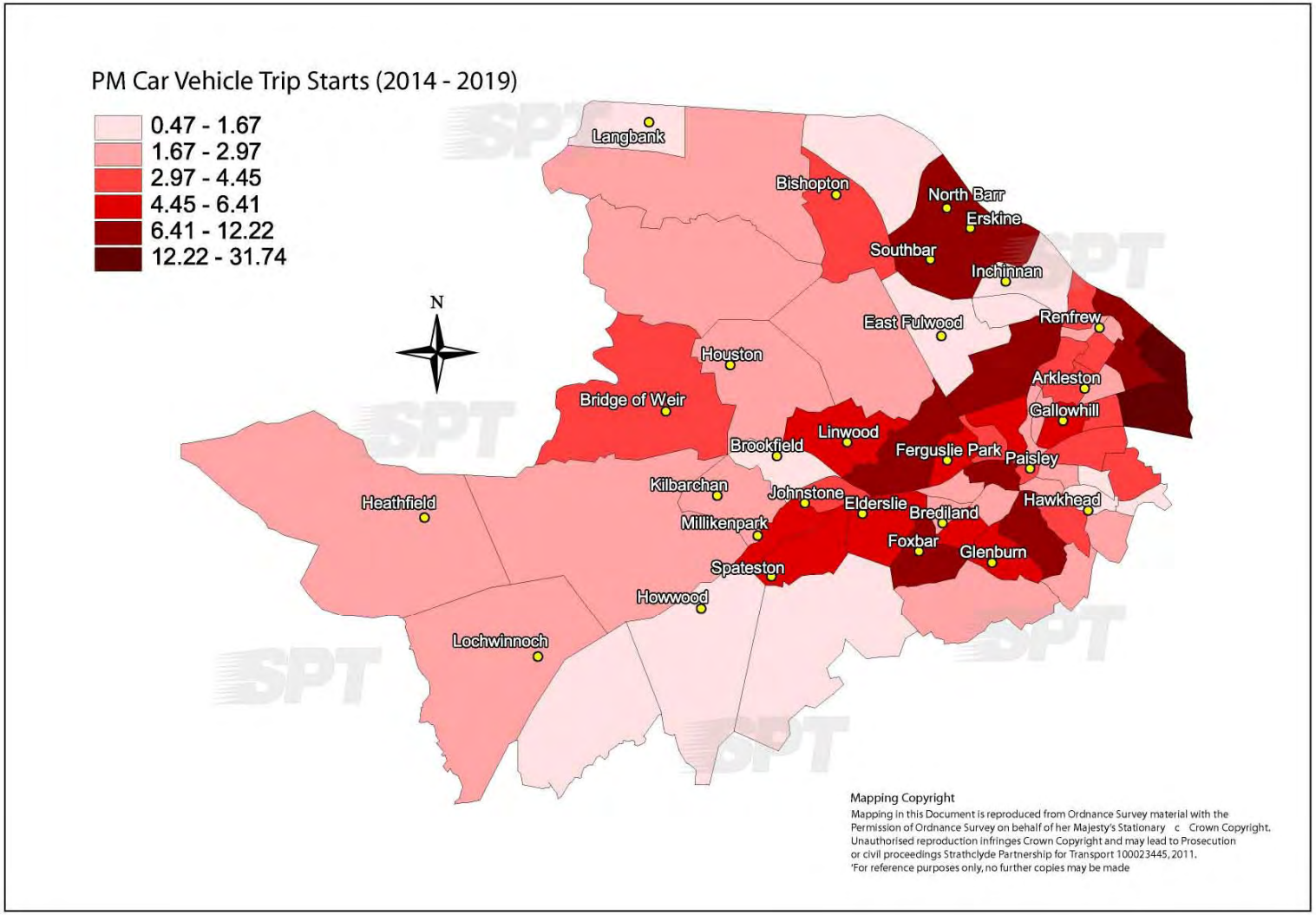


FIGURE 21 – CHANGE IN AM PUBLIC TRANSPORT PASSENGER TRIP ENDS

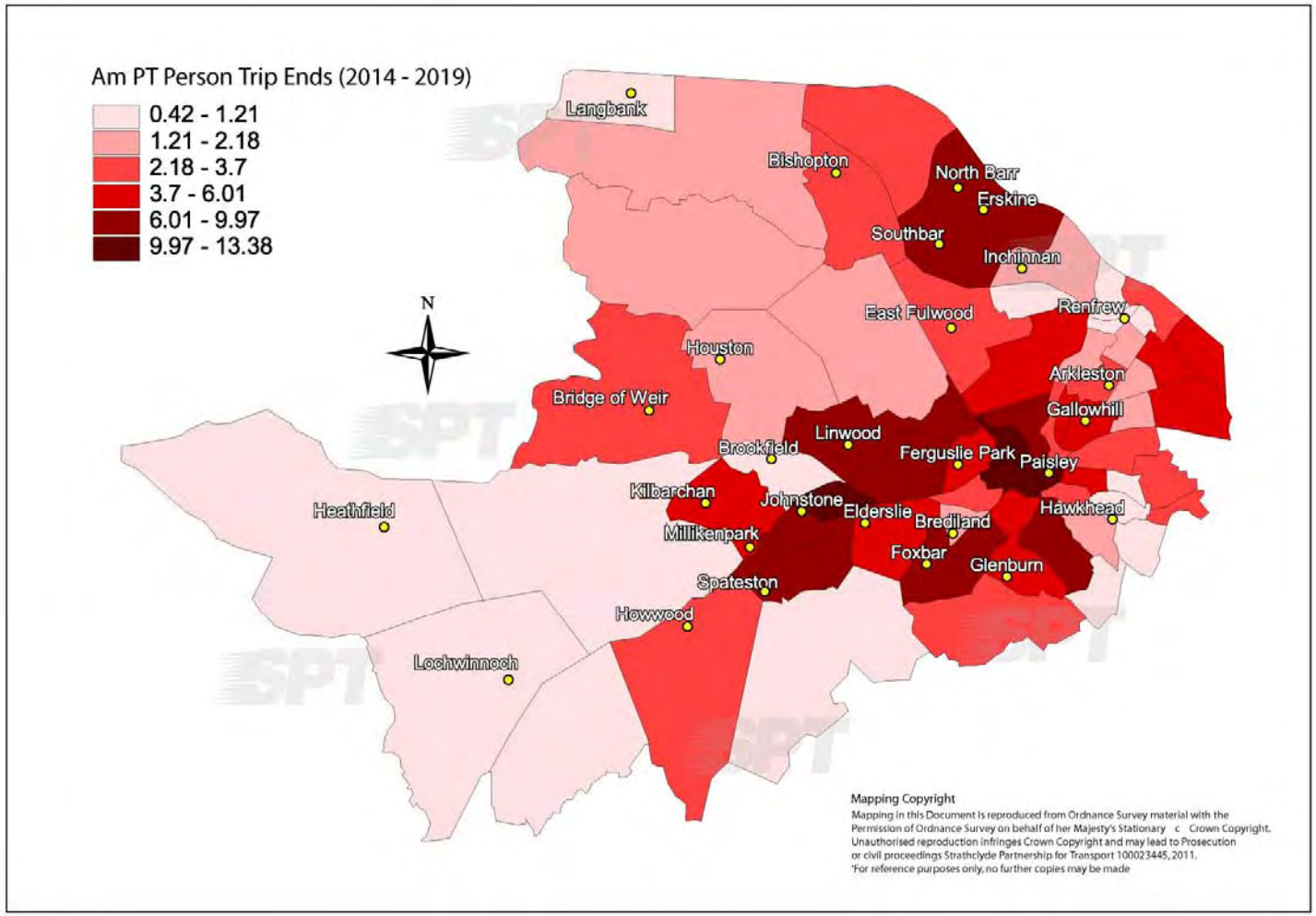


FIGURE 22 – CHANGE IN PM PUBLIC TRANSPORT PASSENGER TRIP ENDS

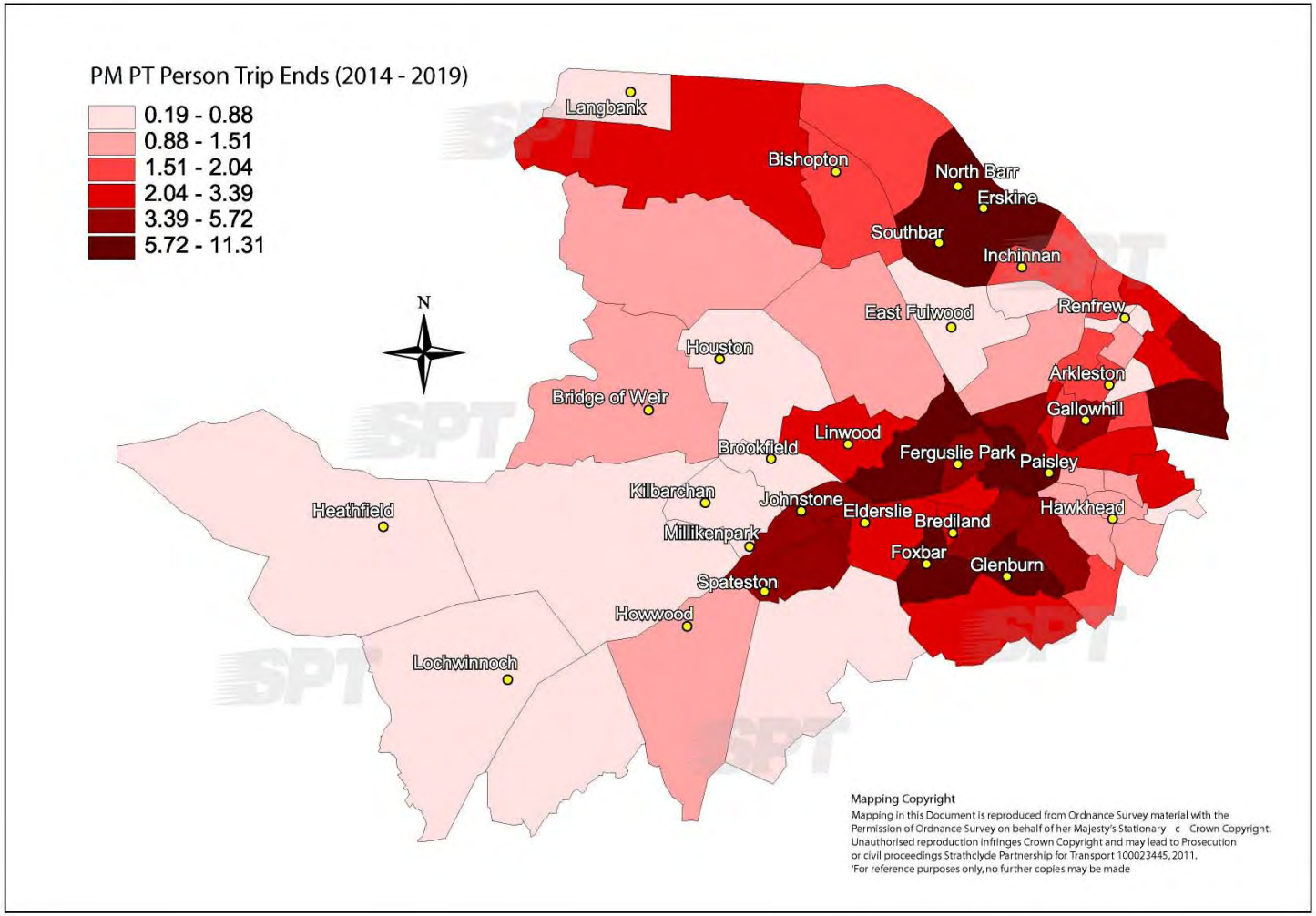


FIGURE 23 - CHANGE IN AM CAR PERSON TRIP ENDS

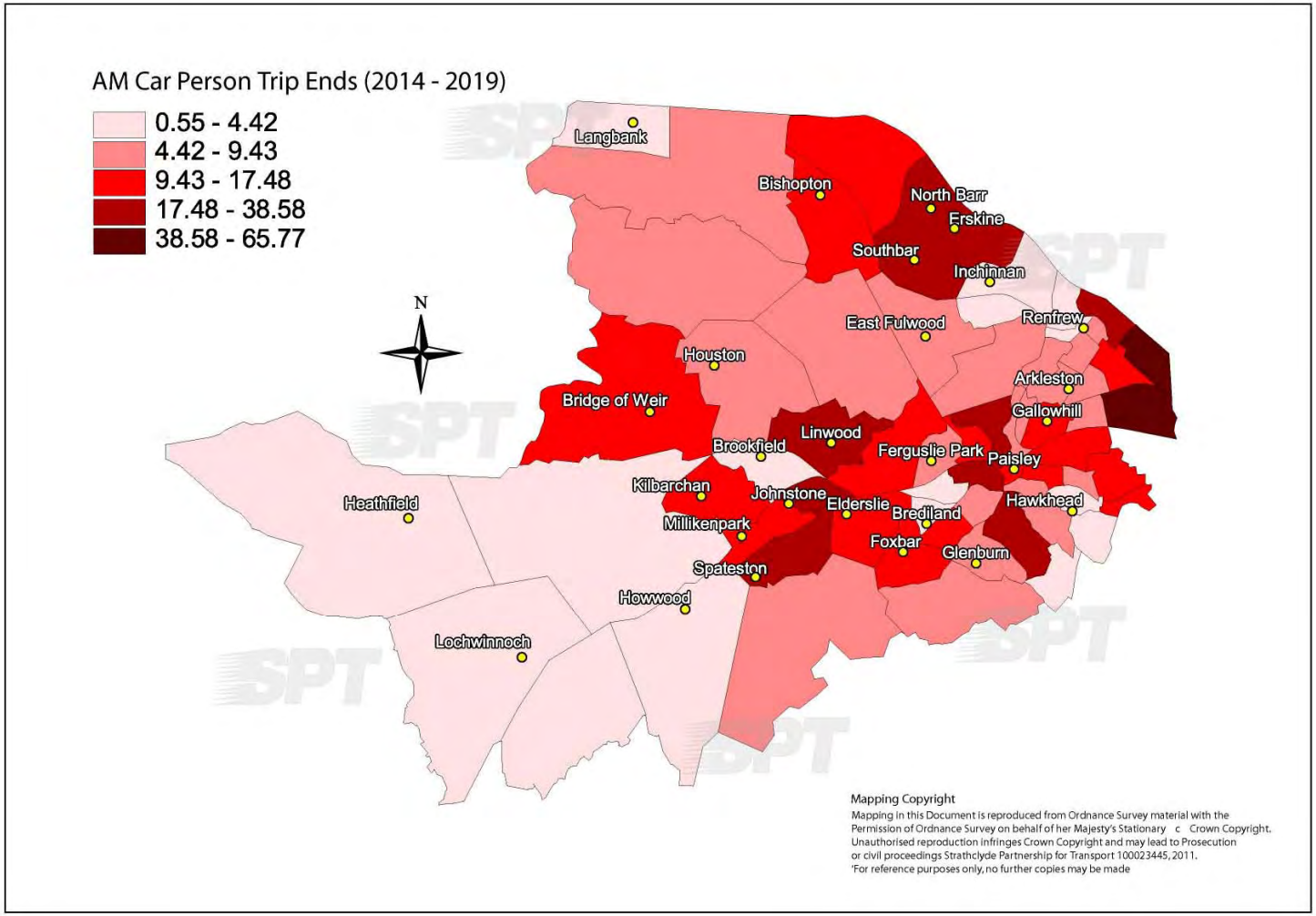


FIGURE 24 – CHANGE IN PM CAR PERSON TRIP ENDS

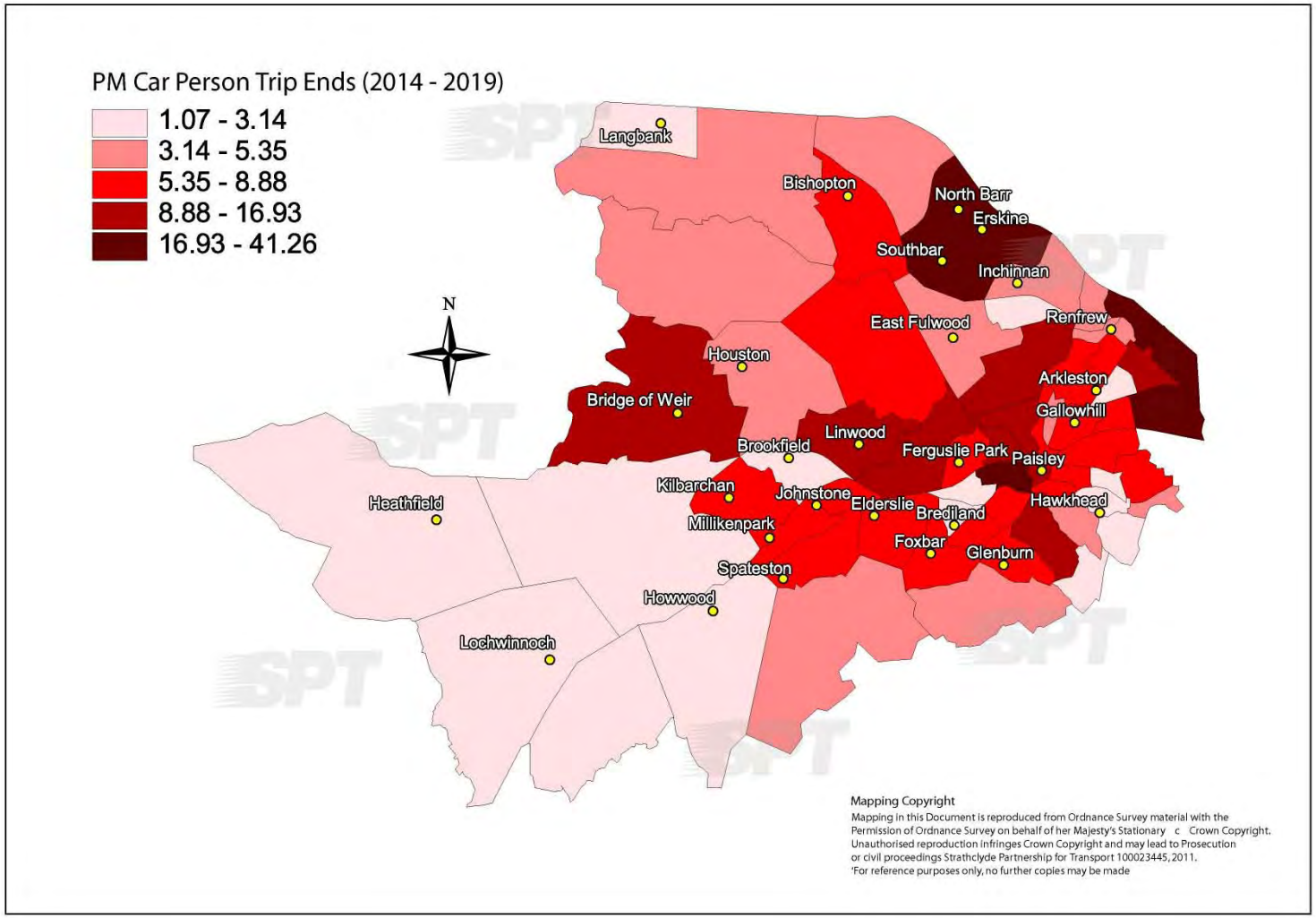


FIGURE 25 – CHANGE IN AM CAR VEHICLE TRIP ENDS

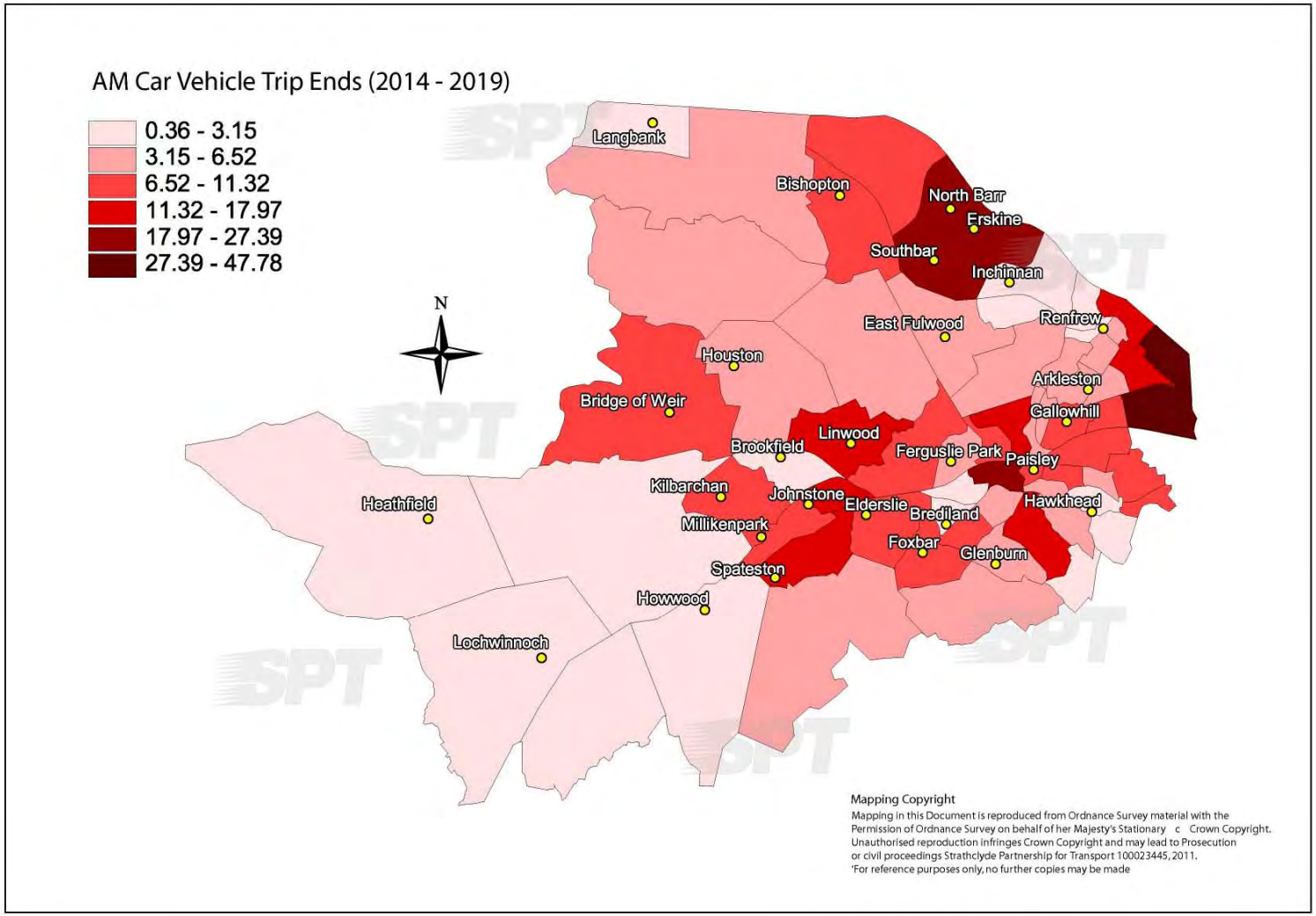
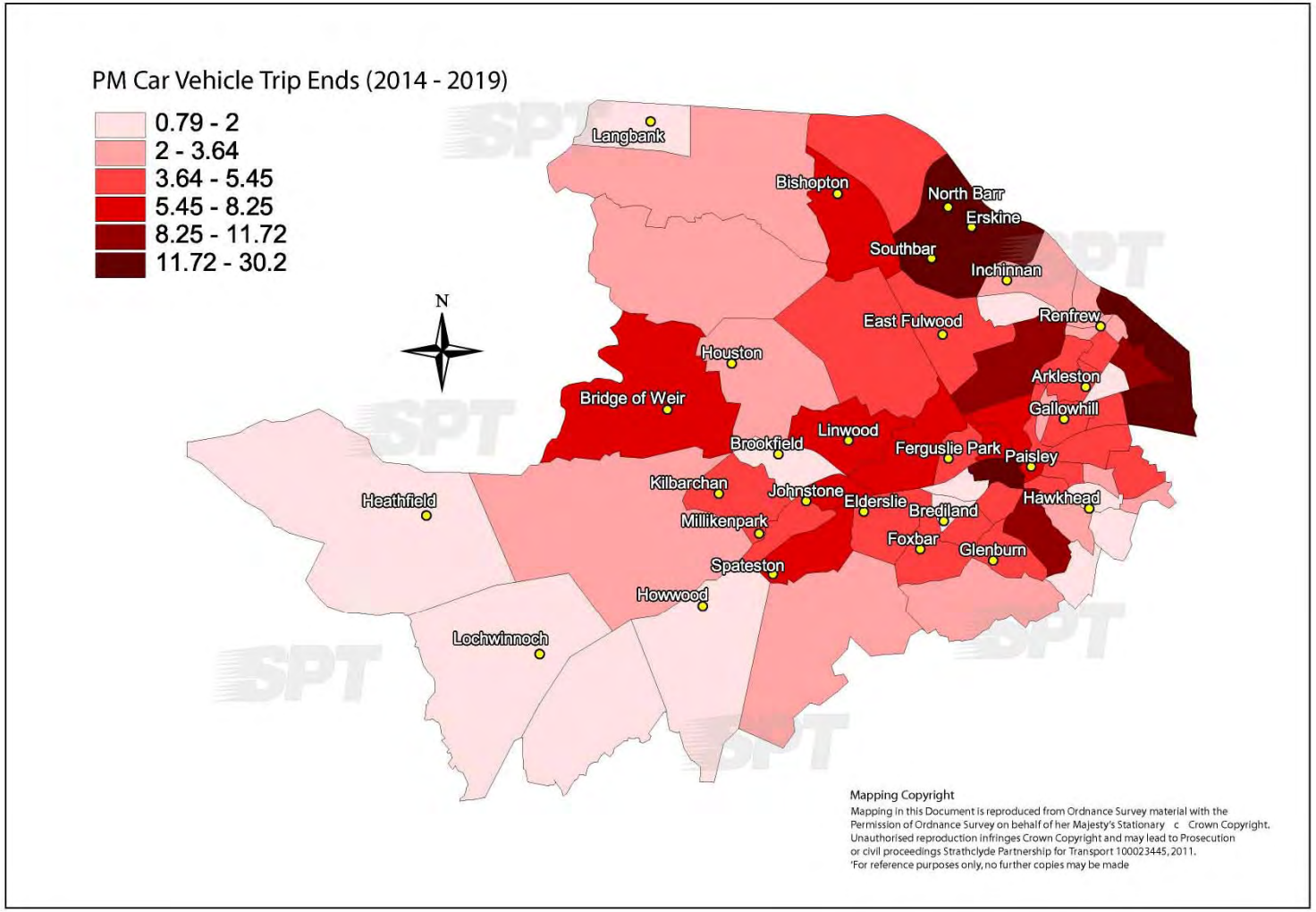


FIGURE 26 – CHANGE IN PM CAR VEHICLE TRIP ENDS



7 OUTPUT EMISSIONS DATA

7.1 OUTPUT: CHANGE IN NO_X

FIGURE 27 – PERCENTAGE CHANGE IN NO_X – AM PEAK HOUR

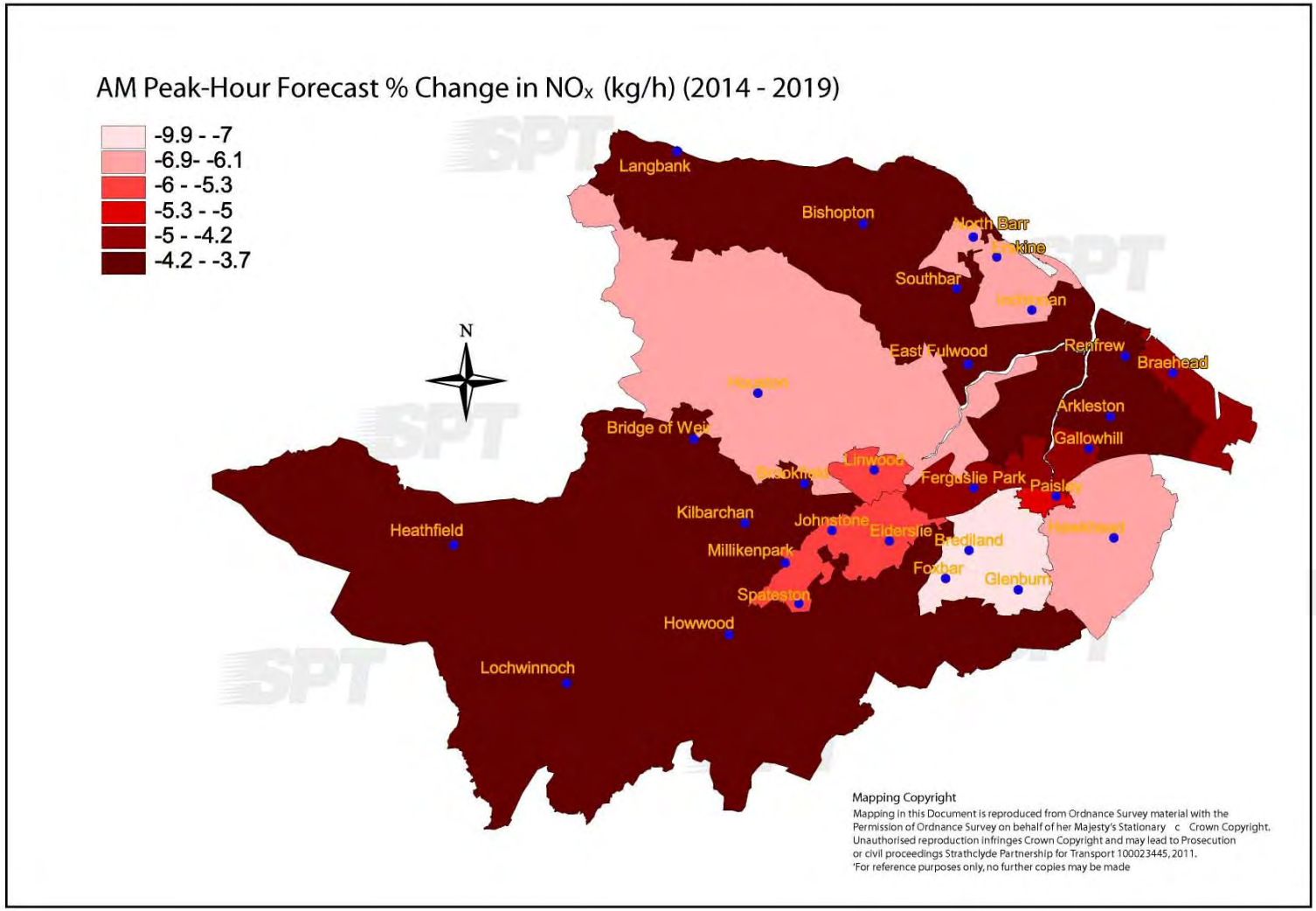
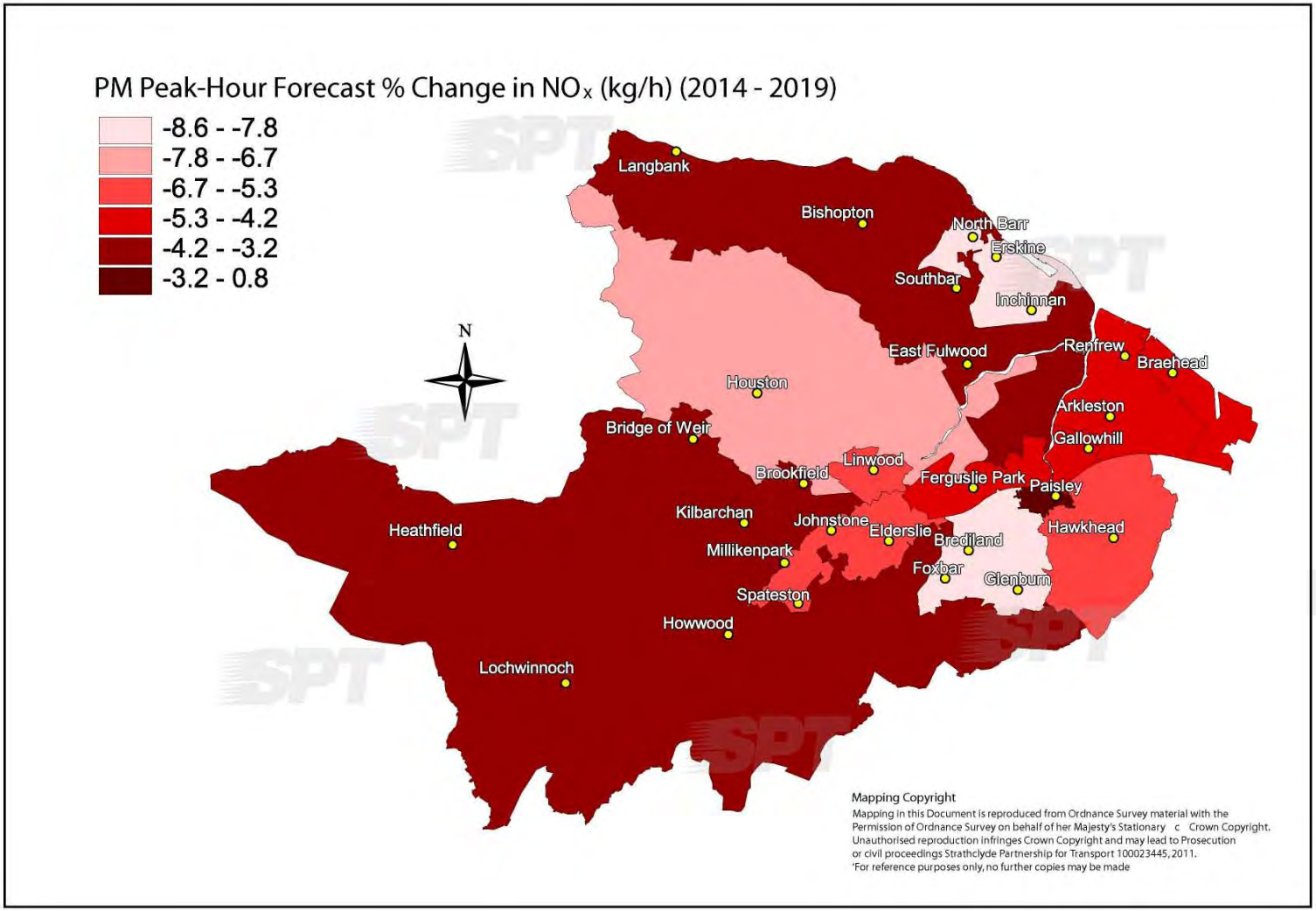


FIGURE 28 – PERCENTAGE CHANGE IN NO_X – PM PEAK HOUR



7.2 OUTPUT: CHANGE IN CO_2

FIGURE 29 – PERCENTAGE CHANGE IN CO_2 AM PEAK HOUR

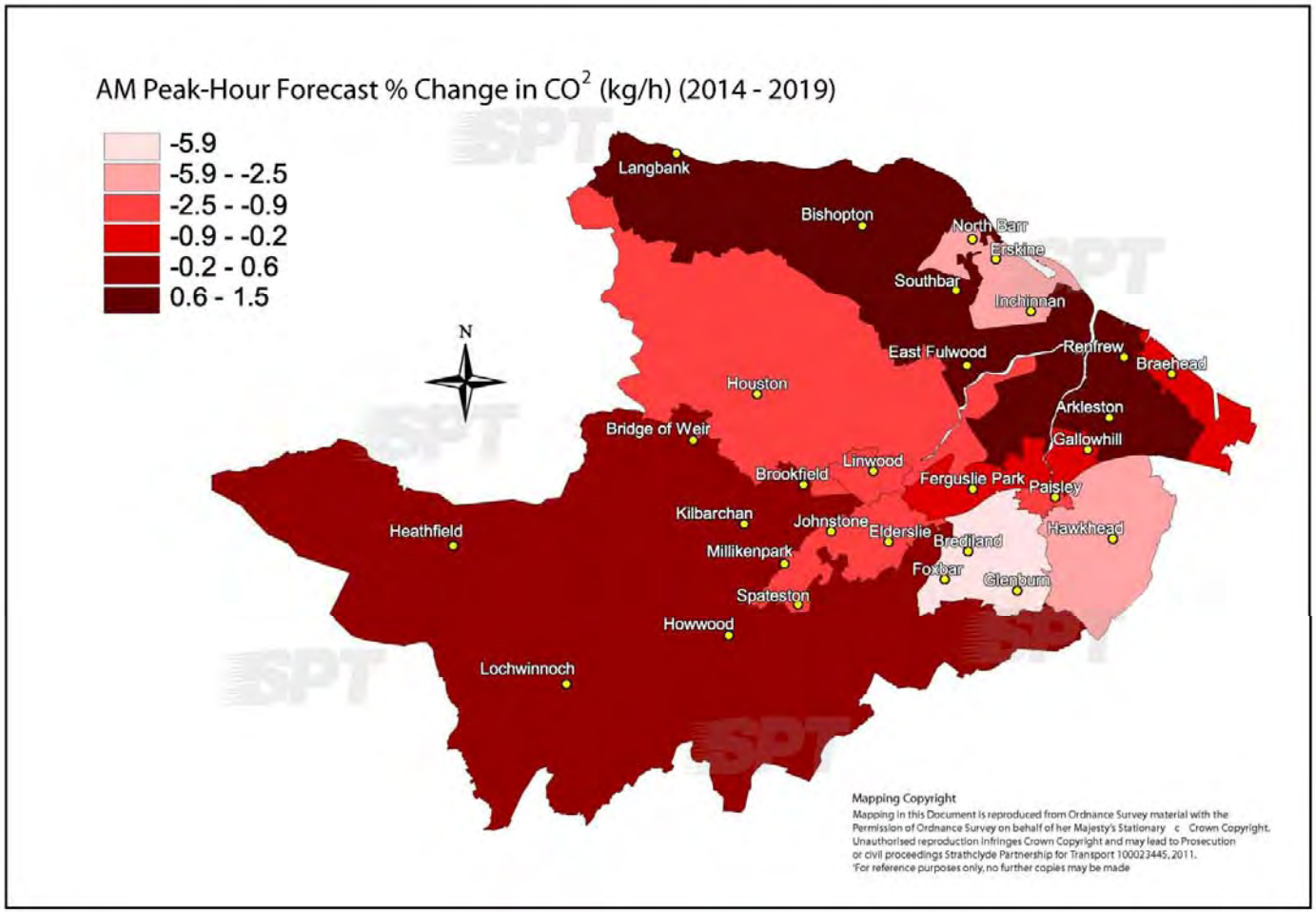
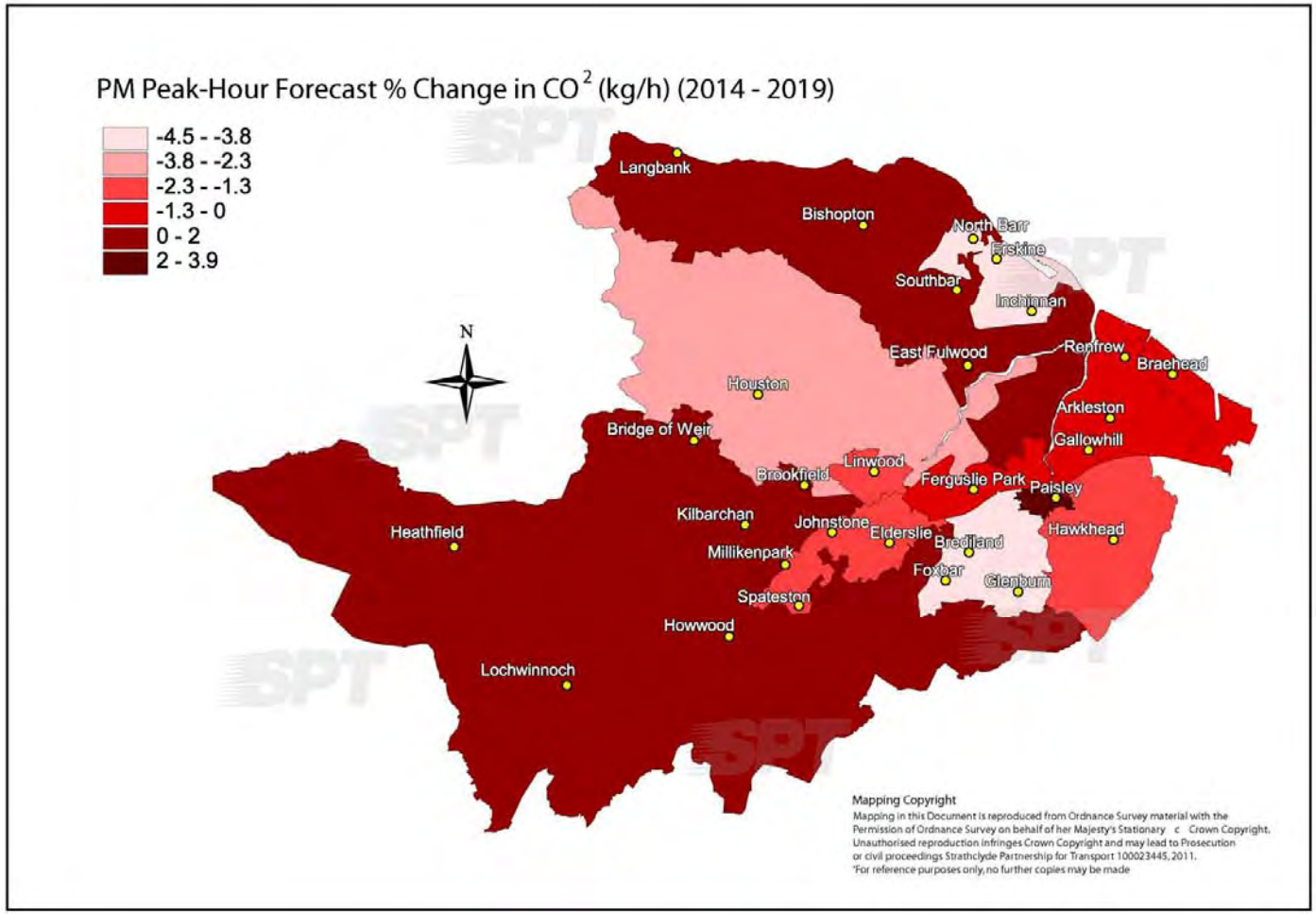


FIGURE 30 – PERCENTAGE CHANGE IN CO_2 PM PEAK HOUR



7.3 OUTPUT CHANGE IN PM10

FIGURE 31 – PERCENTAGE CHANGE IN PM10 AM PEAK HOUR

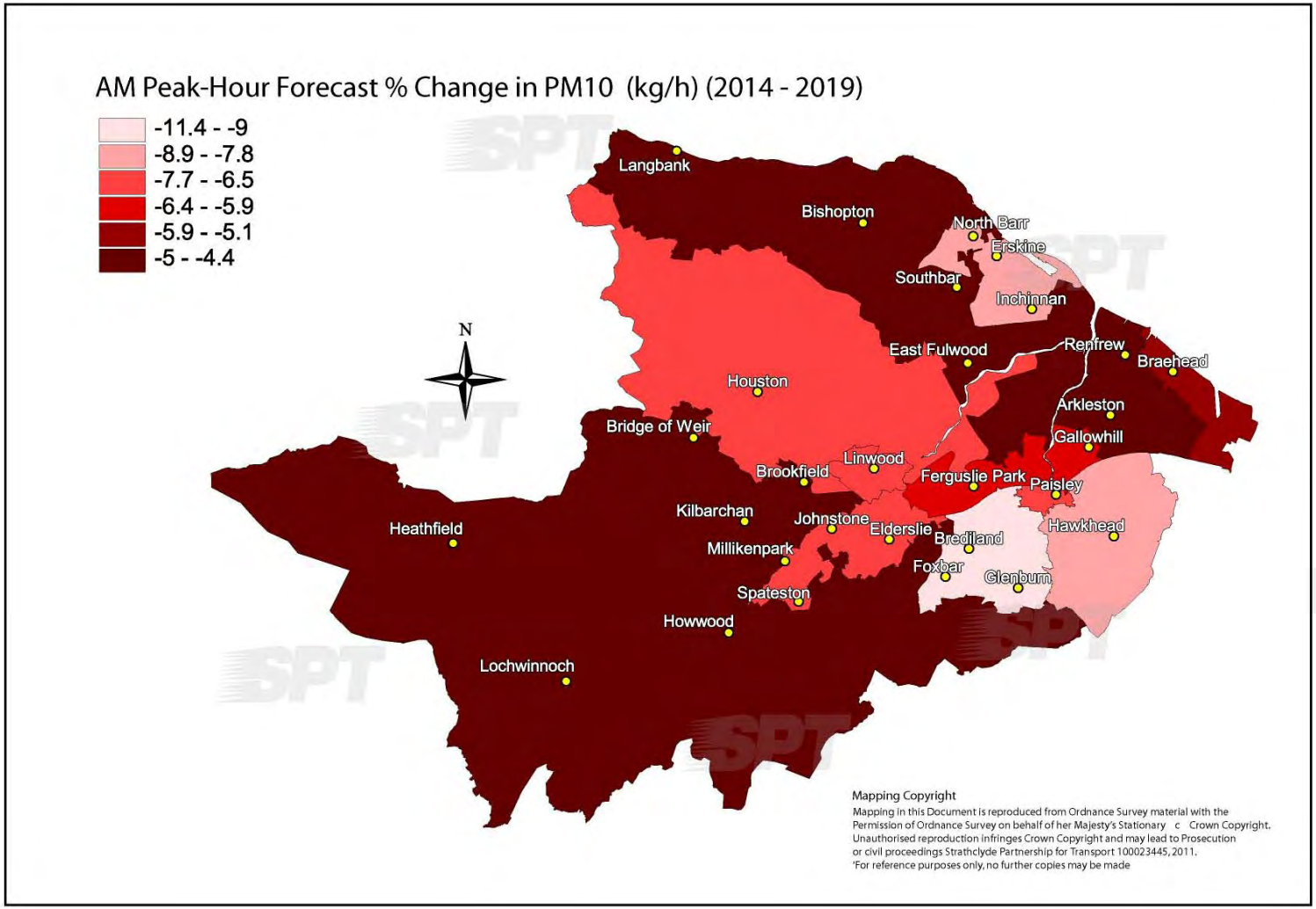
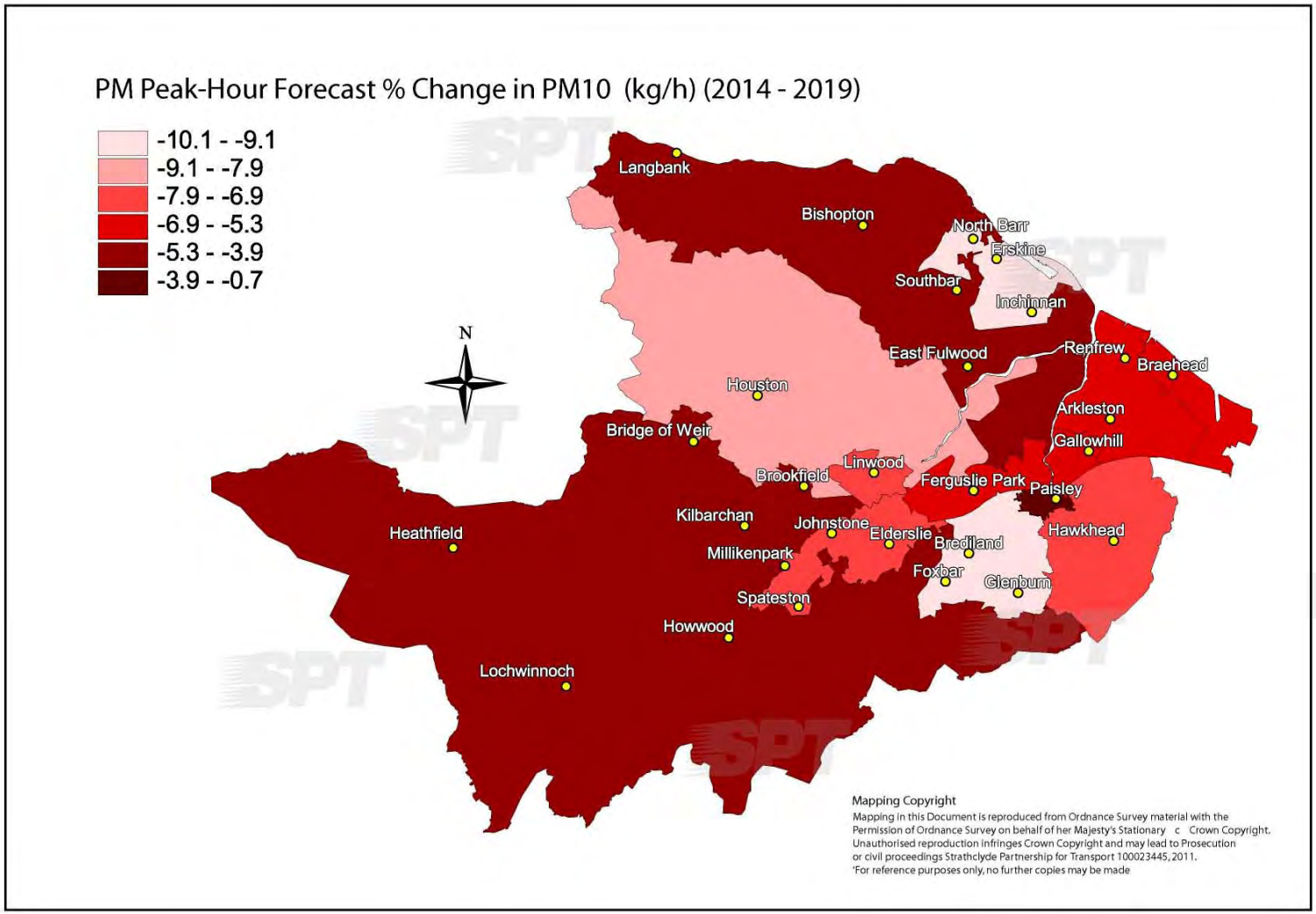


FIGURE 32 – PERCENTAGE CHANGE IN PM10 PM PEAK HOUR



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