Appendix 8: Travel Analysis

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1. Introduction

This document outlines the travel time analysis that has been completed for the Bristol, North Somerset and South Gloucestershire Stroke Reconfiguration Programme. This analysis has been used to inform the evaluation of the clinical options, in particular the following evaluation criteria:

Quality of Care:

- Will this option allow for patient transfers/emergency intervention within a clinically safe time-frame? Will travel time impact on patient outcome?

Access to Care:
- Does this option increase or decrease choice for patients?
- Will this option increase/reduce travel time and/or cost for patients to access specific services?
- Will this option involve patients travelling more/less frequently, change the number of journeys to access urgent medical intervention?
- Will this option increase/reduce travel time and/or cost for carers and family?

This evaluation criteria, along with others, was applied when considering the number and location of the Hyper Acute Stroke Unit(s), Acute Stroke Unit(s) and Sub-Acute Rehabilitation Unit(s). Further detail of the evaluation process can be found within the main PCBC document.

In February 2021, following recommendations from the NHSEI South West Clinical Senate, the proposed options for public consultation were agreed and can be seen below. Therefore, the pertinent detail applicable to the public consultation is figure 1 - 10 and section 6.

Option 1b	
Hyper Acute Stroke Unit at Southmead Hospital	
Acute Stroke Unit at Southmead Hospital	
Sub-Acute Rehab Unit	Sub-Acute Rehab Unit

Option 2b	
Hyper Acute Stroke Unit at Southmead Hospital	
Acute Stroke Unit at Southmead Hospital	Acute Stroke Unit at BRI
Sub-Acute Rehab Unit	Sub-Acute Rehab Unit

2. Travel Time Analysis: Methodology

The South, Central and West (SCW) GI and Mapping Team was commissioned to model the travel times for the Bristol, North Somerset and South Gloucestershire (BNSSG) population to travel to possible locations of stroke services. The decision to commission SCW was based on expertise, cost and availability. The team has worked extensively with multiple Clinical Commissioning Groups (CCGs), NHS England and other health organisations.

The SCW GI and Mapping Team use the TravelTime Platform that has been built by the technology company iGeolise in combination with desktop mapping software. This methodology is well recognised as the industry standard and has been applied in several other service transformation programmes.

The SCW were commissioned to model typical accessibility between the usual residence of the GP registered population of BNSSG CCG and locations of possible stroke services using three travel modes: blue light (travel by Ambulance), private car (peak and off peak), and public transport (peak and off peak).

The TravelTime Platform models private car journeys according to the following methodology:

1. A base map is broken down into urban and rural areas at a detailed local level, using data such as speed limits
2. The final areas are: Rural, Village, Town, Urban, City, Extra Urban, Dense Urban
3. All roads are tagged with a road type, e.g residential, tertiary, trunk, motorway, etc.
4. A library of representative trip samples is built
5. Statistical modelling techniques are applied to build speed profiles for all combinations of road types and area, including the density of different connecting road types
6. The speed profiles are applied to real-world routes, taking into account map features such as traffic lights and zebra crossings, and peak and off-peak times
7. Where appropriate, driving routes are book-ended with walking to represent how people actually travel, rather than simply 'snapping' to or from the nearest road
8. Drive time predictions are tested extensively against a number of real-world routes and actual journeys and the software used is regularly validated and updated.

Ambulance 'Blue light' times use night time travel as a proxy. Across the country this has been shown to be more similar to blue light times than application of a simple formula as it takes into account differences in road conditions.

The TravelTime Platform models public transport journeys according to the following methodology:

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1. Travel Time have a dedicated Data Team whose sole job is to identify Public Transport agencies, and secure their data for the transport analysis platform.
2. In the UK, they have identified and have information for every one of the 1,038 Public Transport agencies they have identified (e.g. Regional Bus operators, Coach Operators, Arriva Trains etc.)- The same coverage as Google use for their Maps platform.
3. The timetable information is updated every two weeks for maximum accuracy.
4. Every available transport mode is factored- bus, coach, train etc.
5. The timetable information is consolidated in to a model, so that for any journey requested, an optimum solution using the public transport network can be created.
6. As with road network, public transport journeys are book-ended by walking to represent how people travel from origins, to the network and then to the final destination.
7. Public transport journeys are benchmarked extensively against journey predictions from Google Maps (because these are the natural comparison people make).

The SCW GI and Mapping Team use the TravelTime Platform to model the travel time for geographical bands and these are illustrated on the maps attached. The residential address for the registered population are mapped over the top of these bands, and this determines the proportions of the population who are able to travel to the defined destination (either Southmead Hospital for the HASU, or the nearest ASU or nearest Sub-Acute Rehabilitation Unit) within a certain time period.

The output of the analysis gives a breakdown in map and table form of the proportion of the population who can reach the nearest defined point (HASU, nearest ASU or nearest Sub-Acute Rehab Unit).

3. Population

The population density of BNSSG varies significantly as do the available options for transport. Many of the rural areas of North Somerset and South Gloucestershire do not the same level of public transport services that are available in the city of Bristol, and these services generally correlate with the population density of the region.

Figure 1: Population density of the registered population in BNSSG

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Bristol, North Somerset and South Gloucestershire (BNSSG) - Stroke Review

Travel Analysis To Southmead, Bristol Royal Infirmary & Weston General Hospitals - Private Car & Public Transport

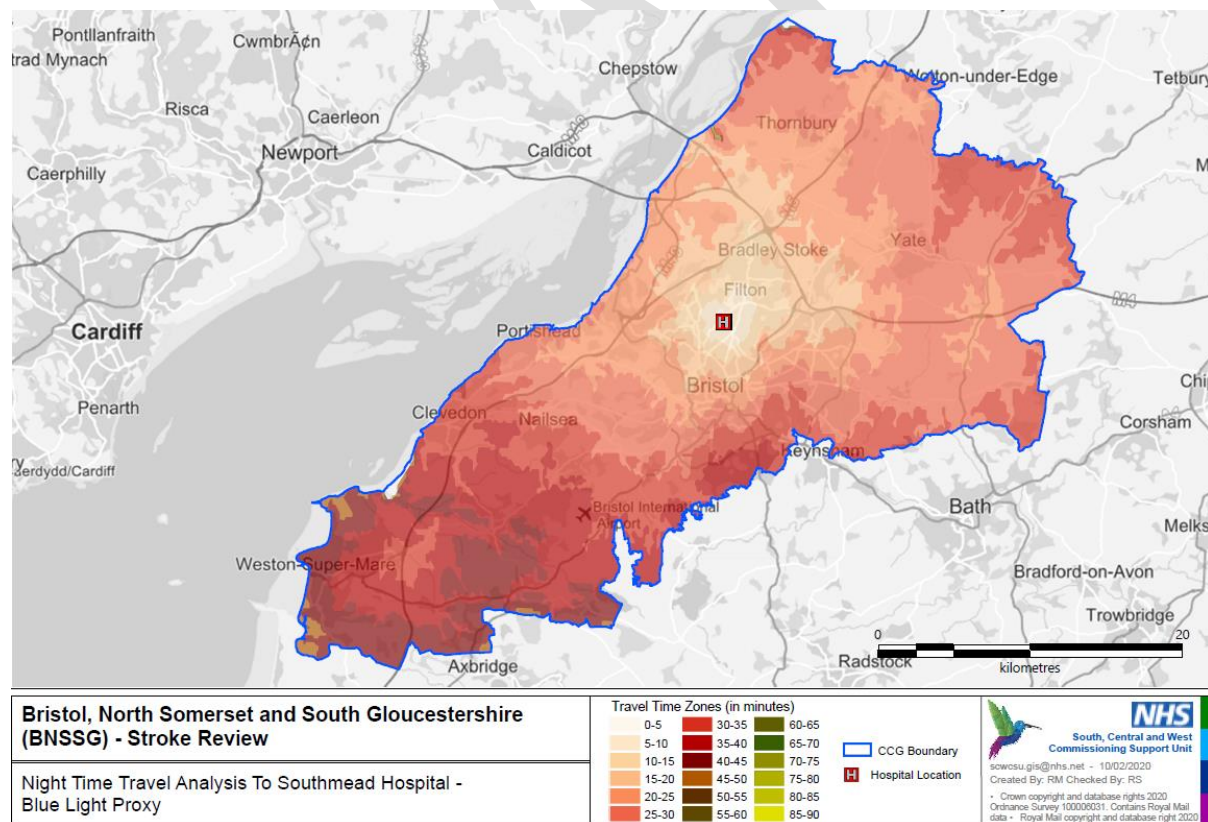| Travel Time Zones (in minutes)		Registered BNSSG Patients per sq km at LSOA	
0-15	90-105	10,000 to 23,100	
15-30	105-120	7,000 to 10,000	CCG Boundary
30-45	120-135	4,000 to 7,000	H Hospital Location
45-60	135-150	2,000 to 4,000	
60-75	150-165	0 to 2,000	
75-90	165-180		

4. Hyper Acute Stroke Unit

The evaluation on the number and location of Hyper Acute Stroke Unit(s) considered the evidence in the Bigger Better Faster Report on travel times.[1] Further analysis was done on the 'blue light' travel time for patients having a stroke in the BNSSG region. This analysis considered the maximum travel time to Southmead Hospital for the registered population of BNSSG who are living within the BNSSG boundaries.

The results of the modelling were as follows:

Scenario	Proportion of residents within time travel bands			
	Proportion 0 - 10 mins	Proportion 0 - 20 minutes	Proportion 0 - 30 minutes	Proportion 0 - 45 minutes
Southmead HASU Blue Light Travel	5%	28%	71%	100%

Figure 2: Blue light travel time for patients in BNSSG

Bristol, North Somerset and South Gloucestershire (BNSSG) - Stroke Review

Night Time Travel Analysis To Southmead Hospital - Blue Light Proxy

Travel Time Zones (in minutes)

0-5	30-35	60-65
5-10	35-40	65-70
10-15	40-45	70-75
15-20	45-50	75-80
20-25	50-55	80-85
25-30	55-60	85-90

CCG Boundary
H Hospital Location

NHS South, Central and West Commissioning Support Unit
scwcsu.gis@nhs.net - 10/02/2020
Created By: RM Checked By: RS
· Crown copyright and database rights 2020 Ordnance Survey 100006031. Contains Royal Mail data · Royal Mail copyright and database right 2020

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[1] http://www.swscn.org.uk/wp/wp-content/uploads/2013/12/SW-CV-SCN-Bigger-Better-Faster-Full-Report-September-2016.pdf

5. Acute Stroke Unit

57% of stroke patients will have a 6 day length of stay on an ASU.

As all patients will have their initial stroke care at the HASU unless it is not clinically safe to move them to the site of the HASU, there is no need to consider the blue light travel time to the sites of the ASUs. Therefore, the travel time analysis on the options for the site of the ASU(s) has been used to consider the impact of travel for the visitors of inpatients in the ASU. This includes the clinical benefits of patients receiving visitors.

The options considered in the travel analysis for the ASU(s) were as follows:

Option A	Option B	Option C	Option D
ASU at Southmead Hospital	ASU at Southmead Hospital	ASU at Southmead Hospital	ASU at Southmead Hospital
	ASU at Bristol Royal Infirmary	ASU at Weston General Hospital	ASU at Bristol Royal Infirmary
			ASU at Weston General Hospital

The table below shows the proportion of the population who would be able to reach their nearest ASU within 30, 60 and 90 minutes via private car journeys (peak and off-peak) and public transport (peak and off-peak). This analysis is based on patients having an inpatient stay on their nearest ASU to home.

Options Description	Transport Options	% of population able to reach nearest ASU within 30 minutes	% of population able to reach nearest ASU within 60 minutes	% of population able to reach nearest ASU within 90 minutes
1 ASU at Southmead	Option A – driving off peak	43%	100%	100%
	Option A – driving peak	50%	100%	100%
	Option A – public transport peak	29%	70%	96%
	Option A – public transport off peak	28%	71%	96%
1 ASU at Southmead and 1 at BRI	Option B – driving off peak	87%	100%	100%
	Option B – driving peak	76%	100%	100%
	Option B – public	50%	92%	99%

	transport peak			
	Option B – public transport off peak	49%	93%	99%
1 ASU at Southmead and 1 at WGH	Option C – driving off peak	87%	100%	100%
	Option C – driving peak	64%	100%	100%
	Option C – public transport peak	33%	82%	98%
	Option C – public transport off peak	32%	82%	99%
1 ASU at Southmead, 1 at BRI and 1 at WGH	Option D – driving off peak	100%	100%	100%
	Option D – driving peak	90%	100%	100%
	Option D – public transport peak	54%	96%	99%
	Option D – public transport off peak	53%	98%	99%

The maps on the following pages show this information in visual form. Note that the areas where there is no shading are the areas from which the nearest ASU cannot be met within the time bands allowed (max 90 minutes).

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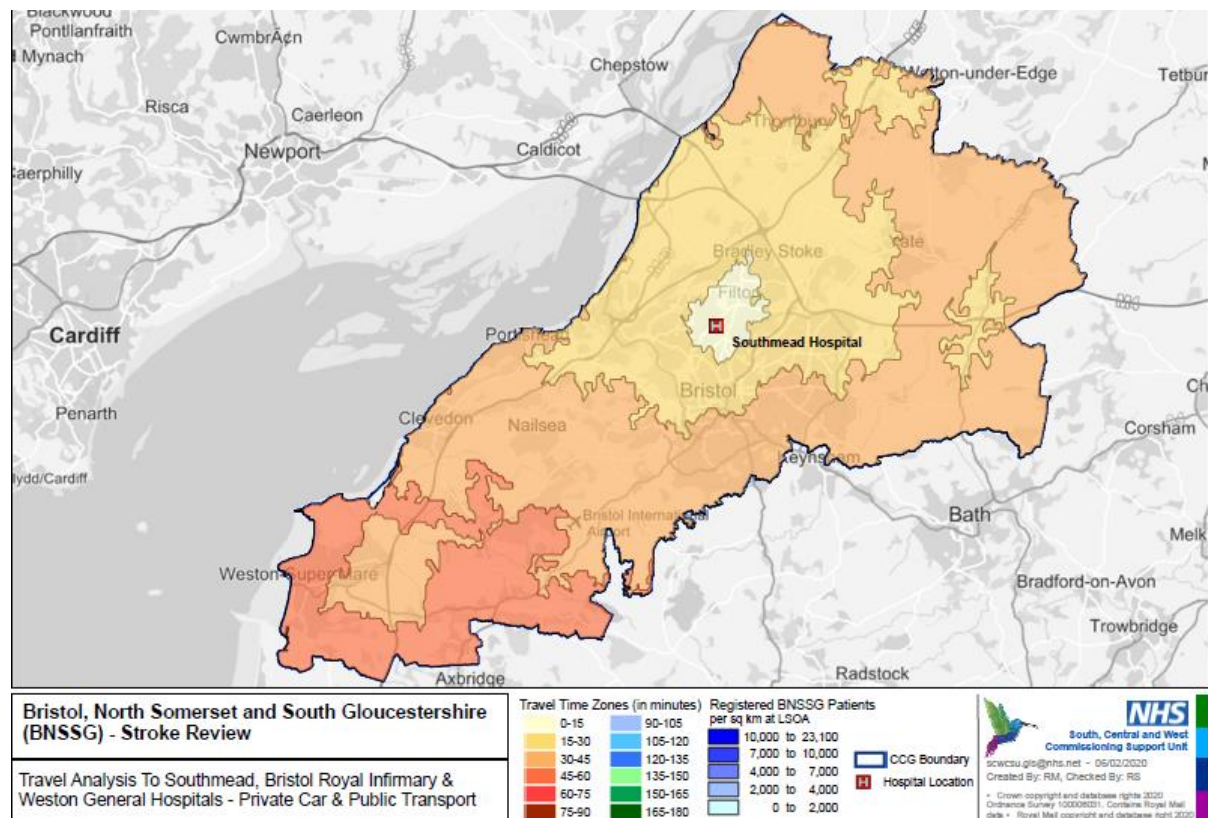## Figure 3: ASU at Southmead, driving at peak time
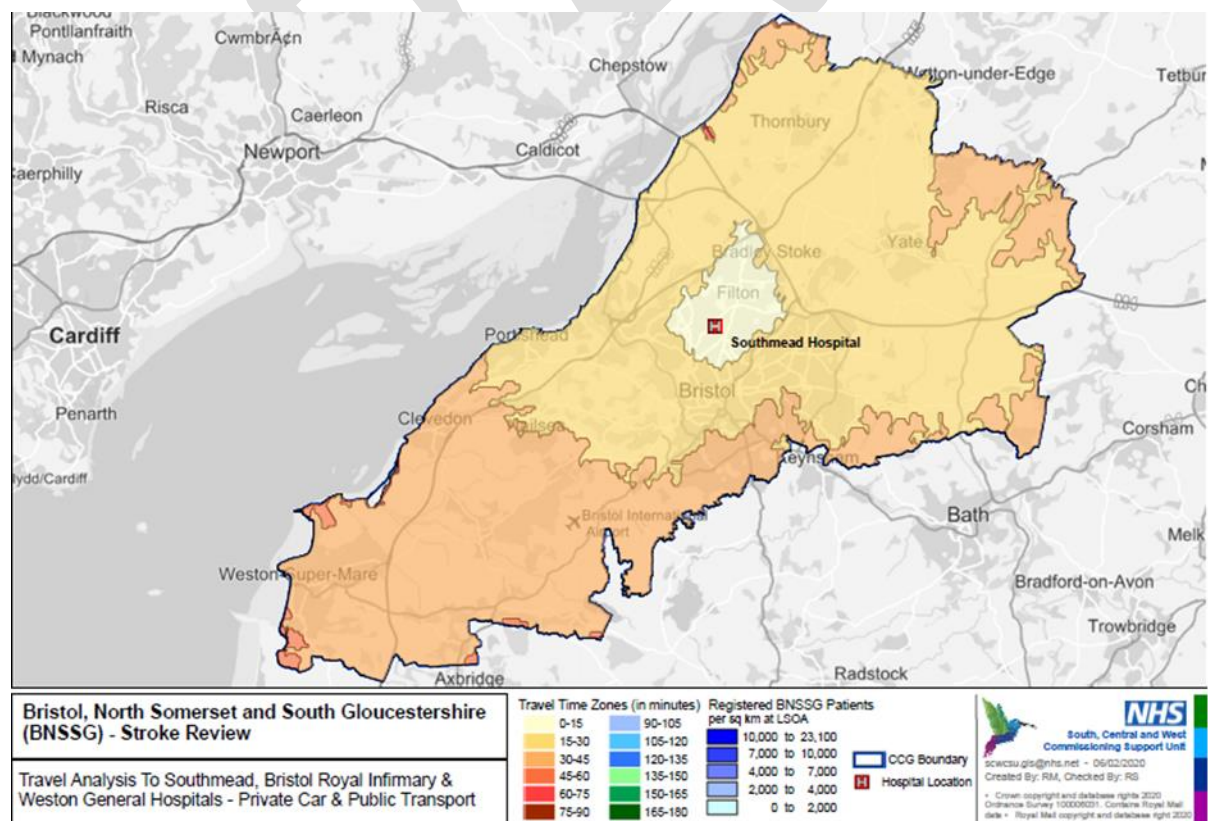

Figure 4: ASU at Southmead, driving at off-peak

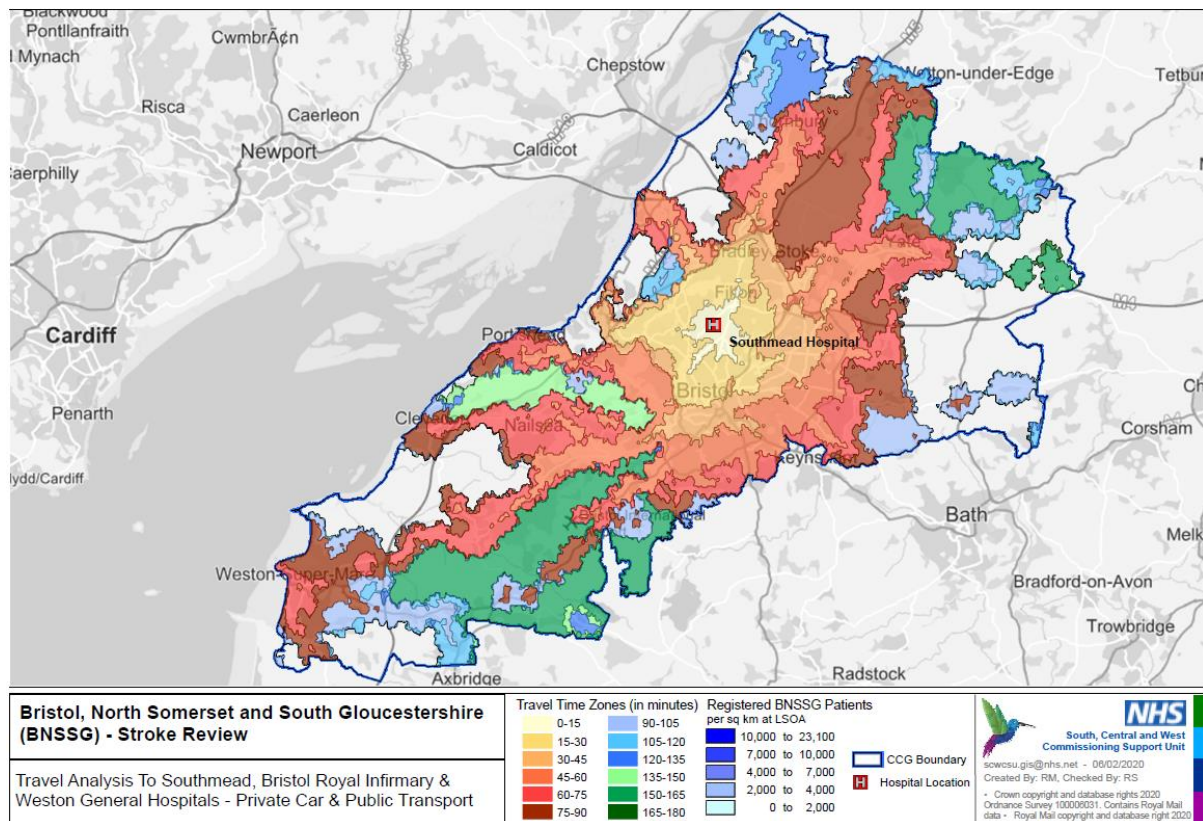## Figure 5: ASU at Southmead, public transport peak

Bristol, North Somerset and South Gloucestershire (BNSSG) - Stroke Review

Travel Analysis To Southmead, Bristol Royal Infirmary & Weston General Hospitals - Private Car & Public Transport

Travel Time Zones (in minutes): 0-15, 15-30, 30-45, 45-60, 60-75, 75-90, 90-105, 105-120, 120-135, 135-150, 150-165, 165-180

Registered BNSSG Patients per sq km at LSOA: 10,000 to 23,100; 7,000 to 10,000; 4,000 to 7,000; 2,000 to 4,000; 0 to 2,000

CCG Boundary
H Hospital Location

Figure 6: ASU at Southmead, public transport off-peak

Bristol, North Somerset and South Gloucestershire (BNSSG) - Stroke Review

Travel Analysis To Southmead, Bristol Royal Infirmary & Weston General Hospitals - Private Car & Public Transport

Travel Time Zones (in minutes): 0-15, 15-30, 30-45, 45-60, 60-75, 75-90, 90-105, 105-120, 120-135, 135-150, 150-165, 165-180

Registered BNSSG Patients per sq km at LSOA: 10,000 to 23,100; 7,000 to 10,000; 4,000 to 7,000; 2,000 to 4,000; 0 to 2,000

CCG Boundary
H Hospital Location
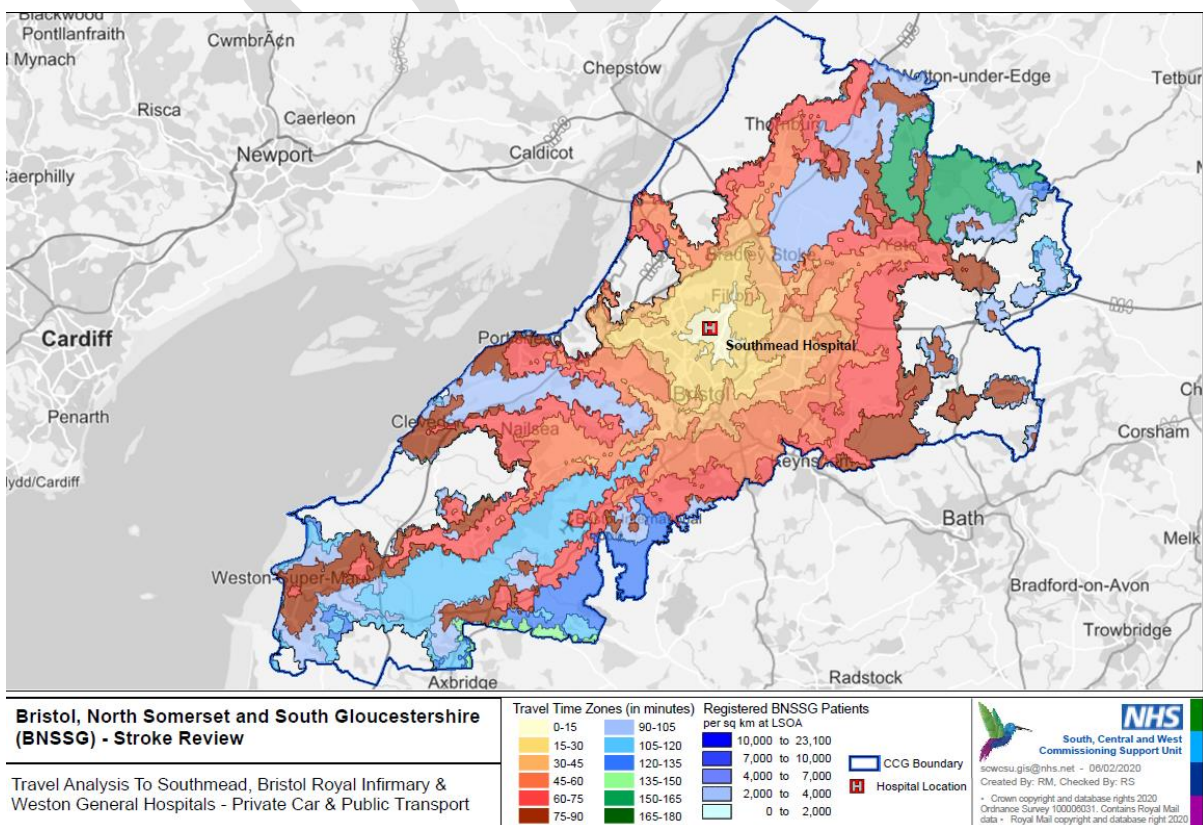
Figure 7: ASUs at Southmead and BRI, driving peak
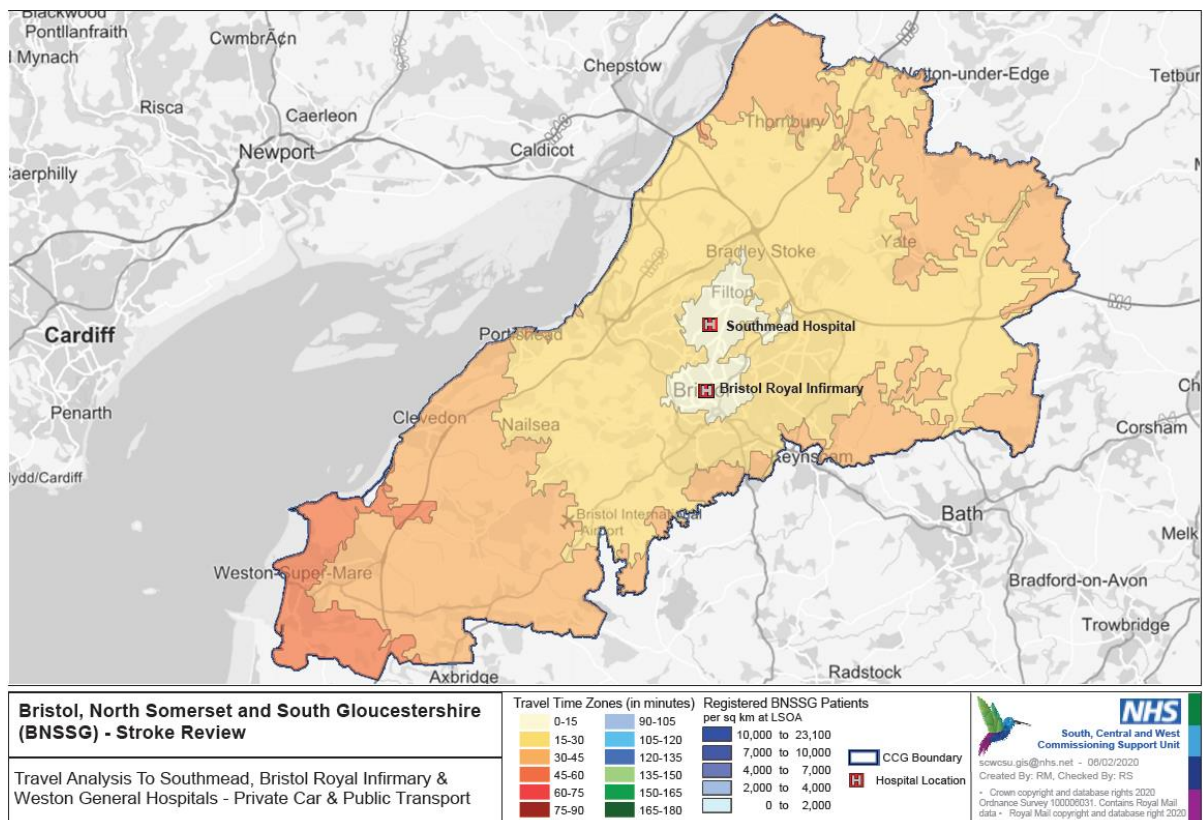

Figure 8: ASUs at Southmead and BRI, driving off-peak

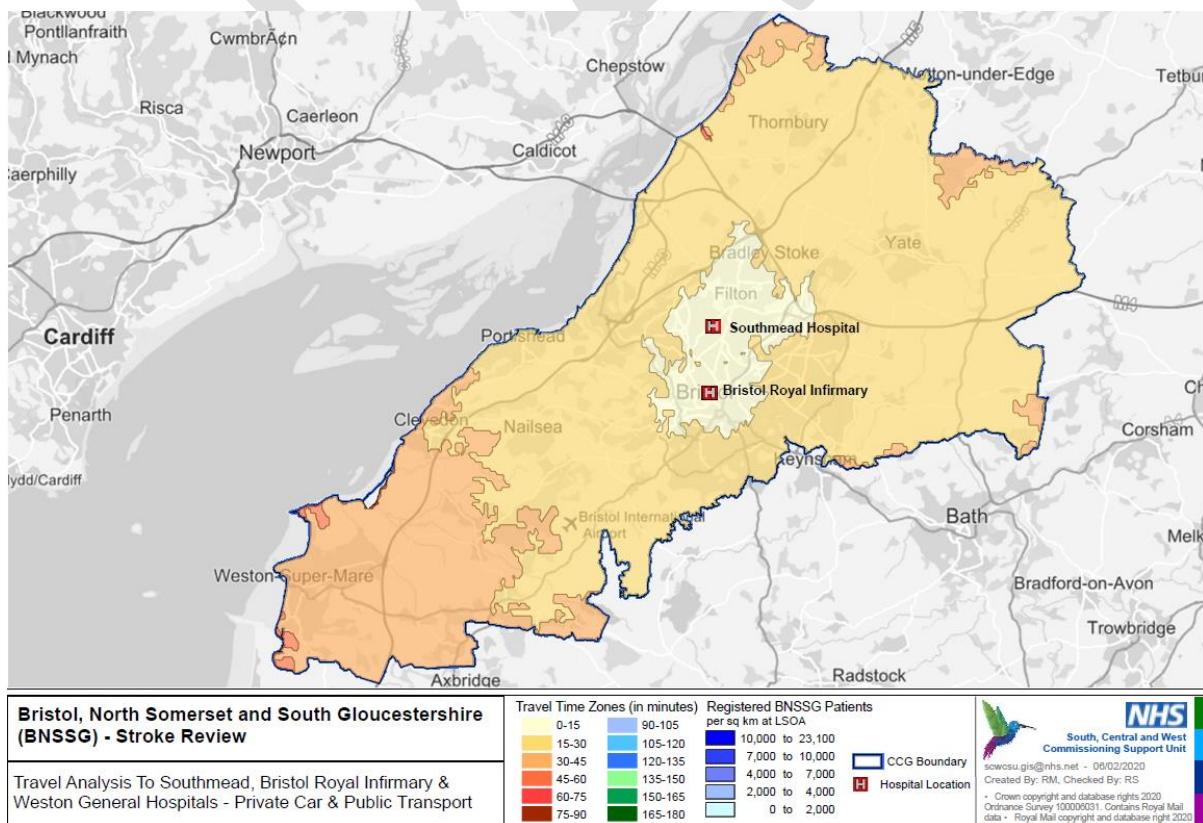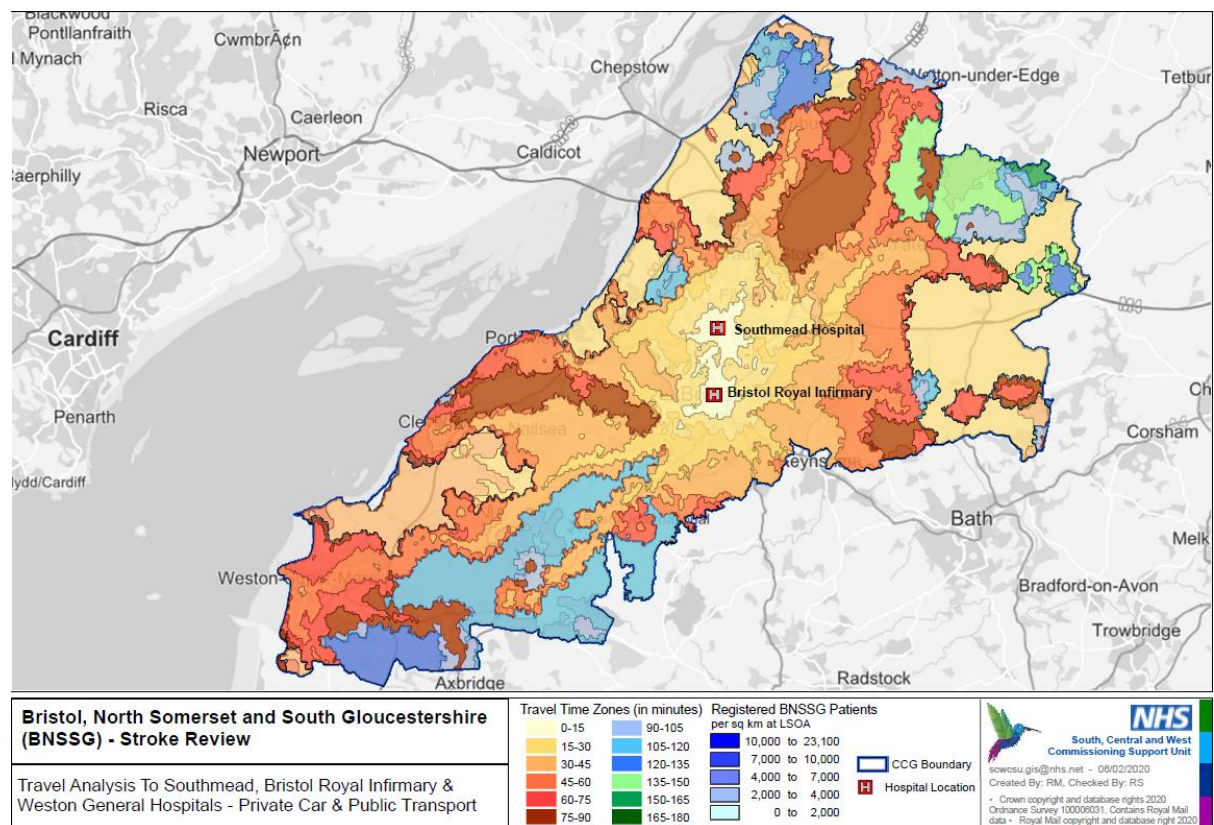## Figure 9: ASUs at Southmead and BRI, public transport peak

Figure 10: ASUs at Southmead and BRI, public transport off-peak
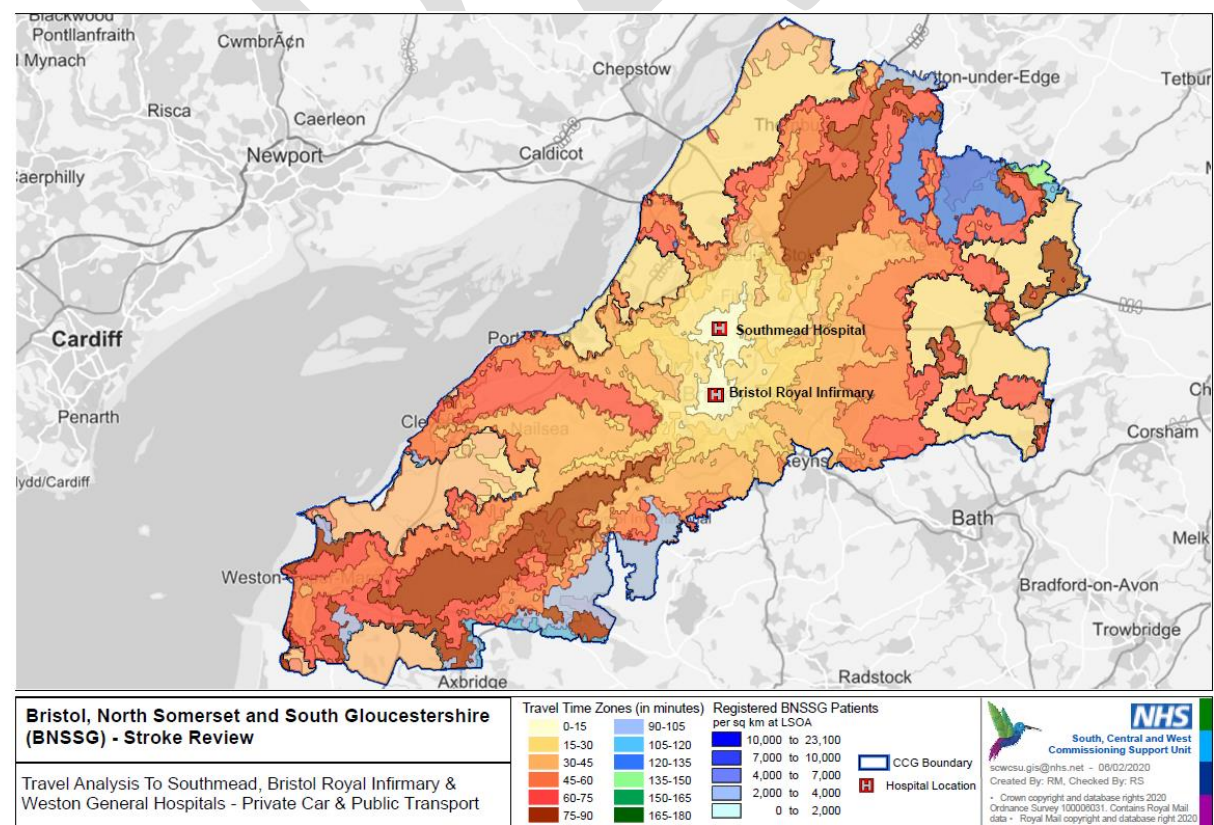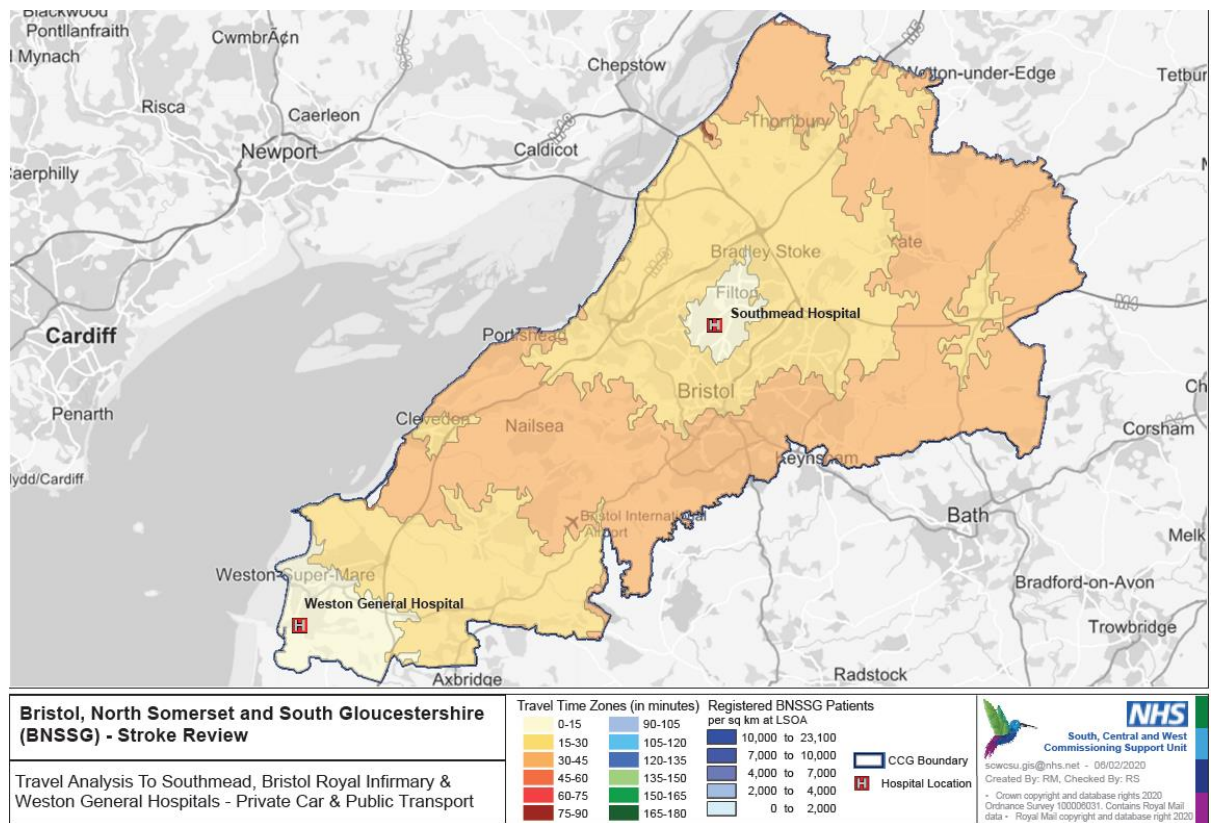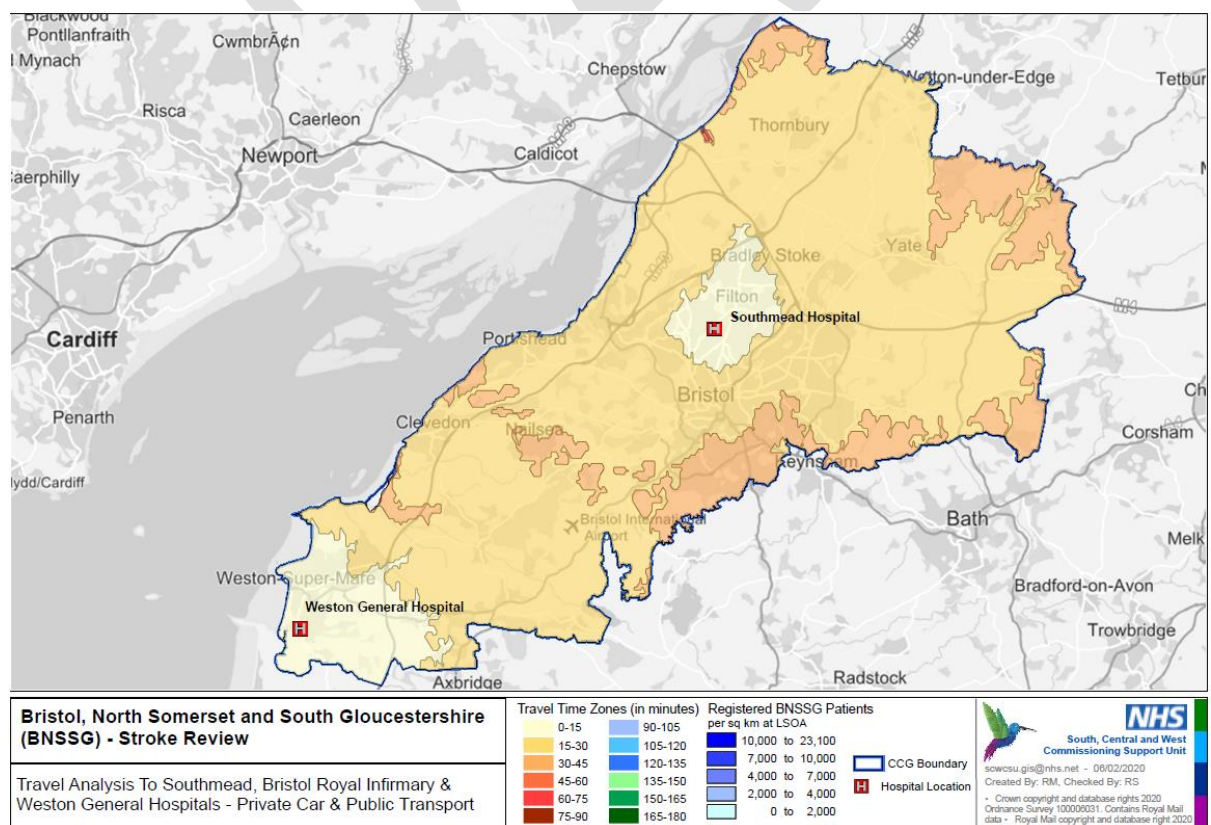
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Figure 11: ASUs at Southmead and WGH, driving peak

Figure 12: ASUs at Southmead and WGH, driving off-peak

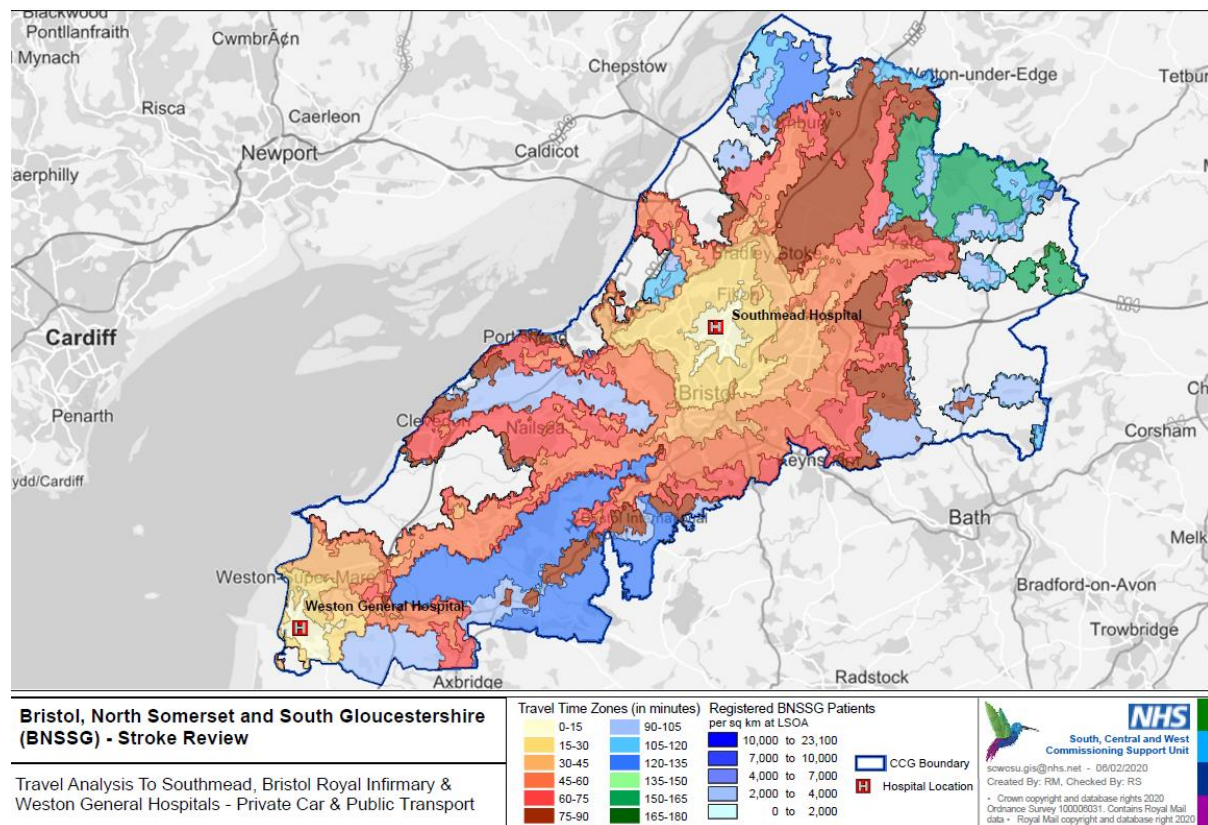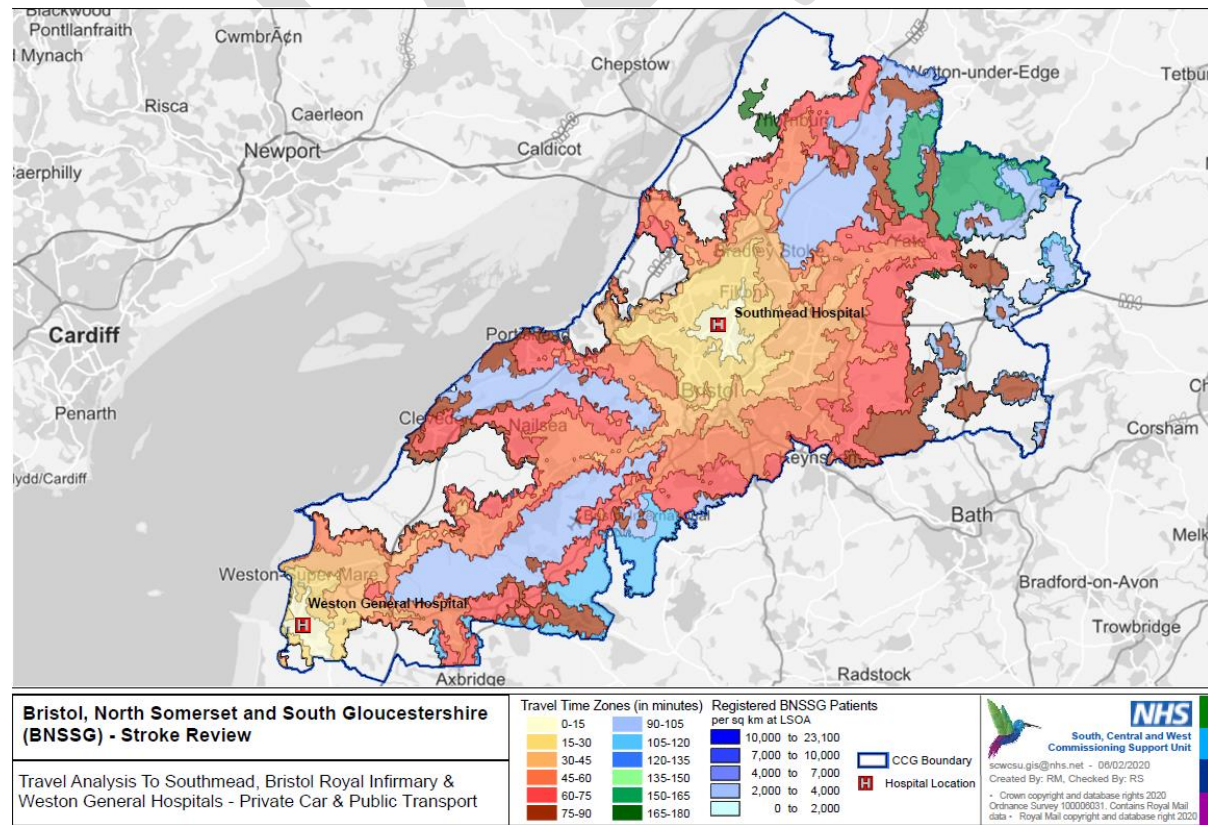**Figure 13: ASUs at Southmead and WGH, public transport peak**

Figure 14: ASUs at Southmead and WGH, public transport off-peak

Figure 15: ASUs at Southmead, BRI and WGH, driving peak

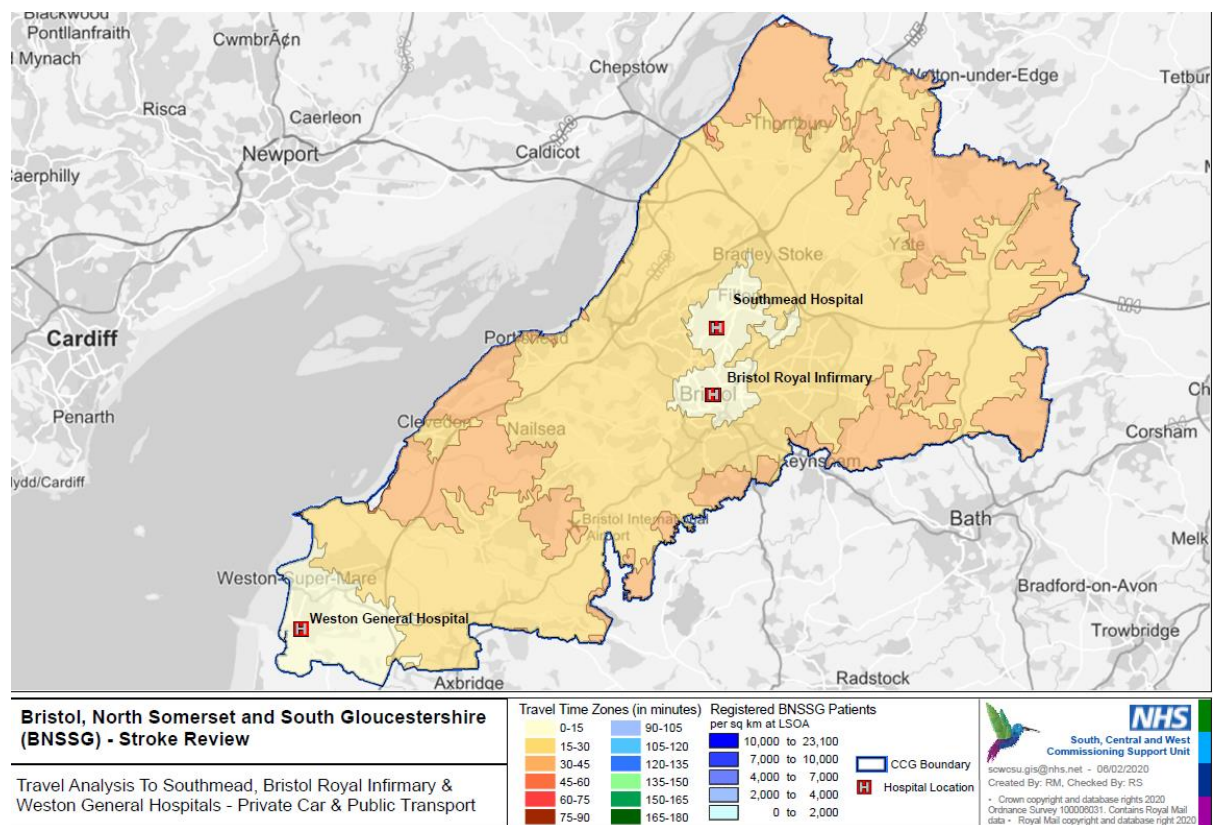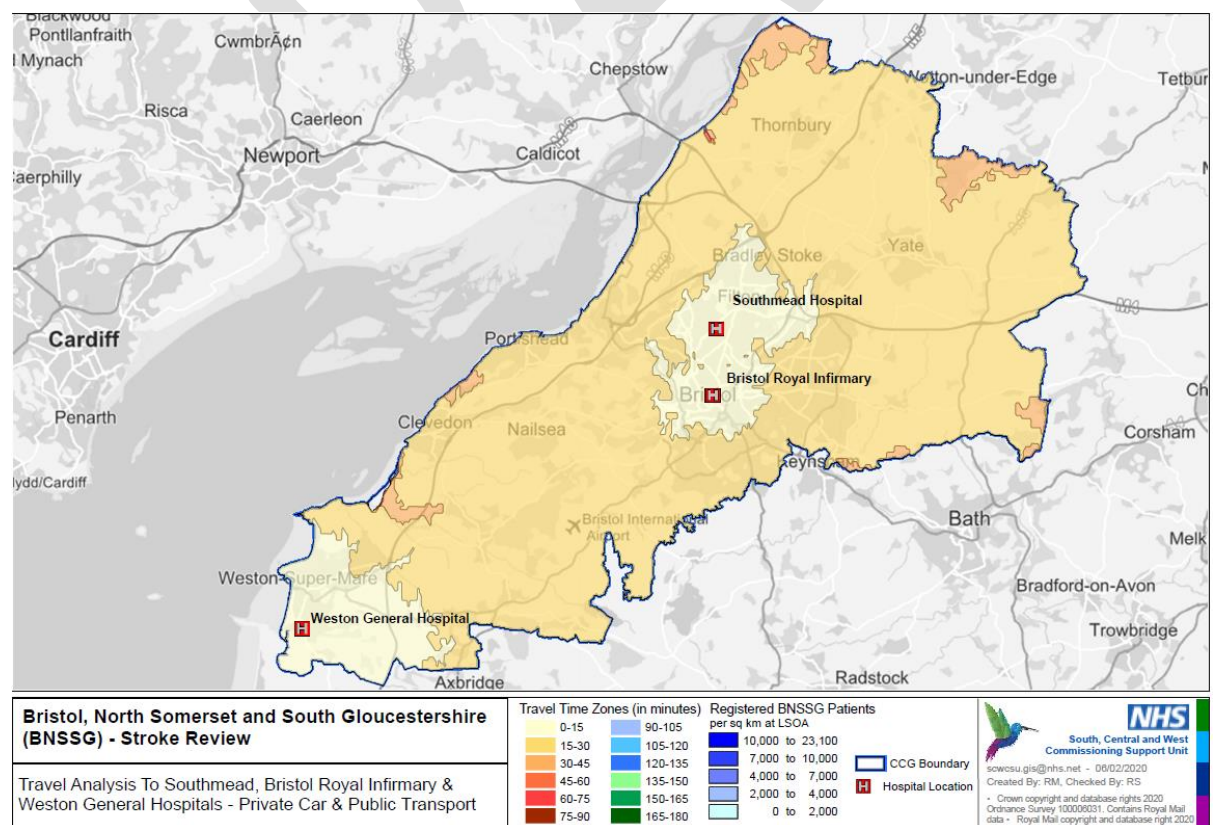## Figure 16: ASUs at Southmead, BRI and WGH, driving off-peak

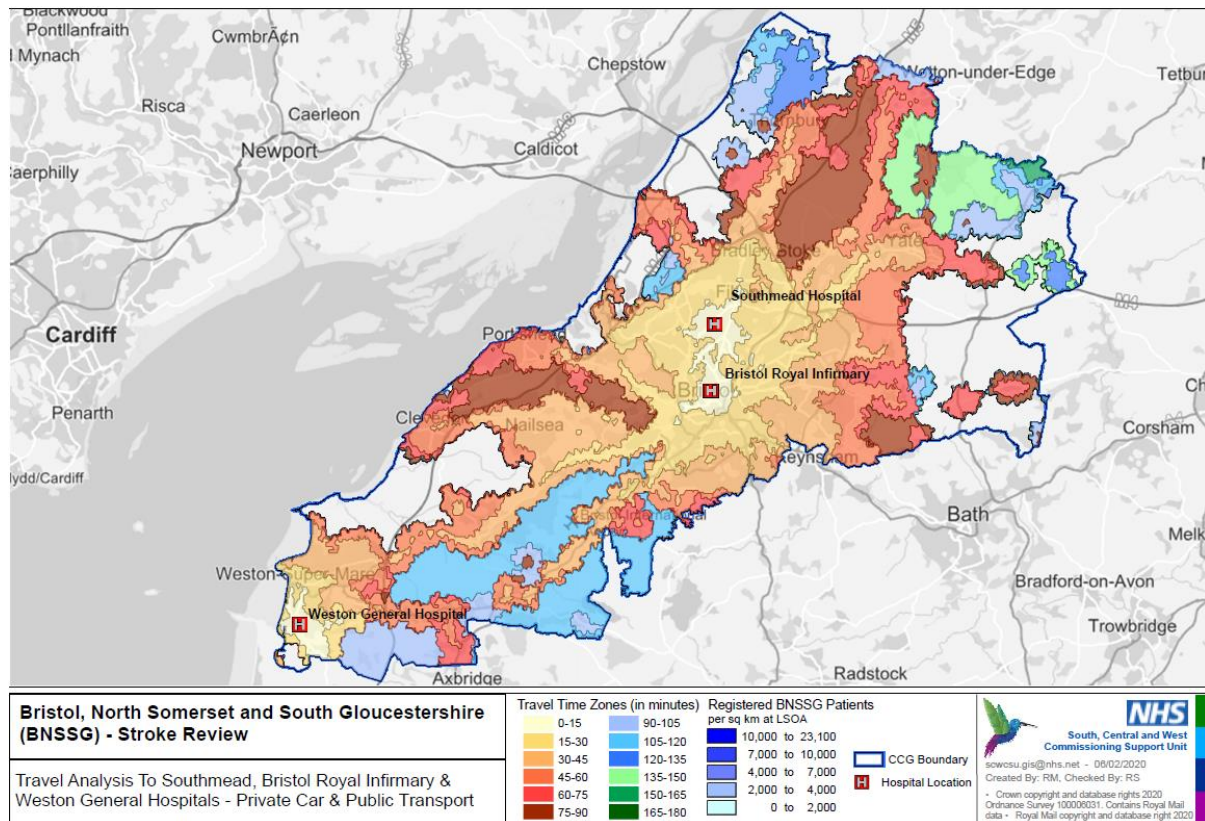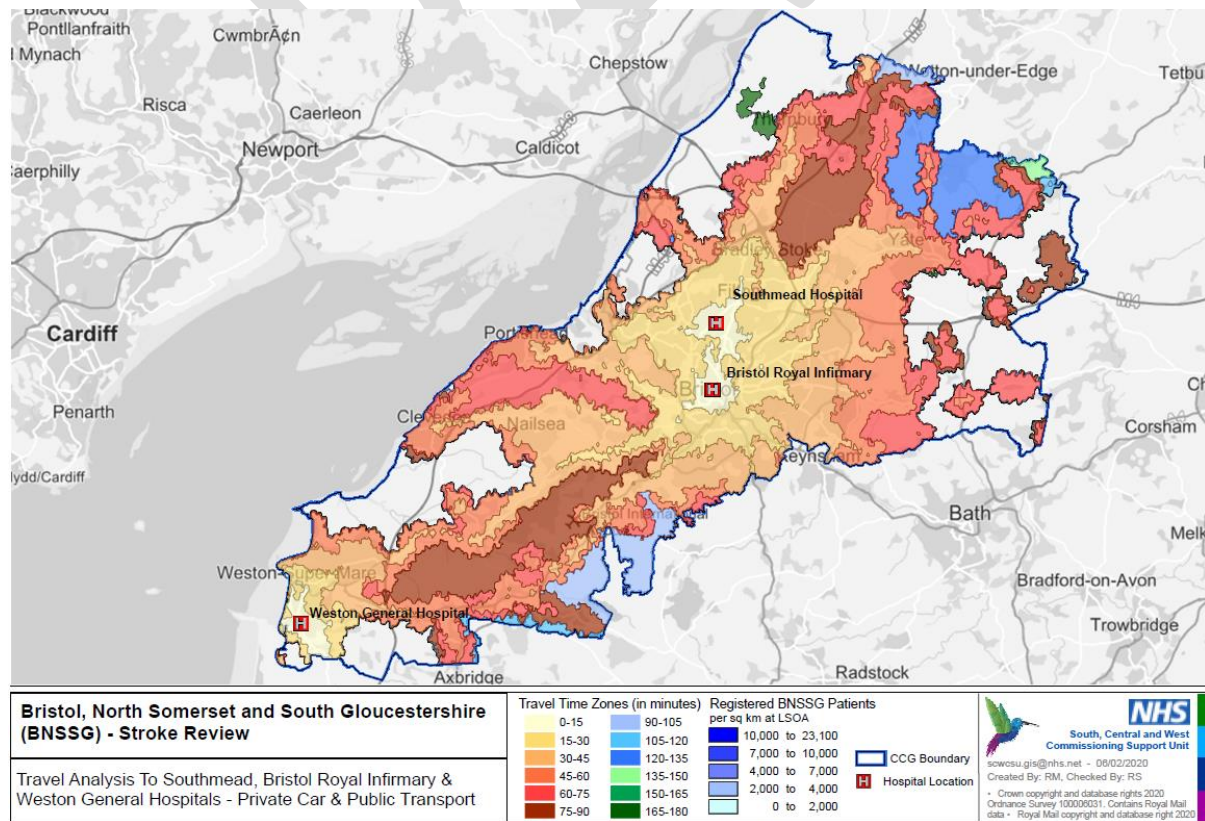**Figure 17: ASUs at Southmead, BRI and WGH, public transport peak**

Figure 18: ASUs at Southmead, BRI and WGH, public transport off-peak

6. Sub-Acute Rehabilitation Units

34% of stroke patients will have an 27.5 day length of stay on a sub-acute rehabilitation unit (SARU). As with the ASU, there is no need to consider the blue light travel time for patients being conveyed to the SARUs. It is likely that the majority of patients will be conveyed to the SARU from the ASU by patient transport because of their ongoing medical needs.

The following options were considered for the location of the SARUs.

Option A	Option B	Option C	Option D	Option E	Option F
Frenchay	South Bristol Community Hospital	Frenchay	Frenchay	South Bristol Community Hospital	Frenchay
South Bristol Community Hospital	Weston Hospital Site	Weston Hospital Site	Weston Hospital Site		
		South Bristol Community Hospital			

Option	Transport option	% of population able to reach a SARU within 30 minutes	% of population able to reach a SARU within 60 minutes	% of population able to reach a SARU within 90 minutes
Option A	Frenchay and South Bristol Community Hospital - Public Transport Peak	35%	80%	97%
	Frenchay and South Bristol Community Hospital - Public Transport Off peak	33%	79%	98%
	Frenchay and South Bristol Community Hospital - Driving Peak	85%	100%	100%
	Frenchay and South Bristol Community Hospital - Driving Off Peak	91%	100%	100%
Option B	South Bristol Community Hospital and Weston Hospital Site - Public	18%	61%	96%

	Transport Peak			
	South Bristol Community Hospital and Weston Hospital Site - Public Transport Off Peak	17%	59%	96%
	South Bristol Community Hospital and Weston Hospital Site - Driving Peak	46%	100%	100%
	South Bristol Community Hospital and Weston Hospital Site - Driving Off Peak	67%	100%	100%
Option C	Frenchay, South Bristol Community Hospital and Weston Hospital Site - Public Transport Peak	39%	91%	98%
	Frenchay, South Bristol Community Hospital and Weston Hospital Site - Public Transport Off Peak	38%	90%	99%
	Frenchay, South Bristol Community Hospital and Weston Hospital Site - Driving Peak	98%	100%	100%
	Frenchay, South Bristol Community Hospital and Weston Hospital Site - Driving Off Peak	100%	100%	100%
Option D	Frenchay and Weston Hospital Site - Public Transport Peak	26%	88%	98%
	Frenchay and Weston Hospital Site - Public Transport Off Peak	25%	87%	99%
	Frenchay and Weston Hospital Site - Driving Peak	92%	100%	100%
	Frenchay and Weston Hospital Site - Driving Off Peak	98%	100%	100%
Option E	South Bristol Community Hospital - Public Transport Peak	13%	51%	95%
	South Bristol Community Hospital - Public Transport Off Peak	13%	48%	95%
	South Bristol Community Hospital - Driving Peak	32%	100%	100%

	South Bristol Community Hospital - Driving Off Peak	53%	100%	100%
Option F	Frenchay - Public Transport Peak	22%	77%	95%
	Frenchay - Public Transport Off Peak	21%	75%	97%
	Frenchay - Driving Peak	79%	100%	100%
	Frenchay - Driving Off Peak	87%	100%	100%

7. Staff Travel

Remodelling of services across the hospital sites will ultimately have an impact on staff travel to and from work. Staff will experience:

- No change as a result of reconfiguration.
- Positive change resulting in shorter travel times.
- Negative change resulting in increased travel time to get to and from their work place.

In relation to recognising potential impacts of change associated with staffing across multiple sites and locations analysis has been undertaken to illustrate the potential for staff should they be required to operate from a different base.

The individual travel times will be determined based on specific location of residence however the table below states the distances between the current sites which are involved in the delivery of Stroke care. This will be discussed with staff as part of the ongoing engagement and eventual formal staff consultations required as part of organisational changes or staff transfers as appropriate.

Distance in Miles	Southmead	BRI	SBCH	Weston
Southmead	0	3.2	9.5	26.7
BRI	3.2	0	5.7	23.4
SBCH	9.5	5.7	0	21.1
Weston	26.7	23.4	21.1	0